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A Comprehensive Study of the Impact and Position of Trade Liberalization on Women's Working Lives and the Glass Ceiling Perception in Various Economic Sectors

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Abstract
This study examines the impact of trade liberalization on women's working lives using data from 74 selected countries around the world and based on the generalized momentum method (GMM) over the period 1990-2006. The results indicate that trade liberalization in developing countries leads to a decrease in women's participation in the industrial sector and an increase in their participation in the service sector and agriculture. In developed countries, trade liberalization leads to an increase in women's participation in the service sector and a decrease in women's participation in the industrial and agricultural sectors.

Keywords: Cultural Identity, Quality of Work Life, Female Heads of Households

1. Introduction

The Impact of Trade Liberalization on Women's Working Lives in Various Economic Sectors Today, one of the most important concerns of politicians and economists is the impact of the phenomenon of economic globalization on real economic variables, such as production and employment. Economic globalization means the convergence, homogenization, and integration of economic markets, including commodity, labor, money, and capital markets, at the international level. This important issue, with the growth of international trade, foreign direct investment, the growth of capital flows at the international level, and the increased use of information and communication technology in the last two decades, has increasingly affected the economies of various countries, so much so that most studies show that almost no country can implement optimal policies to increase welfare, employment, production, and, in its domestic economy, without paying attention to international and global developments (Kamijani and Qovidel, 2006).

Different definitions of globalization are offered, societies and economies around the world are rapidly integrating. These measures and convergence are influenced by the revolution in the field of communications, the reduction of transportation costs, the reduction or elimination of trade tariffs, the increase in capital flows, and the increasing demand for migration.

Such a process is called globalization. The most important feature of globalization It can be seen in the removal of national barriers to economic affairs, in the expanded activities of multinational corporations and the international expansion of commercial, financial and production activities (Sa'i, 2008). Globalization makes some winners and some losers. Globalization causes women to bear the costs of economic liberalization by losing high-paying jobs and jobs (Bussmann, 2009).

The reason for women's participation in the labor force is their high demand for monetary power through marriage and financial independence. This is also confirmed by feminists (Beneria, 2003). With the increase in divorce rates, women's participation outside the home leads to a distribution and division of household chores after marriage. In developed countries, acquiring skills is an important factor for women in competing with men for gainful employment (Iversen & Rosenbluth, 2006).

More development leads to the movement of women (along with men) from agricultural occupations to the manufacturing and service sectors. Men and women from Non-income households and agriculture are moving towards gainful employment in the industrial and service sectors; (Tzannatos, 1999).

Feminist researchers believe that methodology and theories do not take into account the future of economic relations for women. (Elson et al. 2007) These individuals are more likely to believe in other sub-models such as compassion and social relations (Seguino et al.,1996).

A group of economists Scholars, emphasizing the positive dimensions of globalization, believe that women have largely benefited from economic reforms. From their perspective, although globalization has exacerbated the process of polarization, it has also increasingly led to an increase in women's income. One of the most important opportunities for women from globalization is the increase in employment rates (Taher Khani, 2004).

Men and women interact differently with the market due to gender differences in paid and unpaid work. This has an impact on individuals' behaviors and priorities (Ruspini 2001; Beneria, 2003). In most empirical studies, the impact of globalization in the form of free trade on trade volume depends on different explanatory variables.

From On the other hand, women's participation in the labor market determines their employment rate and participation in various economic sectors, and the type of occupations women hold. In this regard, the present study examines the impact of globalization on women's working lives and examines economic theories on how women's participation in the labor market of various economic sectors changes, considering the effects of globalization on the labor market in developing and developed countries (Gol Mohammadi, 2017).

2. Research Background

Since women have always constituted half of the members of society, it is expected that this potential and extensive force, through their active participation in various economic, political, social and cultural activities, will set the wheels of society in motion along with men and achieve greater success in this way. However, throughout history, opportunities and possibilities for women have not been distributed in a way that allows them to easily appear alongside men on the social stage and play their worthy roles without gender limitations.

In the area of decision-making, women's access to managerial positions and positions has not kept pace with the small increase in their participation in the labor market, as women have always been in positions that inevitably involve repetitive and low-level work.

Most women have worked in teaching positions and as assistant production managers, and have rarely held the responsibilities of production managers. Although this situation exists in all developed and developing countries, the severity of gender inequalities is much greater in developing countries (UNDP, 1997). In a general statement, employment is one of the most important sources of human identity. The quantity and quality of working life determine who each person is and what role they play in society.

Work gives order to human life through the continuous and regular activities it creates. It divides and schedules the different areas of his life. Having a formal job is an opportunity to acquire skills and to express creativity. Income from employment improves the freedom and independence of the individual (Haralambo and Holborn, 2004). Durkheim also considers employment as a social and moral commodity that determines the meaning of life and the position of the individual. Similarly, he sees material and economic insecurity and broken patterns of employment as sources of identity destruction and moral weakness in Society knows.

The international economic development of countries affects the type of work women do. As further development leads to the movement of women (along with men) from agricultural and domestic work to the manufacturing and service sectors, In the service sector, alongside the increase in women's participation, it is expected that service jobs will be replaced by non-income-earning domestic work (Kattab and Fenton, 2009).

Horton, 1999; Tzannatos, 1999 In developing countries, it is expected that due to globalization, women will be mostly employed in the agricultural and industrial sectors.

Therefore, working women in developing countries benefit the most from globalization. However, these same women in industrialized countries do not benefit to the same extent, but rather, women who have acquired skills in these countries benefit the most. Therefore, globalization has led to increased social and economic polarization among women; Not only among women living in different geographical areas, but also among skilled and unskilled women (Beneria, 2003; Young, 1998). In summary, globalization leads to an increase in women's participation in low-income employment positions (especially in the agricultural and industrial sectors), as women accept unstable and low-income jobs due to the demand for cheap labor. Almost all over the world, women work longer hours and earn lower wages. They work less than men in similar occupations (Saif, 2015).

Women in developing countries are the first hope for the advancement of their families and the growth and development of their countries. The success of women entrepreneurs in these societies not only brings economic benefits but also social and cultural benefits (Seymour, 2003). Sometimes women seek to create alternatives to family income because other family members may be unemployed as a result of globalization (Beneria, 2003).

Regarding women's expectations of the labor market, in industrialized countries, skilled women have a better chance of accessing jobs and the labor market than low-skilled women. Therefore, globalization has had a small impact on the overall participation rate of women in industrialized countries. In developing societies where the demand for unskilled labor is higher, less skilled women (who are more numerous in developing societies) supply the needs of the industrial sector in the production of specific goods (Bussmann, 2009). According to the Stapler-Samuelson theory, free trade is beneficial for regions that have an abundance of factors of production. Because an increase in the relative price of a good produced by abundant factors of production leads to an increase in the income of that factor of production, in Conversely, owners of scarce factors of production benefit from trade. Thus, societies that are rich in labor but have little capital benefit from trade freedom, while capital owners benefit from protection of domestic industries. In other words, developing societies benefit from unskilled labor and developed societies from skilled labor (Caves et al.1996).

Globalization and the growth of exports of manufactured goods are leading to an increase in women's participation in non-agricultural activities. Factory owners prefer to employ women because they demand fewer rights. Income from work increases women's self-sufficiency and financial independence in the home environment, and thus their position in the family is enhanced (Grown, 2006). Globalization advocates believe that gender inequality leads to economic growth.

Since women's cheap labor reduces the cost of exporting products and increases the competitiveness of products, exports earn foreign exchange, which is necessary for importing intermediate goods, increasing Production, growth, investment, and (Seguino, 2000a, 2000b; Blecker & Seguino 2002) Ninety percent of the world's countries have organizations for the advancement of women's social status, yet women are underrepresented at various levels of decision-making due to lower education, lack of self-confidence, and greater responsibility (Yousefian, 1996). In developing countries, many jobs that were previously performed by men are now being performed by women.

They do the work, especially in countries that have experienced high export growth, and the growth of low-income jobs among women has been high (Standing, 1989). Today, agricultural production is often done by women, although it is not yet clear whether the number of jobs held by women has increased compared to men in different sectors of the economy.

By performing some specific jobs by women, the labor supply increases, which leads to a decrease in women's income and a decrease in labor standards. In this way, women's entry into the labor market is facilitated, but (Tzannatos, 1999; Standing, 1989; Beneria, 2003) working conditions decline. Tzannatos (1999) in a study examining changes in the labor market of women in the world economy believes that women's participation in the labor market is increasing in parallel with men. This gap is narrowing day by day in developing countries. The reason for this is the decrease in male participation (due to education and the existence of pensions) and the increase in female participation.

Ozler (2000), in a study conducted in the Turkish manufacturing sector during the period 1983-1985, concluded that specialized positions were disproportionately filled by men. In the manufacturing sector, which produces products that require a lot of unskilled labor (with low wages) and little need for capital, female employment participation is very high.

Kukra and Kucera & Milberg (2000) examined trade liberalization and manufacturing job losses in OECD countries over the period 1987-1995 and found that in the manufacturing sector, women in developing countries lost their jobs disproportionately, especially in sectors that needed more female participation (such as textiles and leather), and in countries that had engaged in foreign trade in the industries in question.

Seguino (2000) examined Gender inequality and economic growth for a set of export-oriented semi-industrial economies over the period 1975-1995, and argues that the distribution of labor is not only based on educational attainment, but also on economic structure. The greater participation of women in low-income sectors that produce goods at different price points influences trade patterns.

The wage gap leads to increased savings in industries where women participate more, and thus to increased exports. In their study explaining the uneven gender division of labor, Iversen & Rosenbluth, (2006) state that the increase in divorce rates is an important component of the distribution and division of household chores after marriage, also in developed countries, acquiring skills is an important factor for women in competing with men for gainful employment.

On the other hand, studies by Busse & Spielmann (2006) showed that gender inequality in wages leads to increased returns in the production of simple products, while gender inequality in hard work and the production of complex goods does not lead to increased returns, but in this case, the level of education leads to increased efficiency.

This means that the level of education and participation of women in hard jobs (if the level of education and skills of women increases) leads to economic growth. On the other hand, the cheap exploitation of women's labor also leads to economic growth, and it is important to pay attention to these relationships while studying the effects of trade liberalization on the situation of women.

In her study of 134 OECD and non-OECD countries, Bussmann (2009) examined the impact of trade liberalization on women's working well-being over the period 1970-2000 using fixed effects (FE) regression estimation and the generalized minutes method (2GMM). The results indicated that trade liberalization does not directly improve women's expectations.

Trade liberalization improves women’s access to secondary education to some extent, but it does not improve women’s well-being more than men’s. On the other hand, trade liberalization also affects women’s working lives. In developed countries, trade liberalization leads to an increase in women’s employment in the service sector, while in developing countries, it leads to an increase in women’s participation in the industrial and agricultural sectors.

Filipski et al. (2011) conducted a study focusing on gender and migration to examine the impact of free trade on the employment of immigrants and women in the Dominican Republic. They simulated the effects of the Caribbean and Caribbean Free Trade Agreement (CAFTA-DR) on rural income and rural well-being in the Dominican Republic.

The results of this study show that the elimination of tariffs on agricultural imports hurts households, both farmers and non-farmers, through market side effects and has significant and differential effects on the country of origin of workers and their gender. From studies conducted in Iran, regarding the consequences of globalization, including employment, we can see cases He pointed out the following:

Jazni (2004) in a study examined the obstacles and problems in women's employment in government sectors and believes that there are no specific differences between women and men in terms of personal talent and skills, but there are differences in the way they use their talent and skills in their jobs.

Taher Khani (2004) in her study on the effects of globalization on women states that although globalization has positive effects such as increased income, employment growth, development Social capital has been associated with increased productivity, increased voting rights, increased levels of awareness, and reduced fertility for women, but it has also exacerbated negative effects such as the growth of informal employment, low wages, reduced food security, increased migration, the spread of a consumer culture, and job insecurity to the detriment of women. The functional characteristics of Iranian women show that due to the social, economic, political, and cultural limitations prevailing in women's society and the global experience gained from globalization, the threats facing the country outweigh the opportunities facing them.

Kamijani and Qovidel (2006) have examined the effects of one of the most important consequences of economic globalization, namely foreign direct investment inflows, on employment in the service subsectors of Iran between 1997 and 2004.

The results obtained show that when multinational companies enter, service firms active in service sectors can increase their labor productivity by hiring more skilled labor and competing with foreign firms (spillover effect), which of course is the leasing-rental and business activities sectors that rank first in terms of attracting skilled labor and increasing the ratio of skilled to unskilled labor (spillover effect).

Keshavarz and Nejati Mahrami (2006) have studied the impact of globalization, using trade liberalization and tariff reduction as a measure, on wage inequality in Iran. The results of the model, considering tariff rates as an indicator of trade liberalization, show that a reduction in tariff rates causes a decrease in the wages of unskilled workers and an increase in the wages of semi-skilled and skilled workers. In other words, trade liberalization causes an increase in the wage gap between people with different levels of It becomes a skill.

Jawaheri et al. (2010) analyzed the effects of women's employment on their quality of life and reached the following conclusion: individuals who have a more suitable employment status also have a more suitable quality of life. In addition, it also confirms the relationship between job satisfaction and women's quality of life.

3. Research Objective

To determine the impact of trade liberalization on women's working lives in economic sectors (agriculture, services, and industry). (Methodology) In the present study, the generalized momentum method (GMM) is used to estimate the model. What is important about this estimator is that this robust estimator does not require precise information about the distribution of the violation terms.

The main assumption of this method is that the violations in the equations with the set of non-instrumental variables are correlated and by choosing the right instrumental variables, this estimation method, by applying a weighting matrix, can create a powerful estimator for the conditions of variance heterogeneity (Bussmann et al. 2005).

Therefore, given the specific conditions of the presented model, where the existence of a relationship between the explanatory variables and the violation sentences is not far from being expected, we do not have any information about how the violation sentences are distributed, considering the emergence of structural failures in the natural processes of the variables due to accidents such as revolutions, War and the use of different socio-economic programs, the emergence of the phenomenon of heterogeneity of variance is not far from expected, and the existence of intra-temporal relationships between variables cannot be ruled out. It seems that in these circumstances, the best possible estimator that can be used is (GMM). The use of this estimator in similar circumstances has also been emphasized in some other studies (Dufour et al., 2006).

4. Statistical Population

The statistical population under study is all countries of the world and the selected sample is 74 selected countries of the world that had the data needed to estimate the research econometric model during the period 1990-2006. According to the studies conducted on the data and information related to the World Development Indicators (WDI, 2010), the countries in question are: Austria, Ethiopia, Argentina, Uruguay, Azerbaijan, Jordan, Spain, Australia, Estonia, Israel, Slovakia, Slovenia, South Africa, El Salvador, United Arab Emirates, Indonesia, England, United States, Iran, Italy, Ireland, Brazil, Belgium, Bulgaria, Bangladesh, Botswana, Paraguay, Pakistan, Panama, Peru, Portugal, Thailand, Turkey, Trinidad and Tobago, Jamaica, Czech Republic, Denmark, Russia, Romania, Japan, Sweden, Switzerland, Chile, France, Finland, Philippines, Cyprus, Kyrgyzstan, Kazakhstan, Costa Rica, Cambodia, Canada, Croatia, Colombia, Georgia, Guatemala, Poland, Latvia, Lithuania, Malaysia, Hungary, Morocco, Mongolia, Macedonia, Mexico, Mauritius, Moldova, Norway, Nicaragua, New Zealand, Venezuela, Vietnam, Netherlands, Greece.

4.1 Data Collection Tool

In the present study, various websites, magazines, and books were used to collect data using the library method. The data collection tool included statistical tables and observations. Most of the statistical information required was extracted from the World Bank (WDI) CD ROM in 2010.

4.2 Workflow

To determine the impact of trade liberalization on women's working lives in various economic sectors, the Bussmann (2009) model has been used in the form of two equations as follows. Equation(1)

$$x_j = \alpha_1 + \pi_{1i} \ln x_{1i} + \pi_{2i} \ln x_{2i} + \pi_{3i} x_{3i} + \pi_{4i} x_{4i} + \pi_{5i} \ln x_{5i} + \varepsilon_i$$

Equation (2)

$$x_j = \alpha_2 + \varphi_{1i} \ln x_{1i} + \varphi_{2i} \ln x_{2i} + \varphi_{3i} x_{3i} + \varphi_{4i} x_{4i} - \varphi_{5i} \ln x_{5i} + \varphi_{6i} x_{6i} + \varphi_{7i} x_{7i} + \varphi_{8i} x_{8i} + \varepsilon_i$$

J= 9, 10, 11

Where Ln is the natural logarithm and the dependent variables are x9 female employment in agriculture, x10 female employment in industry, and x11 female employment in services. Also, the explanatory variables include x1 the ratio of trade to gross domestic product, x2 per capita income, x3 fertility, x4 women's education, x5 population, x6 male employment in agriculture, x7 male employment in industry, x8 male employment in services, error term and i is the country indicator (intercept). Also, some variables have been used in the estimation with a lag period, which is shown in the table with (-1) next to them.

In the following, some of the variables used in the model are explained. With regard to women's participation in professional occupations, in this study, the number of women employed in the labor market has been considered as an indicator of women's employment. In this way, it can be understood whether globalization leads to an increase or decrease in women's employment. In addition, in order to examine the distribution of women's participation in the agricultural, industrial or service sectors, women's participation in terms of employment in different sectors is considered.

Another common indicator of economic integration is trade freedom, measured as economic flows relative to gross domestic product (GDP). This type of measurement reflects economic size without taking into account economic policies. However, there are problems and limitations of abundant data on other types of trade freedom indicators. Therefore, since economic flows are theoretically explainable, the ratios of trade availability to gross domestic product have been used.

The practical definition of trade freedom is actually the sum of exports and imports relative to gross domestic product (Heston et al. 2002). In this study, many variables can be considered as control variables so that the findings are not affected by the trends of the omitted variables.

The level of economic development is one of the main controls. In countries with low per capita capital, the family relies on the income of individual family members. Therefore, participation in the labor market with development Economically, women's participation in the labor market is very high in developing countries (Cagatay & Ozler, 1995). Therefore, per capita income is used as an indicator of economic development in the labor market participation model.

Another variable is the fertility rate (total number of births per woman), which, on the one hand, controls population growth and, on the other hand, the level of women's involvement in raising and caring for children and reducing leisure time for work. Therefore, the population variable is added to the model in logarithmic form, because populous countries have different views of welfare and labor markets. There is also a tendency for populous countries to have a lower trade liberalization effect, while small countries have a higher trade liberalization index in order to access larger markets (Bussmann, 2009). Finally, the complementary role of men alongside the variables of interest is important when examining the relative effects and Comparative trade liberalization is considered.

5. Results and Discussion

To determine the effect of trade liberalization on the distribution of women's employment in different sectors, equation (1) has been used and the results are given in Table (1). Table: (1) The effect of trade liberalization on the distribution of women's employment in different sectors separately in developed and developing countries.

Table 1: The effect of trade liberalization on the distribution of women's employment in different sectors separately in developed and developing countries

	Developed Countries						Developing Countries					
Veriables	(1)		(2)		(3)		(4)		(5)		(6)	
	x9		x10		x11		x9		x10		x11	
	Coefficient	prob	Coefficient	prob	Coefficient	prob	Coefficient	prob	Coefficient	prob	Coefficient	prob
x9(-1)	0/54	0/0000					0/68	0/0000				
x10(-1)			0/47	0/0000					-0/52	0/0880		
x11(-1)					0/53	0/0000					0/31	0/0000
ln (x1)	-1/36	0/0000	-1/89	0/0000	0/73	0/0093	0/50	0/2875	-1/08	0/1410	0/07	0/5653
ln(x2)	-1/29	0/0000	-1/10	0/1706	1/31	0/1517	-7/61	0/0000	-1/14	0/5616	11/01	0/0000

x 3	1/29	0/0000	4/47	0/0000	-0/74	0/5424	6/10	0/0000	-4/93	0/3385	0/07	0/8092
x4	-0/01	0/0000	0/01	0/0056	0/01	0/4309	0/07	0/0004	-0/06	0/5222	0/11	0/0000
ln (x5)	-5/95	0/0000	-12/37	0/1712	23/80	0/0000	-7/93	0/0004	-16/70	0/2897	-8/90	0/0000

The results show that trade liberalization in developed countries leads to a decrease in the share of women's participation in the two sectors of agriculture and industry, while trade liberalization increases the share of women's participation in the services sector. However, in developing countries, trade liberalization does not have a significant effect on women's participation in the three sectors studied.

Also, the increase in fertility rates in developed countries has led to an increase in women's participation in agriculture and industry. However, with the increase in fertility rates in developing countries, only women's participation in agriculture has increased. With the increase in per capita income in developed countries, women's participation in the agricultural sector has decreased, but in developing countries, with the increase in per capita income, women's participation in the services sector has increased and in the agricultural sector has decreased.

With the increase in the level of education of women in the guidance sector, in developed countries, the level of women's participation in the agricultural sector has decreased and in the industrial sector has increased. In developing countries, as women's education level increases in the leadership sector, their participation in agriculture and services has increased.

To determine the effect of trade liberalization on the distribution of women's employment, if men's employment in the various sectors under study is used as a control variable in the model, then using equation (2), the results can be observed in Table (2).

Table 2: The effect of trade liberalization on the distribution of women's employment (when the variable of men's employment is used as a control variable)

Variables	Developed Countries						Developing Countries					
	(1)		(2)		(3)		(4)		(5)		(6)	
	x_9		x 10		x 11		x_9		x 10		x 11	
	Coefficient	prob	Coefficient	prob	Coefficient	prob	Coefficient	prob	Coefficient	prob	Coefficient	prob
x 9(-1)	0/39	0/0000					0/38	0/0193				
x 10(-1)			0/48	0/0000					0/48	0/0000		

x 8	x 7	x 6	ln (x 5)	x 4	x 3	ln (x 2)	ln (x 1)	x 11(-1)
		0/59	-1/71	-1/01	1/37	2/67	-1/68	
		0/0000	0/5124	0/2726	0/0000	0/0000	0/0000	
	0/18		-17/19	0/02	3/70	-0/57	-0/83	

	0/0082		**0/0964**	**0/0070**	**0/0066**	**0/7225**	**0/1947**	
0/63			**-5/91**	**-0/01**	**-1/52**	**2/94**	**-0/08**	**0/33**
0/0000			**0/1478**	**0/5603**	**0/1758**	**0/0006**	**0/8225**	**0/0000**
		0/61	**-10/15**	**0/02**	**2/47**	**-2/56**	**-0/03**	
		0/0028	**0/5070**	**0/8381**	**0/3912**	**0/3316**	**0/9352**	
	0/63		**-5/83**	**-0/09**	**-7/96**	**-5/78**	**-0/59**	
	0/0000		**0/0000**	**0/0000**	**0/0000**	**0/0000**	**0/0000**	
-0/02			**-9/60**	**0/11**	**0/13**	**10/95**	**0/12**	**0/33**
0/8809			**0/5419**	**0/2026**	**0/9704**	**0/0006**	**0/8321**	**0/0499**

Table: (2) The effect of trade liberalization on the distribution of female employment (when the variable of male employment is used as a control variable). In developed countries, trade liberalization has led to a decrease in women's participation in the agricultural sector, while with an increase in per capita income, more women have been employed in the agricultural and service sectors. In developing countries, trade liberalization has had a negative impact on women's participation in the industrial sector. In these countries, with an increase in per capita income, women's participation in the service sector has also increased significantly, while women's employment in the industrial sector has decreased.

Also, considering the results obtained, it can be seen that in developed countries, with greater trade liberalization and male employment in the agricultural sector, women's participation in the aforementioned sector has decreased, and in developing countries, with trade liberalization and more male employment in the industrial sector, women's participation in the industrial sector has decreased, but the effect of trade liberalization on women's participation in other sectors, with respect to male employment in other cases studied, has not been significant.

Also, as the level of education of women in the management sector increases, in developed countries, women's participation in the industrial sector increases, but in developing countries, women's participation in the industrial sector has decreased.

6. Conclusion

Despite the fact that women constitute half of the world's population, throughout history, opportunities and possibilities for them have not been distributed in a way that allows them to easily participate in society alongside men. Based on previous studies, with the development of countries, women have moved alongside men from agricultural and domestic occupations to income-generating industrial and service sectors. On the other hand, globalization leads to an increase in women's participation in low-wage jobs, because they are cheap labor and industrial owners also prefer to hire women.

Therefore, in the present study, with regard to economic theories, this issue was examined, considering the effects of trade liberalization on the labor market in developed and developing countries, how women's participation in the labor market of various economic sectors (agriculture, industry, and services) changes. In this regard, data from 74 selected countries of the world during the period 1990-2006 were used to determine the effect of trade liberalization on women's working lives. The results obtained from the estimation using the GMM method, It has been shown that trade liberalization in developing countries has led to an increase in the share of women's participation in the two sectors of agriculture and services, while women's employment in the industrial sector has decreased.

Similarly, trade liberalization in developed countries has led to an increase in women's participation in the services sector and a decrease in their employment in the two sectors of industry and agriculture. On the other hand, with the increase in per capita income, women's employment in the agricultural sector has decreased in developing countries, but The share of women's participation in the service sector has increased significantly.

However, in developed countries, with an increase in per capita income, women's participation in the labor market in the agricultural sector has decreased, but in other sectors, the increase in per capita income has not had a significant effect on women's employment (from a statistical point of view). Finally, it can be said that trade liberalization leads to a greater decrease in the overall participation rate of women in developed countries than in developing countries.

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Studying the Importance of the Relationship Between Cultural Identity's Emotional Intelligence, Job Embeddedness and Quality of Work Life in Female Heads of Households

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Abstract
Introduction and Objective of the Research: Cultural identity is one of the most important cultural indicators of any society, and the ratio of commitment and belonging of individuals to their culture can determine and affect the level of work quality. The quality of work life within an organization is estimated by measuring satisfaction, low absenteeism, and high motivation in employees. One of the important management pests is inattention to the quality of work life of the organization's employees. This inattention greatly reduces the effectiveness and efficiency of the organization. Due to the lack of recognition of the organization's managers about the quality of work life, this category has lost its real proportion and dimensions in organizations. Thus, considering the importance of the role of quality of work life in employee performance, the main objective of this research is to investigate the relationship between quality of work life and cultural identity in women head of households. Research Method: This research is descriptive-survey and simple random sampling was used. The statistical population of this study consisted of 109 female heads of households. Participants completed a combination of modified standard questionnaires related to quality of work life and cultural identity. Findings: Pearson correlation coefficient showed that there is a significant relationship between most of the processes of quality of work life and cultural identity, and stepwise regression also showed that among all the variables, three variables of safe environment, capability development, and legalism have a more important relationship with cultural identity. Conclusion: The results show that the greater the commitment and cultural affiliation of female heads of households, the easier it is for female heads of households to tolerate workplace problems and injustices resulting from gender inequalities. Also, increasing cultural affiliation, i.e. respecting and giving importance to the unified culture of the country, leads to greater legalism.

Keywords: Cultural Identity, Quality of Work Life, Female Heads of Households

1. Introduction

Quality of work life is one of the variables that has recently attracted the attention of many managers who are seeking to improve the quality of their human resources. Although the study of indicators that are beneficial or detrimental to quality of work life has a long history (Ma CC et al.2003), the exact origin of the term quality of

work life is unclear and was probably first used at the University of Michigan Institute for Social Research in the early work of Rancy Likert and his approach to systemic change (Hood and Smith, 1994).

A high quality of work life is essential for organizations that value employee attraction and retention. Researchers have shown that the ongoing restructuring, economization, and reorganization of health care systems have negatively affected employee morale and job satisfaction in Ontario.

Researchers have also provided evidence that quality of work life has a significant impact on employee behavioral responses such as organizational identity, job satisfaction, work engagement, job effort, job performance, turnover intention, organizational change, and transformation (Sigry et al. 2001).

The facts have confirmed that quality of work life issues affects employee satisfaction and ultimately retention or leaving the current position (Rosser and Javinar, 2003). It has been shown that quality of work life includes broad aspects of the career environment that affect employee learning and health Brenda et al. (2014) and has a positive effect on organizational commitment, accounting for 28% of its variance. Quality of work life makes an important contribution to satisfaction with other aspects of life such as family, leisure, and health (Sigry et al. 2001).

Evidence that work environments directly affect patient outcomes has also been shown by Aiken, Smith, and Leake. Research in hospitals has shown that the mortality rate of hospitals with supportive work environments is lower than that of other hospitals (Laschinger et al. 2001). Considering the above, the main issue of the present research is whether cultural identity, according to its nature, can change the quality of work life of female heads of households or not?

Because one of the basic issues in the lives of female heads of households is that female heads of households, due to their specific circumstances, always suffer from the problem of lack of quality of work life compared to other working women.

Family pressures on the one hand and the problems of organizations in fair payment, having working and health conditions, learning opportunities and using new skills, work-life balance, welfare facilities and other related problems, cause female heads of households to experience a lower quality of work life.

On the other hand, identity is considered one of the most complex concepts in the field of management. Multifaceted phenomena that reveal various foundations and meanings from different perspectives. In a general view, identity can be considered as the result of the dialectic of a mental system and social structure. An approach that considers identity against otherness and thus highlights the unity of analysis of self and other in the field of identity.

But when we talk about identity, the relationship of identity with complex concepts such as nationality and culture reveals an intertwined task that makes the concept of identity much more complex. This meaning is much more prominent in women heads of households in Central Asian countries, especially Uzbekistan, because Islamic, Asian and Western sources of identity have each influenced the accumulation of Uzbek identity in some way over time and have formed the Uzbek identity. The individual's "identity" emerges from the "self" in response to questions of "who", "what", and "why" (Shikhavandi, 2004: 23) and "identity" is the answer to these questions in the context of the culture of society.

Therefore, considering the process of globalization, the increasing speed of social changes, and the arrival of the era of consumerism, which is one of its natural consequences, the quality of each individual's work life can be considered a clear manifestation of his or her identity. Therefore, in this study, "identity" is considered as a universal phenomenon for all social elements, ethnicities, and nations in Uzbek female heads of households and is examined under the influence of basic components. In this regard, two identity approaches can be considered.

The theoretical approach that looks at the present and the past, and the political or prescription approach that looks at identity policies. In the prescriptive approach, identity components are general, abstract, and universal concepts

because identity is essentially the product of a gradual process. Taking these conditions into account, the identity elements of Uzbek female heads of households can be examined in four subscales: perception, belonging, acceptance, and acceptability.

On the other hand, almost all experts consider female heads of households as the most fundamental capital of single-headed households and a factor in advancing the goals of society, and they believe that female heads of households should be nurtured as the main capital of a part of society, and by applying appropriate policies, the motivation for effort and effort should be created in them. The optimal use of identity relies on measures that are taken to preserve and protect the body and soul of female heads of households, and in this regard, paying attention to the quality of work life (L.W.Q.) is necessary and inevitable. The quality of work life has its own characteristics for each individual or group of individuals with a similar culture and way of thinking (Mirspasi, 2007: 138).

Thus, considering the importance of the role of female heads of households in nurturing a part of the society's people and considering the great role of identity, which is a mixture of the basic components of each individual's social life, in this study we aim to examine the effect of identity on the quality of working life of female heads of households in Tashkent, and to explore the issue of gaps and deficiencies in the quality of working life of female heads of households and to determine the effect of identity in resolving it (Yuki,2002).

2. Theoretical foundations of the research

Identity means the quality of being the same in essence, composition and nature, and also being the same at any time and under any circumstances. However, having an identity, or being unique, has two different aspects: being like others in one's own class and being the same as oneself over time (Golmohammadi, 2012: 16). Cultural boundaries mean the will of a community to distinguish itself and use some cultural characteristics as a determinant of its identity.

At the same time, this community can also accept cultural pluralism without facing any problems. According to Barthes, every boundary is conceived as a social demarcation that has the potential to be continuously renewed in the course of exchanges. This can be the result of social, political, and economic changes. Therefore, given the shifting boundaries of identity and culture, the claim that a fixed and stable definition can be provided for any identity seems to be a false idea (Koosh, 2002). The term quality of work life has become very popular in recent years. There is little agreement on the meaning of the term, but it can be said that there are at least two common uses of it:

First, quality of work life refers to a set of outcomes for employees, such as job satisfaction, growth opportunities, psychological issues, job security, employer-employee human relations, and low accident rates.

Second, quality of work life also refers to a set of organizational practices or functions, such as participatory management, job enrichment, and safe working conditions. In this regard, quality of work life programs may be considered as a human resource management strategy that includes quality of work life practices and improvement of quality of work life programs and improvement of organizational efficiency and productivity (Adams et al. 1979).

There are many variables in the definition of cultural identity and quality of work life. The variables of growth opportunity, fair pay, and safe work environment are taken from Walton's (1974) research results. Growth opportunity is a kind of expression of the importance given to employees in the organization.

In a developed organization, growth opportunity allows employees to demonstrate more creativity and innovation in order to achieve higher levels of performance, and thus, they also find a better quality of work life. Competency development and integration have been studied by Mat Zin (2004) and they are considered important variables for the quality of work life.

Competency development means that both employees and managers attach importance to employee training and always strive to improve their capabilities. In this way, the possibility of collective participation is also provided and the quality of work and work life is improved. The overall living environment has been reflected in the research of Lau, (2000).

Lau believes that the overall living environment of employees outside the work environment also affects the quality of work life within the work environment. In his research, Saklani (2004) concluded that legality determines an important part of the work-life quality relationship. In such a way that in organizations with higher legality, the quality of work life of employees is also higher. National cultural identity consists of two variables: belonging and cultural commitment.

Cabrera and Padilla, (2004) showed that cultural belonging in members of a group or organization leads to the formation of a specific type of behavior that can be considered a manifestation of the cultural identity of that group or organization. Finally, cultural commitment refers to the specific type of perception of members of an organization of common or general behaviors in that organization or group (Cabrera and Padilla, 2004)

3. Research Background

Razazifar, (2000) found that since national identity is a collective phenomenon and is based on the cultural, historical and religious foundations of the country's various ethnic groups, therefore, in a multi-ethnic country such as Afghanistan, Iran and other multinational countries, a complete national identity is achieved when it includes all ethnic, religious and territorial identities, and the historical and beliefs of all ethnic groups, which are considered the main elements of national identity, must have a corresponding share in its formation.

Ayubi (1987) found in his research that in multi-ethnic societies, if national identity is based only on the elements of one ethnic group and in The result is a sociological change in the characteristics of social work.

Thus, it is easy to highlight or reinforce negative characteristics of work. Identity is a necessary condition for social life, and without a framework for defining identity, humans cannot relate to each other in a meaningful and lasting way. In fact, without identity, there would be no society. Therefore, the crisis of identity and meaning seriously disrupts social life, and individuals and groups are forced to resolve this crisis.

Rebuilding identity is undoubtedly the only way to accomplish this task (Golmohammadi, 2012:248). Humans have worked and struggled for centuries to prepare the natural environment for living and to use its resources and blessings. They made tools, explored and invented to provide their own comfort and eliminate their discomforts, and they passed on the fruits of these experiences, achievements, discoveries and skills to their children, and they, in turn, changed, reduced and added to this heritage and passed it on to the next generation, and in this way, each generation added to it in order to This heritage is called culture (Ruh al-Amini, 2015: 17). On the other hand, if the organization wants to have a dynamic and efficient human force, it must find valid and acceptable reasons to maintain and ensure the job satisfaction of its personnel and strengthen them. In other words, factors and conditions that motivate employees must be provided so that human force can provide its work force with high efficiency. And the manager must know that it is not only the hands and brains of people that work, but also their souls and hearts are effective in productivity (Richard,1980).

Thus, paying attention to the quality of work life is a very important category that plays a fundamental role in organizational and social productivity. Finally, women heads of households play a very important role in society, and if they are not helped and their quality of work life and identity are not taken into account, they will be seriously harmed economically and socially (Khorasani, 2011).

If these women are not helped, we will witness many social, economic problems and psychological harm in Uzbek and Central Asian society. National identity is defined as a sense of belonging and loyalty to common elements and symbols in national society and within politically defined borders.

The most important elements and symbols that identify and distinguish people with different national identities from each other are: land, religion and customs, customs and rituals, history, language and literature, people and state. Thus, the national and Uzbek identity, taking into account the long-standing history and culture of Uzbekistan, includes such diverse and important aspects as:

Minoan beliefs, feelings of Uzbekness, belonging to history and civilization, culture, national ethics and traditions, language and literature, national arts, commitment to protecting the ancestral land, the desire for independence and national authority, and efforts for the growth, progress and civilization of the country.

Salmani (2005) in his research entitled Quality of Work Life and Improving Organizational Behavior found that:
1. The relationship between the impact of work on employed women and men towards the effectiveness of the organization, in other words, the reaction of employees to work, especially its individual consequences in job satisfaction and mental health.
2. Work methods, i.e. the way of doing work, which includes specific techniques and methods of work, such as occupational enrichment, socio-technical systems and job design.
3. The idea of participation in solving problems and making decisions in employed women and men in the workplace.
4. In short, the characteristics of quality of work life are:
1. Meaningfulness and meaning of work.
2. Organizational and social fit of work.
3. Rich and rewarding challenge of work.
4. Growth and safety and the context for developing skills and continuous learning at work (quality of work life). (Salmani, 2005: 20).

The common cultural fabric creates these values, and the definition of quality of life and satisfaction with it differs from one cultural fabric to another. The common cultural fabric provides the possibility of this life by creating a common cultural identity.

In this cultural fabric, numerous factors shape cultural identity. Cultural capital in a cultural fabric in three forms: objectified, objectified, and institutionalized, is one of the factors of creating cultural identity (Weininger and Lareau, 2007). Cultural memory also tries to direct the processes of memory (the past made modern), culture, and group. (society) with each other (Assmann and Czaplicka, 1995). Therefore, the second dimension of cultural identity is formed by cultural memory. Religion and language, as further factors that shape cultural identity, lead to the formation of a common culture through the creation of a common cultural and value system (Deh Shiri,2001).

4. Research Questions

1. Is there a significant relationship between cultural belonging and dimensions of quality of work life in women-headed households of the Relief Committee in Uzbekistan?
2. Is there a significant relationship between cultural commitment and dimensions of quality of work life in women-headed households of the Relief Committee in Tashkent?

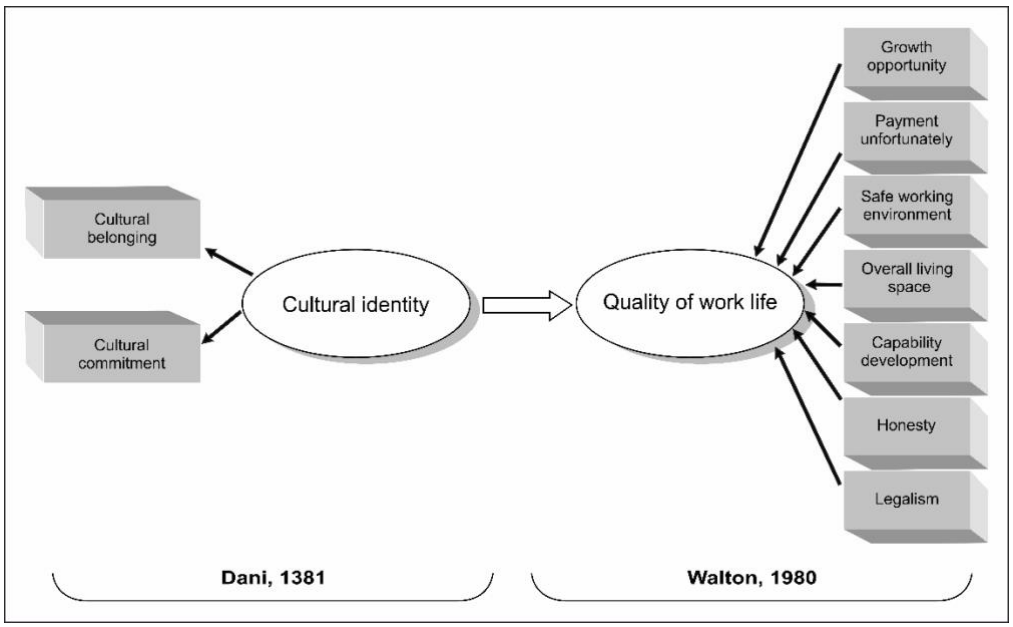

Figure 1: Conceptual research model

5. Research Methodology

This research is a cross-sectional study in terms of time, meaning that it is conducted to collect data on one or more traits at a specific point in time through sampling from the population, and it is an applied study in terms of the results. The goal of applied research is to gain the understanding or knowledge necessary to determine a tool that will solve a specific and known need. From the perspective of logic, it is a deductive implementation. In deductive research, theories are proposed and we are trying to test them. In fact, these studies are also called theory testing. From the perspective of the research objective, it is a correlation analysis. In this type of research, it is determined whether there is a relationship between two or more quantitative (measurable) variables or not. If this relationship exists, what is its size and extent? In terms of the research implementation process, it is quantitative. The sampling method is simple random.

Since the statistical population of this study consists of 150 women heads of households in Tashkent in two organizations of cultural heritage and welfare of Tashkent province, using the sample table Gary Morgan Our sample size will be 109.

5.1 Research Reliability and Validity

Before distributing the questionnaires, to ensure the good validity and reliability of the research, ten percent of the questionnaires were distributed so that if the validity and reliability were determined to be desirable, the questionnaires would be distributed.

To confirm the validity of the results of the questions, the professors were shown them and with their opinion, the validity of the thesis was determined by an appropriate intuitive method. The reliability of the research was also confirmed by the Cronbach's alpha method.

Table 1: Calculating the reliability of research variables with Cronbach's alpha coefficient

Variable	Number of questions	Cronbach's alpha coefficient
Quality of work life	23	0.806
Cultural belonging	4	0.822
Cultural commitment	6	0.988
Safe work environment	10	0.833
Cultural identity	10	0.799
Total research	43	0.866

Also, the KMO value of the research variables is equal to 0.886 and the Bartlett test is rejected even at the significance level of 0.99 (sig = 0.000). Since the KMO index is higher than 0.7, the validity of the conclusion is confirmed. The Kolmogorov-Smirnov test was used to examine the normality of the data. The results showed that all data are normal.

6. Research findings

A- There is a significant relationship between cultural belonging and dimensions of work life quality in women-headed households in Tashkent. Table 2 shows the results using Pearson correlation method. Since the significance level for some factors is less than 0.05, the 1H hypothesis is confirmed and the 0H hypothesis is rejected. Therefore, there is a significant relationship between some cultural belonging factors and dimensions of work life quality in women-headed households.

1. The correlation between the cultural belonging dimension and growth opportunity is 0.891, and the determination coefficient is 0.793, which shows that 79 percent of cultural belonging is related to growth opportunity. Since this value does not include the degree of freedom, the adjusted determination coefficient is used, which is also equal to 73 percent.
2. The correlation between cultural affiliation and fair pay is not significant, and thus these two variables are not related to each other.
3. The correlation between cultural affiliation and safe work environment in women-headed households is 0.978, and the coefficient of determination is 0.956, which indicates that 95% of safe work environment in women are related to cultural affiliation. Since this value does not include the degree of freedom, the adjusted coefficient of determination is used, which is also equal to 95%.
4. The correlation between cultural affiliation and general living environment in women-headed households is not significant. Thus, these two variables are not significantly related to each other.
5. The correlation between cultural affiliation and capability development in women-headed households is 0.923, and the coefficient of determination is 0.851, which indicates that 85% of capability development is related to cultural affiliation. Since this value does not include the degree of freedom, the adjusted coefficient of determination is used, which is also equal to 81 percent.
6. The correlation between cultural belonging and integration in female heads of households is not significant. Therefore, these two variables do not have a significant relationship with each other.
7. The correlation between cultural belonging and legalism in female heads of households is 0.950, and the coefficient of determination is 0.903, which shows that 95 percent of legalism is related to cultural belonging. Since this value does not include the degree of freedom, the adjusted coefficient of determination is used, which is also equal to 95 percent.

B- There is a significant relationship between cultural commitment and the dimensions of work-life quality in female heads of households. According to these statistical assumptions, if the significance level is greater than the error value, we conclude that the null hypothesis is true, and if it is smaller, the null hypothesis is false. Table 3-2 shows the results. Since the significance level for some factors is less than 0.05, H1 is confirmed and H0 is rejected. Therefore, there is a significant relationship between some of the cultural commitment factors and the dimensions of quality of work life.

Table 2: The results of the first sub-hypotheses

Hypotheses	Pearson Correlation	Sig	Coefficient of Determination	Adjusted Coefficient of Determination	Standard Deviation of Error	Durbin-Watson
1. There is a relationship between cultural belonging and growth opportunities in women-headed households.	0/891	0/000	0/793	0/706	0/26064	1/882
2. There is a relationship between cultural belonging and fair pay in women-headed households.	0/947	0/534	----	----	------	1/924
3. There is a relationship between cultural belonging and safe work environment in women-headed households.	0/978	0/000	0/956	0/955	0/19288	1/775
4. There is a relationship between cultural belonging and general living environment in women-headed households.	0/811	0/267	-----	----	----	1/711
5. There is a relationship between cultural belonging and capability development in women-headed households.	0/923	0/000	0/851	0/817	0/71711	1/918
6. There is a relationship between cultural belonging and integration in women-headed households.	0/634	0/075	----	-----	-----	-----
7. There is a relationship between cultural belonging and legalism in women-headed households	0/950	0/000	0/903	0/901	0/26064	1/781

1. The correlation between cultural commitment and growth opportunity in female heads of household is 0.891 and the coefficient of determination is 0.793, which indicates that 79 percent of the growth opportunity is related to cultural commitment. Since this value does not include the degree of freedom, the adjusted coefficient of determination is used, which is also equal to 73 percent.

2. The correlation between cultural commitment and fair pay in female heads of household is not significant, and thus these two variables are not related to each other.

3. The correlation between cultural commitment and safe work environment in female heads of household is 0.978 and the coefficient of determination is 0.956, which indicates that 95% of safe work environment is related to cultural commitment. Since this value does not include the degree of freedom, the adjusted coefficient of determination is used, which is also equal to 95%.

4. The correlation between cultural commitment and overall living environment in female heads of household is not significant. Thus, these two variables do not have a significant relationship with each other.

5.The correlation between cultural commitment and capability development in female heads of household is 0.923 and the coefficient of determination is 0.851, which indicates that 85% of capability development is related to cultural commitment. Since this value does not include the degree of freedom, the adjusted coefficient of determination is used, which is also equal to 81%.

6. The correlation between cultural commitment and cohesion in female heads of household is 0.947 and the coefficient of determination is 0.897, which indicates that 89% of cohesion is related to cultural commitment. Since this value includes degrees of freedom in the equation, the adjusted coefficient of determination is used, which is also equal to 90 percent.

7. The correlation between cultural commitment and legalism in female heads of households is 0.978, and the coefficient of determination is 0.956, which indicates that 95 percent of legalism is related to cultural commitment. Since this value does not include degrees of freedom, the adjusted coefficient of determination is used, which is also equal to 95 percent.

Table 3: Relationship between cultural commitment and dimensions of quality of work life

Hypotheses	Pearson Correlation	Sig	Coefficient of Determination	Adjusted Coefficient of Determination	Standard Deviation of Error	Durbin-Watson
1. There is a relationship between cultural belonging and growth opportunities in women-headed households.	0/891	0/000	0/793	0/706	0/26064	1/882
2. There is a relationship between cultural belonging and fair pay in women-headed households.	0/947	0/534	----	----	------	1/924
3. There is a relationship between cultural belonging and safe work environment in women-headed households.	0/978	0/000	0/956	0/955	0/19288	1/775
4. There is a relationship between cultural belonging and general living environment in women-headed households.	0/811	0/267	-----	----	----	1/711
5. There is a relationship between cultural belonging and capability development in women-headed households.	0/923	0/000	0/851	0/817	0/71711	1/918
6. There is a relationship between cultural belonging and integration in women-headed households.	0/947	0/000	0/897	0/895	0/31431	1/924
7. There is a relationship between cultural belonging and legalism in women-headed households	0/978	0/000	0/956	0/955	0/19288	1/775

6.1 Relationship between Cultural Identity and Quality of Life Dimensions

Stepwise regression is used to examine the most important relationships. The regression analysis is shown in the table below. The output variable for the stepwise regression in models number three onwards is None. This means that these input variables did not have a significant relationship with the dependent variable and were therefore removed from the equation. In Table 4, the adequacy indices of the stepwise regression model have been calculated. In the first stage, safe work environment is entered into the model, and its correlation with cultural identity is equal to 0.978.

At this stage, the square root of the multiple correlation coefficient is 0.956, and the square root of the adjusted multiple correlation coefficient is 0.955. In the next step, with the introduction of the second variable, capability development, the multiple correlation coefficient increases to 0.993, the square root of the multiple correlation coefficient increases to 0.987, and the square root of the adjusted multiple correlation coefficient increases to 0.986.

In other words, 98 percent of cultural identity is determined by the two variables of safe work environment and capability development, of which 0.031 percent is exclusively and incrementally related to capability development. With the introduction of the third variable, legalism, the multiple discordance coefficient increases to one, the square of the multiple correlation coefficient also increases to one, and the square of the adjusted multiple correlation coefficient also increases to one. In other words, 100 percent of cultural identity is explained.

6.2 Investigating the status of a safe workplace for female heads of households

Since a 5-point Likert scale has been used, the number 3 will be the middle or abstention number. In a very simple statement, if the average of the views of 109 female heads of households is greater than 3, it means that the safe workplace is in a favorable situation, and if it is smaller than 3, it means that the safe workplace is not in a favorable situation. But relying only on the average value is not statistically correct. It should be examined whether the

observed average is significant or not. For this purpose, a binomial test is used. The results of the binomial test for a safe workplace are shown in the table below.

The results showed that the average of a safe workplace in this study is less than 3 and also Sig0.05> =0.286. Thus, it is concluded that from the perspective of female heads of households, the workplace is not safe and appropriate.

Table 4: Adequacy indices of the stepwise regression model

Model	Solidarity	Coefficient of determination	Adjusted coefficient of determination	Standard error	Camera-Watson
1	.978[a]	.956	.955	.18142	1.960
2	.993[b]	.987	.986	.10032	
3	1.000[c]	1.000	1.000	.00000	

7. Research Findings

1. There is a significant relationship between cultural affiliation advertisements and growth opportunities.
2. There is no significant relationship between cultural affiliation and fair pay.
3. There is a significant relationship between cultural affiliation and safe work environment.
4. There is no significant relationship between cultural affiliation and general living environment.
5. There is a significant relationship between cultural affiliation and capability development.
6. There is no significant relationship between cultural affiliation and integration.
7. There is a significant relationship between cultural affiliation and legalism.
8. There is a significant relationship between cultural non-commitment and growth opportunities.
9. There is no significant relationship between cultural commitment and fair pay.
10. There is a significant relationship between cultural commitment and safe work environment.
11. There is no significant relationship between cultural commitment and general living environment.
12. There is a significant relationship between cultural commitment and capability development.
13. There is a significant relationship between cultural commitment and integration.
14. There is a significant relationship between cultural commitment and legality.
15. 100 percent of cultural identity is explained by safe work environment, capability development, and legality.

The need to pay attention to the quality of work life and its improvement has a logic, and that is that 65 percent of the useful life of humans is spent in the workplace. The indicators of improving the quality of work life are:
1. Satisfaction or job satisfaction.
2. Participation in work (such as the right to express an opinion).
3. Reduction of accidents and incidents at work.
4. Right to choose (such as job, destiny, influence).

Senior managers of an organization should pay attention to the fact that a creative and dynamic organization needs various roles and jobs with a high degree of importance, and if it is supposed to create false values for some positions with material and spiritual privileges unfairly given to them and as a result other positions are considered unimportant and worthless, no one will feel responsible for their job as they should and over time it will cause a kind of lethargy and a decrease in work motivation among the employees of the organization (Chaipol, 1989).

Individuals can serve their organization with all their heart when their personal and family needs are relatively satisfied. In other words, individual interest and collective interest should both be in the same direction and in the same direction. However, in third world and developing countries, unfortunately, this issue is generally on the contrary. If an individual thinks about the collective good, he will lag behind in his personal life, and if he wants to think only about his personal interests, he will not be able to serve the organization honestly.

Since the distribution of wealth and income in Far East is unequal compared to other developing countries, the majority of people in society who have ordinary jobs live below the poverty line. Under these conditions, if an individual wants to devote himself to his work, he will completely lag behind in his personal life (Kayem, 1986).

When unfair conditions and unfair opportunities increase in an organization, it means that organizational positions have different value burdens. As a result, the value gap between positions increases and the value of an employee becomes much less than the value of a manager. Another very important point is that in the modernized unequal system, which views everything as a means of obtaining personal benefits, individuals with higher levels of organizational structure demand from others that others show them special respect and much more rights (in a general sense).

Following this difference in value and status, individuals are not satisfied with what they have and are and are always trying to change their situation. If these efforts are not fruitful in improving the individual's income situation, the individual suffers from an identity crisis and becomes a purposeless and depressed individual, which ultimately leads to instability and progress in the organization (Feather, 1995).

8. Conclusions and Discussion of Results

If we look around us at work, we may have asked ourselves how many of our colleagues actually enjoy their work environment and the work they do. If we look at this issue realistically, we can say that in many organizations, the situation is not very favorable. Where are we going? Today's workplaces seem to be more inflamed and confused than ever.

Surveys have shown that more than 50% of employees do not know what the mission of the organization they work for is? 84% of them believe that awareness of the organizational mission does not have much impact on the quality of their work, and 44% of employees do not see any empathy or emotional connection between themselves and the higher-level managers of the organization they work for.

Another study in this field shows that the two phenomena of work life and personal life have reciprocal and intensifying effects on each other. A person who has many problems in his family and personal life will definitely have these problems affect his concentration, job satisfaction, productivity and happiness in the workplace. Quality of Work Life (QWL) is the attitude of individuals towards their jobs.

It means the extent to which mutual trust, attention, appreciation, interesting work and appropriate opportunities for investment (material and spiritual) in the workplace are provided by managers to employees. The degree of quality of work life within the organization is estimated by measuring satisfaction, low absenteeism, and high motivation in employees.

One of the important management problems is inattention to the quality of work life of the organization's employees. This inattention greatly reduces the effectiveness and efficiency of the organization. Due to the lack of recognition of the organization's managers about the quality of work life, this category has lost its real relevance and dimensions in organizations.

Quality of work life or quality of work system is one of the most interesting methods of creating motivation and an important path in designing and enriching employees' jobs, which is rooted in the attitude of employees and managers to the category of motivation. The need for attention There is a logic to the quality of work life and its improvement, and that is that 65 percent of human useful life is spent in the workplace. Some indicators of improving the quality of work life include:
1-Satisfaction or job satisfaction.
2- Participation in work (such as the right to express opinions).
3- Reduction of accidents and incidents at work.
4- Right to choose (such as job, destiny, influence).

Low quality of work life means that the employee sees his job as a means to meet economic needs, and employees with such thinking often have little loyalty to the organization and are generally forced to do other things to compensate for the shortcomings. In an international survey conducted in different countries, 10,400 employees

of different organizations were questioned. The most important expectations of these people from their work environment can be summarized in the following 5 items:
1- A balance between work and personal life.
2- Having a job that is truly enjoyable.
3- Having a sense of security and securing the future.
4- Having a decent salary.
5- Having good colleagues.

In most countries, the first item is the ability to balance work and personal life is the most important factor in workplace satisfaction. In all countries, there is a significant gap between what employees want and what they get; especially in terms of pay, work-life balance, and job security.

In explaining this result, it should be said that today, many people view their jobs as temporary jobs, and in many cases, due to dissatisfaction with the quality of their work life, they simply want to change their position, even if it is a lower position, and they are trying to get a better and higher position from their current position at the first opportunity.

Therefore, fewer people take their jobs as seriously as they should, and this is more evident in most ordinary employees of the organization who have a second job outside the organization with a relatively higher income.

Thus, positions and roles within the organization do not have the necessary and sufficient stability, and positions experience a kind of instability. In the future, this process is exacerbated by the process of economic instability (increase in inflation and prices), which has a stronger impact on employee behavior.

But what is the reason for this? In the current time, and in the wake of the great economic inequality that has arisen, the desire to obtain a higher job position by any means has become normal in the administrative system of Uzbek society; on the other hand, economic pressure, as well as measures such as the payment system, document-oriented and the possibility of using certificate centers for certain numbers; and the use of special government facilities such as corporate housing, cars, mobile phones and sending managers and directors to various foreign and domestic missions, in the long run lead to a decrease in work motivation in the current position of employees. Luxurious office space and the use of expensive cars, holding meaningless meetings and unnecessary domestic and foreign trips under the pretext of missions are among the factors that prove the role of the manager in the emergence of unethical principles.

Certainly, such actions and behavior on the part of the manager will leave a negative and destructive impact on the employees, and they will have a negative mental image of the organization and its management. Unfortunately, the above-mentioned cases, without considering the wishes of the employees, led the organization to the path of slander, employee and client dissatisfaction, and instability.

Senior managers of an organization should pay attention to the fact that a creative and dynamic organization needs various roles and jobs with a high degree of importance, and if, with material and spiritual privileges given to some positions in an unfair manner, false values are created for them and, as a result, other positions are considered unimportant and worthless, no one will feel responsible for their job as they should, and over time, it will cause a kind of lethargy and a decrease in work motivation among the employees of the organization.

Individuals can serve their organization with all their heart when their personal and family needs are relatively satisfied. In other words, individual and collective interests should both be in the same direction. But in third world and developing countries, unfortunately, this is generally the opposite. If an individual thinks about collective interests, he will lag behind in his personal life, and if he wants to think only about his personal interests, he will not be able to serve the organization honestly.

Since in Uzbekistan, the distribution of wealth and income is unequal compared to other developing countries, the majority of people in society who have ordinary jobs live below the poverty line. Under these conditions, if an

individual wants to devote himself to his work, he will completely lag behind in his personal life. When unfair conditions and unfair opportunities increase in an organization, it means that organizational positions have different value burdens.

As a result, the value gap between positions increases and the value of an employee becomes much less than that of a manager. Another very important point is that in the modernized unequal system, which views everything as a means of obtaining personal benefits, individuals with higher levels of organizational structures demand from others that others give them much more special and legal respect (in a general sense). As a result of this difference in value and status, individuals are not satisfied with what they have and are and are always trying to change their position. If these efforts are not fruitful in improving the individual's income situation, the individual suffers from an identity crisis and becomes a purposeless and depressed individual, which ultimately leads to a lack of stability and progress in the organization.

Unfortunately, other aggravating measures are also being taken in society today, as a result of which, higher job positions are given false values, including excessive flattery and respect for managers and government luxuries such as luxurious offices with many amenities. It is obvious that in such an organizational system, most people enjoy having such positions and enjoying unusual amenities in the shadow of these positions and excessive self-respect.

In such organizations, participation of subordinates, consultation with them, explaining the goals of the organization to them and creating internal motivation have no place in the policy of the organization and the needs are dictated from above, the goal and the order should never be questioned, the goal and the order should be carried out in the shortest possible time, the disobedient person should be punished, even if it is a severe punishment. When the issue is examined more deeply, we realize that even those managers who are not willing to use these unfair facilities cannot swim against the current and are inevitably caught.

As a result of all the factors mentioned (inequality, wrong job evaluations, etc.), gaining status, as the main goal of jobs in the organization, becomes a fundamental and fundamental value. A manager who behaves correctly and honestly, without intending to educate employees, teaches them moral commitment. He is a role model for his employees in the field of ethics and embodies the values that prevail in the organization. If the manager expects his employees to participate, be conscientious, disciplined, and serious, or to avoid negligence, inefficiency, and waste of resources, in return, the manager's failure to understand and ignore the needs of employees and the failure to establish appropriate working conditions are unacceptable. The manager's ostentatiousness paves the way for unethical behaviors to occur in the organization. Considering the above, we find that the vicious circle created as a result of not paying attention to the quality of work life causes each person to individually seek ways to satisfy his needs, which It often conflicts with the collective interest and causes further disruption of social relations and the emergence of a vicious circle.

The situation is so irregular that few people hope to rectify this situation. Everything has gone round and round, and depression resulting from despair about the future is increasing. It is time to write clearly and transparently about the consequences of the methods used by inefficient management in managing affairs and to think about ways to improve by investigating and reflecting on these cases.

Things have reached a point where today a successful manager is called someone who can provide the minimum acceptable work by using his maximum punitive power such as: reprimands, salary deductions and incentive facilities such as granting bonuses, overtime, selecting exemplary employees, etc.

However, experts believe that an effective manager is someone who can use 80 to 90 percent of the abilities of individuals. When an organization's reward and punishment systems are designed to positively reinforce bad behavior, good people will do bad things. When an organization promotes or praises liars, cheats, or those who commit wrongdoing, it is perceived that unethical behavior has appropriate rewards, and this is where unethical principles take root in the organization. What are unethical principles? The dominance of relationships over rules is just one of the things that drives organizations towards unethical principles. Other things such as: tardiness,

leaving the workplace, secrecy, doing personal things in the workplace, using the organization's facilities for one's own benefit, stealing the organization's property, revealing the organization's secrets, hypocrisy, flattery, taking bribes, and unfortunately, today they have sometimes become values.

Strengthening morale and increasing mental energy in the workplace increases personal and organizational efficiency, and when people feel good about the work they do, they try to do it in the best way and, more importantly, they try to find better and more effective ways to do it.

Otherwise, they cannot be expected to show extraordinary effort to do or find a solution. So it is better for managers to direct their work culture in a direction that strengthens such morale in the workplace. Motivation at work is a means of moving a person. A person without motivation cannot complete a task and pursue a goal.

Motivation brings the potential and latent creative power of a person to action. Paying attention to and applying motivation is the simplest and most complex task of management. Motivation is a type of internal tension, and applying that tension reduces it. Paying attention to the quality of work life is one of the things that can increase motivation in the organization's employees.

9. Suggestions

A review of the research and theoretical foundations of the present study indicates that the quality of life of employees in various institutions is an important element and component related to the success of the organization. Therefore, attention to the components of work quality is recommended. The organization should, in addition to being familiar with the quality of work life, pay more attention and greater willingness to apply its components such as a safe work environment, legality, employee participation in decision-making, the general work environment, and social integration and cohesion in its work area and in relation to the relevant employees, so that they can achieve the goals and ideals of the organization by reaching a collective agreement and common efforts. Managers and officials of organizations should make more efforts in this field to increase efficiency and overall improve the quality of work life, by becoming familiar with how to promote culture and increase interactions with subordinate employees.

Managers and officials should provide easier conditions and rules so that employees can express their opinions on organizational decision-making, short-term and long-term plans, improving working conditions for each person, and all matters related to their field of expertise, so that with these measures, work and achieving the organization's goal will be a hobby and interest for them, thereby facilitating the conditions for moving towards the goal in the organization.

Quality of work life and efficiency are two practical and effective concepts in various organizations, so in order to achieve a comprehensive and coherent program for implementing these two concepts in organizations, it is appropriate for researchers to pay sufficient attention to these two categories, which are essential for the development and advancement of developing countries. Attention to the components of cultural identity is essential for improving work quality.

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A Comprehensive Review of the Role and Importance of Strategic Human Resource, Human Resources Management Practices and Human Capital Management

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Abstract
This study aimed to investigate the relationship between strategic human resource management functions and intellectual capital components in Ashgabat, Turkmenistan. The research is a correlational type and the method of collecting field data. The statistical population of the research includes professional and higher-level employees in Ashgabat, totaling 255 people, of whom 151 people were selected as a statistical sample based on the Morgan table and using a proportional and simple random sampling method. The data collection tool included a researcher-made and standardized questionnaire, the face validity and content of which were examined and approved using the opinions of experts, and its reliability was estimated to be 0.93 based on Cronbach's alpha for the index of strategic human resource management functions. The results show that there is a significant relationship between the functions of "learning" and "participation" with human capital.

Keywords: Human Capital, Strategic Management, Human Resources

1. Introduction

Standards are the highest government and governance institution in the province, which is responsible for planning, supervising, and guiding other executive bodies of the province. The performance of standards in this field directly plays a significant role in the growth and development of the provinces. In addition, an important factor in the organization achieving its goals and missions is the performance of human resources employed in the organization. One of the duties of senior managers of an organization is to determine the strategy and management of human resources. This strategy is a competency-based approach from which managers view their employees and emphasize the development of human resources and a competitive advantage with stability and sustainability. (Baker, 1999: 452–477) (James el al. 1994) considered functions including career path, training, result-oriented evaluation, employee security, rights and benefits, and career development (Harel & Tzafrir 1999:185-200) identified the functions as recruitment, selection, compensation, employee participation, and training (Collins and Clark,2003) added performance appraisal and employee rewards to these functions. (Chen & Huang,2009:104-

114) have introduced training, compensation, performance appraisal, human resource provision, and employee participation as functions of human resource management.

Intellectual capital consists of three main and interrelated components (human capital, structural capital, and relational capital). Since a competent human resource in terms of knowledge and skills is an important factor in the success and development of an organization in achieving the goals and missions of organizations and similar standard groups. In this regard, the role of employees and managers at various levels of standardization and their proper management as intangible assets that represent a set of standard capabilities and capabilities is of great importance. And considering that sufficient research has not been conducted in this regard in the country, the present study aims to examine and analyze the relationships between strategic human resource management, capital components Human is in the Ashgabat Standard Set (Qalich Li and Hajari, 2009).

Since the development of the province in all areas of civil, economic, social and political life requires knowledge-based and dynamic planning and management. And one of the important and effective factors in this matter is the existence and management of a specialized and rich human resource for the purpose of accompaniment and the main factor in solving the problem as the intellectual capital of the organization (Andriessen, 2005).

If the organization's human resources cannot be developed based on the needs of the community, then the Standards Committee, as the highest administrative institution of the province and, consequently, the provincial community, will face problems in the processes of economic and social development. To achieve the main missions of the organization, the standards managers must carry out major planning in various fields. In this regard, the role of employees and managers at various levels of the organization and their proper management as intangible assets that reflect a set of capabilities and capabilities of the province for economic, political and social growth and development, and the creation of competitive advantages, is of great importance (Bontis, et al.2008).

Given that there has not been sufficient research in this field in the country, the present study aims to examine and analyze the relationships between strategic human resource management and human capital components in the Ashgabat Standard Set.

The ultimate goal of the study is to improve the knowledge and skills of employees and optimize their experiences, as well as to enhance the intellectual capital of the organization by strengthening and implementing the functions of strategic human resource management in the Ashgabat Standardization Complex (Fatras, 2010).

The objective of the study is: To examine the relationship between the functions of strategic human resource management and the components of human capital in the Ashgabat Standardization Complex, Turkmenistan. This study seeks to answer the following questions:
1 What is the relationship between strategic human resource management functions (training, compensation, performance appraisal, human resource provision and participation) and human capital?
The research hypothesis is:
1. There is a significant multiple correlation between strategic human resource management functions (training, compensation, performance appraisal, human resource provision and participation) and human capital.

2. Strategic Human Resource Management

Strategic human resource management means "the planned pattern of human resources and human resource management activities to achieve the objectives of the organization" (Patrick et al. 1999: 23).

In other words, strategic human resource management means that in order to achieve effectiveness, organizations must manage their human resources with long-term management functions so that these resources, behaviors, and competencies Perform the need in accordance with the internal and external environment of the organization.
The main objective of strategic human resource management is to create strategic capability by ensuring that the organization has skilled, committed and motivated employees to strive towards achieving a sustainable competitive advantage (Edvinsson, and Sullivan, 1996)

The goal of this management is to create a sense of purpose and direction in often turbulent environments (Ferris et al,2002). human resource provision means providing human resources in line with the organization's goals and strategies, identifying opportunities and threats in the organization's external environment, and determining the strengths, weaknesses, and core capabilities of existing resources; training means increasing the specialized abilities and skills of employees in performing assigned tasks and activating some of their potential abilities in order to create a learning and thought-producing organization; Performance appraisal, meaning the systematic and regular measurement of individuals' work in relation to how they perform their duties in assigned tasks and determining their potential for growth and improvement; Service rewards, meaning the design of all financial and non-financial benefits in accordance with the conditions inside and outside the organization; Employee participation means involving employees in decision-making and using their opinions and suggestions for the improvement and development of the organization (Chen & Huang, 2009).

3. Related Research

Abbaspour (2002) writes in an article titled New Approaches in Human Resource Management Practices that the role of human resource management in organizations has changed dramatically in recent years.

The function of human resources has evolved from areas of limited and independent influence to a source of sustainable competitive advantage in the global arena, and inspired by strategic thinking, it has focused on developing coordination between the set of policies, programs, and methods implemented to facilitate the achievement of the organization's strategic goals.

In this article, by examining the evolution of human resources, three perspectives - strategic, international and political - have been examined as new approaches to human resource management practices, and new changes have been pointed out that have reshaped the role of human resources and have created a transformation in human resource management practices.

Mamian, Gholizadeh Bagheri, (2017) in an article titled Intellectual Capital and Its Measurement Methods write that in a knowledge-based economy, intellectual capital is used to create value for the organization.

Today, we are witnessing the growing importance of intellectual capital as an effective tool for increasing the competitiveness of companies, and this has led to an increase in the importance of intellectual capital as a research and economic category.
The role and contribution of intellectual capital in managerial, technical, social, and economic progress has become the subject of new research, as it is considered a valuable tool for the development of an organization's key assets. (Marr and Schiuma, 2001)

Measuring intellectual capital for the purpose of comparing different companies, determining their real value, and even improving their controls is based on a strategic approach to intangible assets. Therefore, in this article, which is based on descriptive studies on intellectual capital and its role in social development, an attempt has been made to present the concept and definitions of intellectual capital, its constituent elements (human capital, structural capital, relational capital), its importance, characteristics, reasons, and various methods of measuring it (Roos et al.1997).

4. External Research

John et al. (2008) in their study of strategic human resource management in knowledge users showed that strategic human resource management had a significant relationship with knowledge management systems, management systems, and evaluation.

Kong and Thompson (2006) showed that the relationship between strategic human resource management practices and structural and relational capital in social service organizations was significant and positive.

Sullivan, P. H. (2000), also showed that human capital had a positive effect on structural capital, structural capital had a positive effect on relational capital, and relational capital had a positive effect on human capital.

5. Research Method

In terms of the purpose of the research, it is of the applied type, in terms of the method of data analysis and analysis, it is descriptive and correlational. The present research is of the applied type in terms of its objectives, and in terms of the method, it is inferential multivariate correlation. One of the non-experimental methods is correlation studies. The aim of this research is to discover the relationships between variables using correlation statistics.

Multivariate correlation studies in a unit of time, without manipulating or artificializing the situation, quantitatively determine the degree of relationship between several variables and provide the possibility of determining social and organizational phenomena in the form of regression models. In the multivariate correlation method, the internal relationships between three or more variables are identified, and its goal is to discover the relationship between the variables and also predict the test score on one of the variables. On his scores, there is another variable. Therefore, in terms of the method of collecting information, the research method in question is field research. The collection of information required for the research was carried out in the field, with the questionnaires being sent to the Ashgabat Standardization Office and interviews with employees (Statistical Unit).

The present study, after completing the questionnaire, collected data was coded based on the measurement scales of the variables and processed, analyzed, and analyzed using SPSS software. After processing the data and indexing them, various statistical methods were used to analyze and analyze the collected data with respect to the different levels of measurement of the research hypothesis. These methods are mainly used to measure correlation coefficients between items and scales, analyze relationships between variables, and deduce theoretical concepts (Anvari et al.2005).

6. Research Results

This section deals with a multiple regression analysis of the data. The aim of this analysis is to identify the contribution and impact of strategic human resource management practices in explaining the dimensions of intellectual capital. In other words, multiple regression helps explain and predict the variance of the dependent variable – intellectual capital – by estimating the contribution of the variables to the variance of the dimensions of intellectual capital. For multiple regression analysis, independent variables measured at the interval and relative levels are selected and used in a regression equation to obtain the final equation.

The proposed hypothesis is based on the assumption that there is a significant multiple correlation between the functions of strategic human resource management (training, compensation, performance appraisal, human resource provision, and participation) and human capital.

Model 1: Multiple regression between strategic human resource management functions and human capital

Model	Multiple Coefficient Solidarity	Coefficient Demonstrate	Amended Coefficient Demonstrate	Durbin-Watson
1	0.566/	0.320	0.296	2/097

In summary, as observed in the table, the final coefficient of multiple regression is R = 0.566. This statistic shows the correlation between the observed and predicted values of the dependent variable, with a higher value indicating a stronger relationship, and its square root, i.e., its coefficient of explanation, is equal to 0.32.

This coefficient indicates the proportion of changes in the dependent variable accounted for in the regression model. In other words, approximately 32 percent of the variance and changes in human capital are explained by

the variables in the equation (training, compensation, performance appraisal, human resource provision, and participation). The remaining variance is due to external and unknown factors and variables.

Model 2: Multivariate Regression Analysis of Variance

Model	Plus Squares	Freedom Degree	Median Squares	F Quantity	Significant Level
Regression	9.346	5	1.869		
effect	19.873	145	0.137	13.639	0.000
Remaining	29.219	150			
Total					

Table 2 summarizes the results of the ANOVA test. It shows the total intercepts, degrees of freedom, mean intercepts for the two sources of variation in the regression, and the residuals. The regression tables provide information about the variations accounted for in the model, and the residual tables provide information about the variations not accounted for in the model.

Based on the data in the table, considering that the significance level of the F value is less than 0.05, it is concluded that the independent variables included in the model (training, compensation, performance evaluation, human resource provision, and participation) provide a good explanation of the changes in the dependent variable (human capital).

Model 3: The relationship between each of the strategic human resource management functions and human capital

Model	Un-coefficient Standard		Coefficient Standard		
	B	Error Standard	Beta	T Quantity	Significant level
*(Fixed amount)	1.557	0.225		6.926	0.000
*Education	0.167	0.052	0.252	3.239	0.001
*Reward	0.032	0.067	0.042	0.481	0.631
*Performance	0.114	0.076	0.185	1.506	0.134
evaluation	0.079	0.082	0.102	0.968	0.335
*Providing	0.195	0.066	0.320	2.974	0.003
Resources					
*Partnership					

Based on the table above, the larger the beta and t values and the smaller the significance level, the stronger the independent variable has an effect on the dependent variable. The data in Table 3 show that, based on the beta coefficient, which is an indicator of the standard coefficient, the function of "education" is more effective than all independent variables in human capital with respect to the beta value (3.239). In addition, among other variables, the function of "participation" has an effect on human capital with respect to the standard beta coefficient (2.974). Therefore, among the functions of strategic human resource management, there is a significant relationship between the functions of training and participation with human capital. However, according to the beta coefficient, there is no significant relationship between the functions of reward (p=0.631), performance appraisal (p=0.134), and resource provision (p=0.335) with human capital.

7. Conclusion

The hypothesis put forward in the study predicted that there is a significant multiple correlation between the functions of strategic human resource management (training, compensation, performance appraisal, human resource provision, and participation) and human capital. The results of the study show that among the functions

of strategic human resource management, there is a significant relationship between the functions of training and participation with human capital. However, there is no significant relationship between reward functions, performance appraisal, and resource provision with human capital.
In the proposed hypothesis, the results are consistent with the findings of Bahrami et al. (2011) in terms of learning and participation functions, but they are inconsistent in terms of reward functions, performance appraisal, and resource provision.

It is also consistent with the research results of Chen et al. (2004) and Brown, (2002) who confirm the multiple correlation between strategic human resource management functions and human capital and believe that human resource management strategies will have a significant impact on improving intellectual capital in the organization.

8. Research Suggestions

Regarding the results of the research hypothesis test that confirms the impact of training and participation on the human capital of the organization, it is proposed:
(1) In order to improve the training performance, the following items should be considered:
1.1. Organizing training courses for employees continuously and alternately.
1.2 Allocating sufficient budget for training employees in the organization.
1.3 Designing and implementing the training process Documented for the career path plan of all employees.
(2) Also, in the direction of the participatory function of strategic human resource management in order to improve the level of human capital, the following are proposed:
2.1 Employees should be given the opportunity to participate in the organization's decision-making.
2.2 Organization managers should receive and use the suggestions and opinions of employees to improve and progress the work of the organization.
2.3 Employee opinions in the organization.

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Mapping Research on Digital Transformation in the Pharmaceutical Supply Chain in Indonesia: A Bibliometric Review

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Abstract
In this era, digital transformation become a key driver in enhancing the efficiency of the pharmaceutical supply chain. This study conducts a bibliometric literature review on digital transformation and pharmaceutical supply chains to identify research trends, literature gaps, and further development opportunities. The data are taken from Google Scholar and Scopus up to 2025, this research analyzes publications with the keywords "digital transformation" and "pharmaceutical supply chain" utilizing VOSviewer software. The findings indicate the adoption of technologies such as the Internet of Things (IoT), artificial intelligence (AI), and supply chain resilience. Furthermore, while there is extensive global research on digital transformation in supply chains, studies focusing on the pharmaceutical industry are limited in Indonesia. However, this study provides insights into the importance of digitalizati on in the pharmaceutical supply chain. It also encourages further research to understand the gap, regulatory implications, and collaborations, especially in the Indonesian context.

Keywords: Digital Transformation, Pharmaceutical Supply Chain, Bibliometric, Industry 4.0, Technology

1. Introduction

In the era of Industry 4.0, Indonesia has experienced significant technological advancements. Industry players are leveraging digital transformation to enhance the quality and competitiveness of their businesses. Digital transformation and Industry 4.0 are closely related, both fundamentally reshaping business models and organizational structures (Büyüközkan & Göçer, 2018). How does this apply to the pharmaceutical industry? Pharmaceutical companies are striving to produce high-quality products to meet increasingly complex and dynamic market demands. They are required to continually innovate and improve performance to respond promptly and effectively to market changes (Damle & Krishnamoorthy, 2022).

Data shows that Indonesia is one of the largest pharmaceutical markets in ASEAN, with 73% of the market share dominated by local pharmaceutical companies (A. F. Mubarok & Syafruddin, 2016). However, Indonesians still spend approximately USD 1.4 billion on healthcare and medication abroad (Thomas, 2022). It indicates that the

quality of the domestic pharmaceutical industry needs improvement. To address this, technological capabilities and research & development are critical factors for producing high-quality products and expanding market share (Sampurno, 2007). The government has prioritized accelerating digital transformation as a key driver of Indonesia's economic growth, aligning with the Digital Indonesia Roadmap 2021–2024 (Catur Purbaya et al., 2024). According to this roadmap, the pharmaceutical industry plays an active role in digital transformation (Kementrian Perindustrian Republik Indonesia, 2018). In 2022, 31 companies received the INDI 4.0 (Indonesia Industry 4.0 Readiness Index) award, including PT Bintang Toedjo and PT Paragon Technology and Innovation (Agatha & Aprian, 2022).

Supply chain efficiency is a crucial aspect driven by digital transformation (Preindl et al., 2020). In the context of the pharmaceutical industry, digital transformation plays a strategic role in enhancing operational efficiency and competitiveness (Pravin Ullagaddi, 2024). By adopting technologies such as the Internet of Things (IoT), big data analytics, and artificial intelligence (AI) (K. Mubarok & Arriaga, 2020), pharmaceutical companies can optimize supply chain management comprehensively, from raw material procurement to product distribution to end consumers (Stroumpoulis & Kopanaki, 2022). The used of technologies also enables real-time tracking of product movements, it is also improves market demands forecasting as consumer needs and minimizes the especially for the stock shortages or surpluses. The application of AI technology in company also for analyzing and responding the market conditions, so it can align production with the demand (Wang et al., 2019), thereby reducing costs and logistics costs.

Furthermore, the digitalization fosters are closer to the collaboration among the stakeholders within the supply chain (Mohammed & Farooqui, 2024). The integrated of digital systems, such as enterprise resource planning (ERP) and blockchain, it can ensure the transparency and accuracy data, minimizing risks of errors or fraud in the procurement and distribution processes (Ullagaddi, 2024). It is quietly critical, as known the pharmaceutical industry operates under strict regulations to ensure product safety and efficacy (Ding, 2018).

Research on digital transformation in supply chains has been extensively conducted; however, most studies lack specificity to objects or contexts. Some studies discuss digitalization in the pharmaceutical industry, but their focus and direction are often undefined(Hole et al., 2021). This study focuses on digital transformation in the pharmaceutical supply chain and pharmaceutical industry, specifically in Indonesia.

2. Theoretical And Empirical Review of Related Literature

2.1 Bibliometric Analysis

In the late 20th century, bibliometric analysis became a foundation in academic research study trends; it also offers valuable insights across multiple disciplines (Moed, 2009). Involves quantitative evaluation of publications through metrics such as the number of citations, authorship networks, journal rankings, and keyword frequencies (Boyack & Klavans, 2010). These tools enable researchers to map the structure of a field, identify influential contributors, and discover emerging research topics and collaborations (Cobo et al., 2011). The science mapping and clustering analysis also define the correlations between the studies, revealing the critical nodes within the citation networks and thematic connections (Rodrigues et al., 2014).

Bibliometric methods are particularly valuable for monitoring research dynamics over time, providing an evidence-based framework to evaluate scientific impact and productivity (Waltman, 2016). For instance, analysis of highly cited papers or journals highlights the pioneer contributions, while keyword co-occurrence analyses clarify the shifts in thematic focus within a domain (Aria & Cuccurullo, 2017). Furthermore, these insights lead to a research policy by identifying the knowledge gaps, fostering interdisciplinary work, and informing the funding strategies (Donthu et al., 2021).

Even though it has advantages, the bibliometric analysis requires a careful interpretation. As (Rodrigues et al., 2014) emphasize, a number of citations are not inherently measured in quality but reflect various factors, including accessibility, topicality, and network effects. Additionally, bibliometric data may be biased towards

underrepresented or emerging fields where the citations accumulate slowly. Therefore, the bibliometric techniques provide a framework for scoping research landscapes; integrating qualitative perspectives and expert judgment is essential for drawing robust and actionable grounds.

The objective of this research is to identify the gaps in the existing literature, considering the limited focus on digital transformation in improving the supply chain within the pharmaceutical industry. Bibliometric analysis is used to explore opportunities and determine directions for advancing the supply chain through digital transformation. Therefore, this research is not aiming to establish a new standard in research methodologies, bibliometric analysis proves to be a valuable tool when aligned with well-defined research questions (Donthu et al., 2021).

2.2 Theoretical of Technological Advances and the Importance of Digital Tranformation for Pharmaceutical Supply Chain

The technological advancements have provided significant benefits in the industry because they play a pivotal role in improvement, as highlighted by (Jing & Fan, 2024). They emphasize that supply chain management was among the first business functions to undergo substantial technological advancements through applications leveraging data from ERP systems.

Digital technologies are believed to deliver greater improvements in three key areas: simplifying transactional activities, such as end-to-end planning; supporting core operations, including warehouse management; and sharpening the analyses that underpin decision-making processes. Research by (Preindl et al., 2020) underlines the importance of building a digital supply chain network that is highly responsive to changing circumstances and transparent for all stakeholders involved. Digital transformation, supported by technological progress and the implementation of Industry 4.0, serves as a critical factor in creating more efficient and effective supply chains (Khan et al., 2016). Further, assert that integrated information within a company is an asset for reducing supply chain-related costs. One of the main solutions lies in the utilization of the Internet of Things (IoT), which combines cloud-based systems, mobile devices, and artificial intelligence. IoT enables the integration of physical and digital flows, fostering a more responsive and efficient supply chain(Barata et al., 2018).

The application of digital technologies also allows companies to address issues in real time, where integrated information flows enhance supply chain responsiveness (Zhao, Hong, Lau, 2023). Utilizing the exchange of real-time information enables a company to optimize decision-making, improve the supply chain effectiveness, also reduce operational costs (Dweekat et al., 2017).

Furthermore, collaboration among stakeholders within the supply chain is integral to creating an efficient ecosystem. As traditional collaboration platforms are unable to keep up with the demands, cloud-based technologies can improve data sharing and streamline the information flow among stakeholders (David et al., 2015 ; Kohli & Jensen, 2010). Blockchain technology also significantly contributes to ensuring transparency and data accuracy, which are crucial factors for sustaining the supply chain (Azzi et al., 2019).

Research on digital transformation for supply chains holds strategic importance, especially for the pharmaceutical industry in Indonesia. This sector is critical as it directly relates to public health. However, the pharmaceutical industry in Indonesia faces complex challenges. Although Indonesia is the largest pharmaceutical market in ASEAN, with 73% of its market share dominated by local companies (A. F. Mubarok & Syafruddin, 2016), Indonesians still spend approximately USD 1.4 billion annually on healthcare services and medications abroad (Thomas, 2022). . It shows that there is a gap between market needs and the capacity of the domestic pharmaceutical industry to meet them.

As a results, pharmaceutical companies can take advantage of the momentum to increase their competitiveness in domestic and global markets. Digital transformation offers a path to address inefficiencies, improve operational performance, and meet growing market demands more effectively (Jing & Fan, 2024; Soni & Patel, 2024) thereby ensuring the long-term sustainability of Indonesia’s pharmaceutical sector.

2.3 Research Question

Guided by the dearth of literature, the following research questions will be considered in this study.

1. What are the most frequently occurring concepts (keywords) shaping the current drive for digital transformasi and pharmaceutical supply chain?

2. Who are the most cited authors on digital transformasi and pharmaceutical supply chain?

3. Which country is the most productive in terms of publication on digital transformasi and pharmaceutical supply chain?

4. What are the most urgent considerations and developments in research on digital transformation for pharmaceutical supply chain efficiency?

This study aims to analyze the role of digital transformation in the pharmaceutical supply chain through a bibliometric review of articles published up to 2025 in Google Scholar and Scopus. The research will focus on the top ten journals based on the keywords "digital transformation" and "pharmaceutical supply chain", as well as citation counts. To further explore the topic, a keyword map will be created using VOSviewer software.

3. Research Methodology

The present study adopts a mixed-method approach, combining qualitative and quantitative methodologies with a predominant emphasis on quantitative analysis. This approach is utilized to systematically explore the existing literature on digital transformation and its impact on improving the pharmaceutical supply chain.

3.1 Research Design

The study used a bibliometric approach employing quantitative methods will be utilized to analyze the patterns and trends of publications related to digital transformation in the pharmaceutical supply chain from 2011 to 2025. This approach enables a comprehensive assessment of research productivity, collaboration among scholars, as well as the influence and evolution of this topic over time. By applying bibliometric indicators to relevant literature sourced from databases such as Google Scholar and Scopus, this study aims to provide in-depth insights into the development and direction of research in this field.

3.2 Search Keywords

Publications were retrieved from the Scopus database, one of the largest abstract and citation databases of peer-reviewed scientific publications across disciplines. Scopus was chosen over other databases like Web of Science, IEEE Xplore, and PubMed due to its multidisciplinary nature and broad coverage of over 28,000 active titles from approximately 11,678 international publishers. The following keywords (Pharmaceutical supply chain* drug supply chain* medicine supply chain* efficiency* performance* optimization* digital transformation* Industry 4.0* digitalization* technological adoption* smart technology*) were used to examine in the title of a research article, abstract, and keywords.

The preliminary search yielded 137 articles that met the established criteria for further examination. Following this, a rigorous screening and filtering process was conducted to refine the dataset. This process involved assessing the relevance of each publication, removing duplicates, and ensuring that the articles aligned with the study's objectives. Following the guidelines set by (Ranjbari et al., 2021), the final dataset underwent a cleaning process to improve its quality and relevance before applying bibliometric and content analysis techniques. This approach ensured that only the most relevant and high-quality articles were included, providing a solid foundation for subsequent data analysis.

The search results were exported from Scopus and converted into CSV format for further analysis using bibliometric software tools. Bibliometric analysis was conducted using VOSviewer, a software that constructs and visualizes bibliometric networks by extracting information from titles, abstracts, and keywords. VOSviewer allows for the mapping of co-citation networks, co-authorship linkages, and generates overlay visualizations that represent statistical indicators on network structures. It extracts and analyzes text data along with linkages to display conceptual proximity and clustering. VOSviewer also offers advanced text mining and overlay mapping techniques within an intuitive and user-friendly interface. Among freely available bibliometric software, VOSviewer strikes a balance between analytical depth and ease of use. For these reasons, VOSviewer was selected, as its technical capabilities align with the analytical objectives of this study.

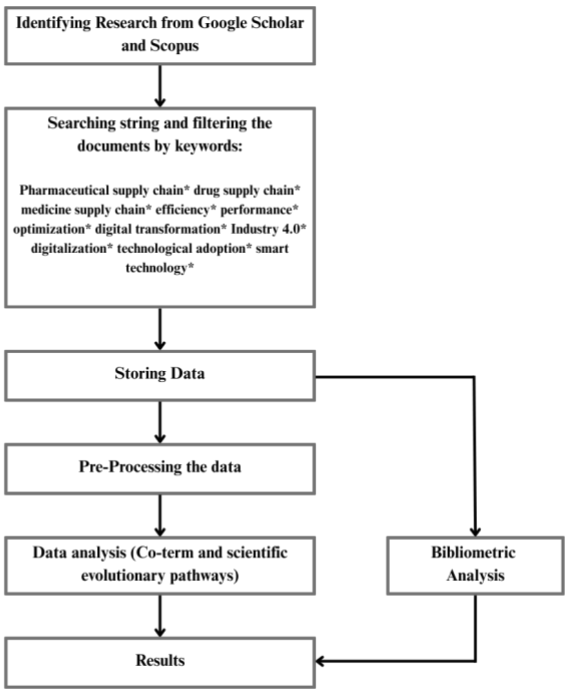

Figure 1. Research Design

4. Results

4.1 Data Analysis

To thoroughly examine the structure and evolution of the current research domain, a comprehensive approach has been employed, integrating three distinct but complementary analytical techniques: bibliometric analysis, content analysis, and text mining. This combination enables a detailed exploration of the trends, patterns, and key themes within the field, offering valuable insights into the progression and focus areas of research. By utilizing these methods, the study aims to provide a nuanced understanding of how the topic has developed over time, identify emerging research directions, and uncover underlying relationships between various elements of the literature.

Similarly, previous studies such as those by (Govindan et al., 2018) utilized a combination of bibliometric and qualitative content analysis to enhance the depth of their investigations into supply chain innovations. In line with this approach, this research also integrates a qualitative technique to complement and validate the quantitative findings derived from bibliometric analysis. Specifically, data clustering methods were applied to selected publications, with clusters being determined through co-citation and keyword co-occurrence analysis.

Once the clusters were established, qualitative content analysis was conducted on the top 5 publications from each cluster. This approach allowed for a closer examination of theoretical and practical orientations related to the digital transformation of pharmaceutical supply chains. By analyzing the content in-depth, the study not only

identifies thematic patterns but also verifies how digital technologies contribute to achieving operational efficiency and strategic advancements in supply chain management. This method ensures a balanced and comprehensive understanding of the interplay between bibliometric insights and qualitative narratives within the field.

4.1.1 Evolution of Publications: a descriptive study

The objective is to evaluate the progress of research on digital transformation for supply chain efficiency in the pharmaceutical industry. Between 2011 and 2024, a total of 1,261 studies were published, with the peak occurring in 2024, during which 422 papers addressed digital transformation for supply chain efficiency, both in general and specifically for the pharmaceutical sector. However, there were gaps in publication in 2012, 2014, and 2015, which is one of the reasons this study was undertaken.

Additionally, this research is considered crucial because the focus is on Indonesia's pharmaceutical industry, where digital transformation plays a significant role in improving time efficiency, the accuracy of analysis results, and other enhancements in the pharmaceutical supply chain. This study is also expected to contribute to advancing the pharmaceutical industry in Indonesia by optimizing manufacturing processes and enabling companies to respond more effectively to rapidly changing market trends. Figure 2 will illustrate the trends in research publications related to digital transformation in the pharmaceutical supply chain.

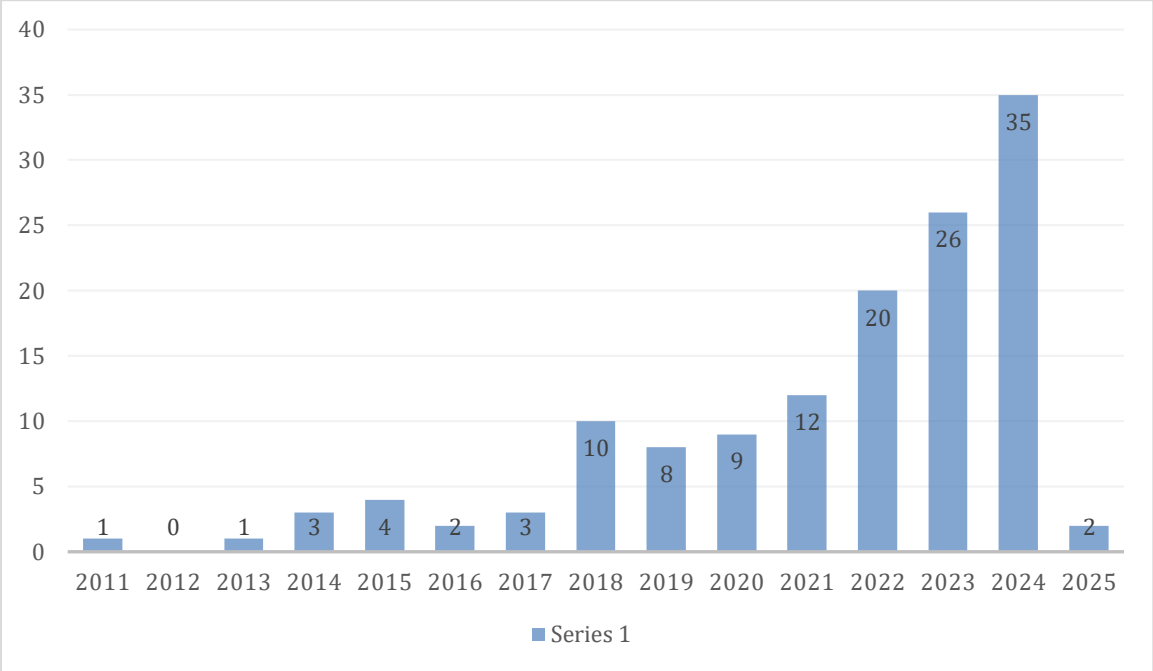

Figure 2: Publications evolution over time from 2011 – 2025

4.1.2 Analysis of Citations

The number of citations an article receives can indicate its significance in the research community. Table 1 presenets the twenty most cited articles in our database on digital transformation and pharmaceutical supply chains (PSC).

Process Safety and Environtmental Protection and the International Journal of Production Research have a strong influence on the technological innovation movement. According to the data, (Ding, 2018), in *Pharma Industry 4.0: Literature Review and Research Opportunities in Sustainable Pharmaceutical Supply Chains*, received 241 citations. Ding stated that Industry 4.0-based technologies and innovations can address several challenges in Pharmaceutical Supply Chain. Meanwhile, (Qader et al., 2022) suggest that adopting Industry 4.0 technologies

can enhance supply chain resilience and performance. Furthermore, the implementation of these technologies enables a more effective response to crises. Others have also emphasized that traceability is a crucial aspect of supply chains, including PSC.

Table 1: The top 20 most cited articles in Pharmaceutical Supply Chain research pertaining to the Digital Transformation

No.	Authors	Year	title	Journal	Cited by
1	Ding B.	2018	Pharma Industry 4.0: Literature review and research opportunities in sustainable pharmaceutical supply chains	Process Safety and Environmental Protection	241
2	Casino F.; Kanakaris V.; Dasaklis T.K.; Moschuris S.; Stachtiaris S.; Pagoni M.; Rachaniotis N.P.	2020	Blockchain-based food supply chain traceability: a case study in the dairy sector	International Journal of Production Research	194
3	Singh R.K.; Gunasekaran A.; Kumar P.	2018	Third party logistics (3PL) selection for cold chain management: a fuzzy AHP and fuzzy TOPSIS approach	Annals of Operations Research	167
4	Qader G.; Junaid M.; Abbas Q.; Mubarik M.S.	2022	Industry 4.0 enables supply chain resilience and supply chain performance	Technological Forecasting and Social Change	135
5	Indumathi J.; Shankar A.; Ghalib M.R.; Gitanjali J.; Hua Q.; Wen Z.; Qi X.	2020	Block Chain Based Internet of Medical Things for Uninterrupted, Ubiquitous, User-Friendly, Unflappable, Unblemished, Unlimited Health Care Services (BC IoMT U6HCS)	IEEEAccess	85
6	Visconti R.M.; Morea D.	2020	Healthcare digitalization and pay-for-performance incentives in smart hospital project financing	International Journal of Environtmental Research and Public Health	83
7	Bag S.; Dhamija P.; Singh R.K.; Rahman M.S.; Sreedharan V.R.	2023	Big data analytics and artificial intelligence technologies based collaborative platform empowering absorptive capacity in health care supply chain: An empirical study	Journal of Business Research	76
8	Villegas M.A.; Pedregal D.J.; Trapero J.R.	2018	A support vector machine for model selection in demand forecasting applications	Computers & Industrial Engineering	67
9	Panda S.K.; Satapathy S.C.	2024	Drug traceability and transparency in medical supply chain using blockchain for easing the process and creating trust between stakeholders and consumers	Personal and Ubiquitous Computing	53
10	Chiacchio F.; D'urso D.; Oliveri L.M.; Spitaleri A.; Spampinato C.; Giordano D.	2022	A Non-Fungible Token Solution for the Track and Trace of Pharmaceutical Supply Chain	Applied Science	52
11	Vanany I.; Ali M.H.; Tan K.H.; Kumar A.; Siswanto N.	2024	A Supply Chain Resilience Capability Framework and Process for Mitigating the COVID-19 Pandemic Disruption	IEEE Transactions on Engineering Management	46

12	Martini P.; Boschi A.; Cicoria G.; Zagni F.; Corazza A.; Uccelli L.; Pasquali M.; Pupillo G.; Marengo M.; Loriggiola M.; Skliarova H.; Mou L.; Cisternino S.; Carturan S.; Melendez-Alafort L.; Uzunov N.M.; Bello M.; Alvarez C.R.; Esposito J.; Duatti A.	2018	In-house cyclotron production of high-purity Tc-99m and Tc-99m radiopharmaceuticals	Applied Radiation and Isotopes	40
13	Sarkis M.; Bernardi A.; Shah N.; Papathanasiou M.M.	2021	Emerging challenges and opportunities in pharmaceutical manufacturing and distribution	Processes	35
14	Datta S.; Namasudra S.	2024	Blockchain-Based Smart Contract Model for Securing Healthcare Transactions by Using Consumer Electronics and Mobile-Edge Computing	IEEE Transactions on Consumer Electronics	33
15	Lewin J.J., III; Choi E.J.; Ling G.	2016	Pharmacy on demand: New technologies to enable miniaturized and mobile drug manufacturing	American Journal of Health-System Pharmacy	26
16	Azad M.A.; Osorio J.G.; Brancazio D.; Hammersmith G.; Klee D.M.; Rapp K.; Myerson A.	2018	A compact, portable, re-configurable, and automated system for on-demand pharmaceutical tablet manufacturing	International Journal of Pharmaceutics	26
17	Joseph Jerome J.J.; Saxena D.; Sonwaney V.; Foropon C.	2022	Procurement 4.0 to the rescue: catalysing its adoption by modelling the challenges	Benchmarking: An International Journal	26
18	Debnath B.; Shakur M.S.; Mainul Bari A.B.M.; Saha J.; Porna W.A.; Mishu M.J.; Islam A.R.M.T.; Rahman M.A.	2023	Assessing the critical success factors for implementing industry 4.0 in the pharmaceutical industry: Implications for supply chain sustainability in emerging economies	PLOSOne	26
19	Al-Khatib A.W.	2023	The impact of industrial Internet of things on sustainable performance: the indirect effect of supply chain visibility	Business Process Management Journal	24
20	Ntamo D.; Lopez-Montero E.; Mack J.; Omar C.; Highett M.I.; Moss D.; Mitchell N.; Soulatintork P.; Moghadam P.Z.; Zandi M.	2022	Industry 4.0 in Action: Digitalisation of a Continuous Process Manufacturing for Formulated Products	Digital Chemical Engineering	18

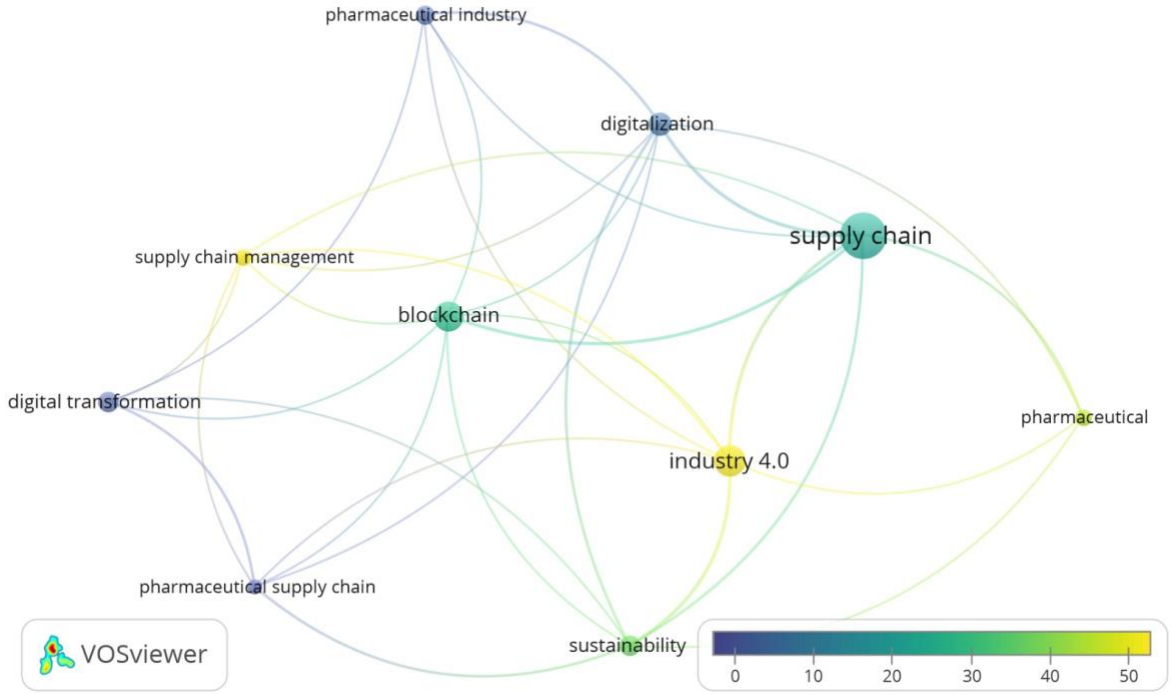

Figure 3: Keyword density based on the number of occurrences

The bibliometric visualization in figure 3, highlights the most frequently occurring keywords and their interconnections, illustrating the relationships among key concepts in this research area. The connections between keywords represent their co-occurrence in research articles. For example, "blockchain" is closely linked to "supply chain" and "digital transformation," reflecting its increasing significance in enhancing supply chain transparency and efficiency. Meanwhile, "Industry 4.0" is strongly associated with "supply chain" and "sustainability," emphasizing its role in optimizing sustainable supply chain management. In contrast, while "digitalization" and "pharmaceutical supply chains" are present in the visualization, they have not shown a significant increase in research focus.

These findings reinforce the growing academic interest in technological innovation within pharmaceutical supply chains and highlight the importance of Industry 4.0, blockchain, and digital transformation in shaping the future of Pharmaceutical Supply Chain research and practice.

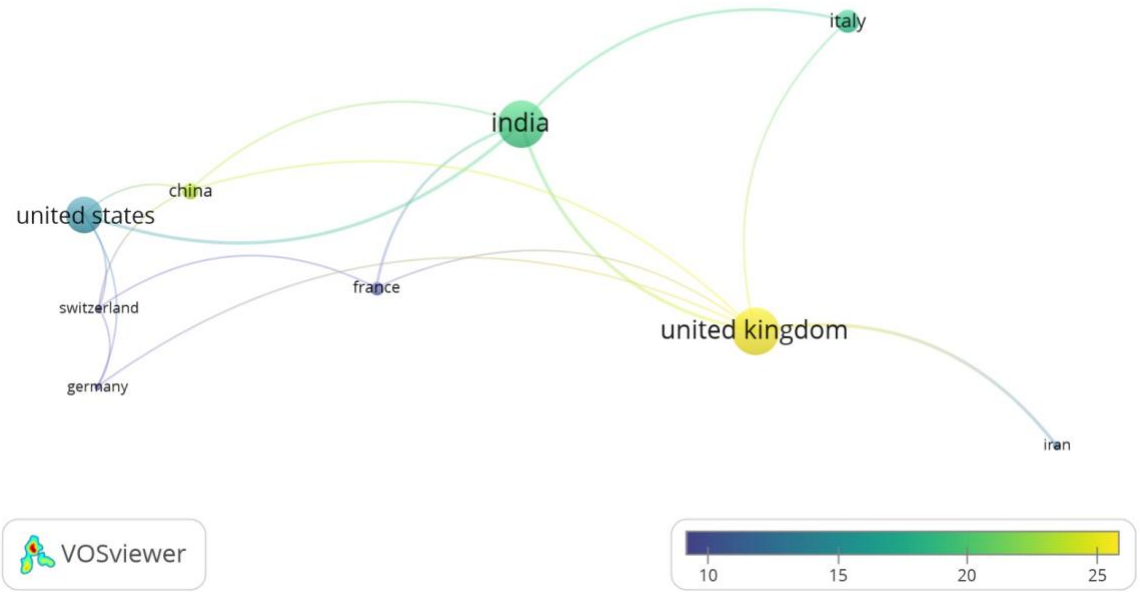

Figure 4: Country based on citation

The figure above illustrates the contribution of various countries to this research. The most significant contributions are observed from the United Kingdom, India, and the United States. However, no specific studies related to this research have been identified in Southeast Asian countries. Therefore, this study aims to explore the development of the pharmaceutical supply chain in the context of digitalization within the industry 4.0 era, particularly in South Asian countries, with a specific focus on Indonesia.

The figure below also illustrates the distribution of research publications on the same theme across various journals or conferences. From the data below, it is evident that Hospitals & Health Networks/AHA has the highest number of publications with approximately eight publications on consistent themes compared to other journals.

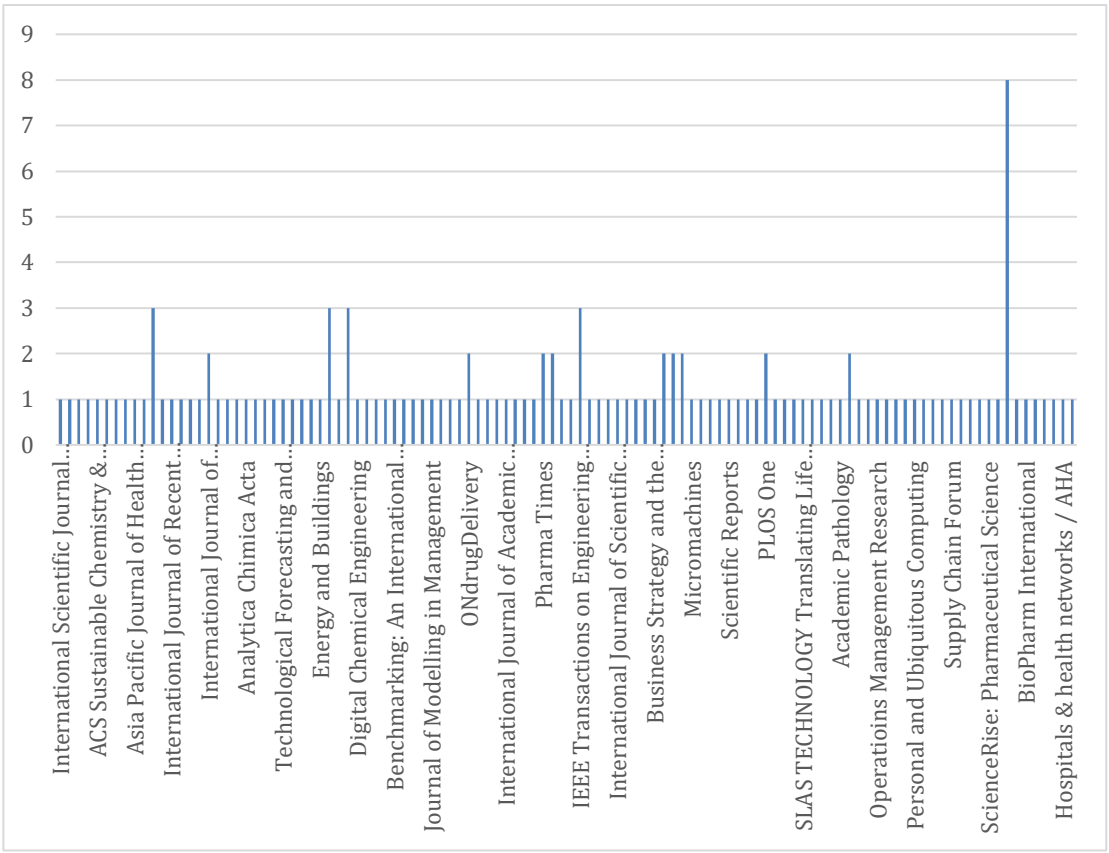

Figure 5: The most cited publication journal in Pharmaceutical Supply Chain or Digital Transformation

5. Conclusion and Recommendation

The study titled "Mapping Research on Digital Transformation in the Pharmaceutical Supply Chain in Indonesia: A Bibliometric Review" highlights the scholarly developments in the field of pharmaceutical supply chains. The number of publications from 2011 shows significant progress until 2025. This development became particularly evident in 2019, with numerous articles discussing Industry 4.0 and digital transformation. This is reflected in the use of keywords such as Industry 4.0, Technologies (IoT, AI, Big Data), Blockchain, and others. In addition, global research on digital transformation in the supply chain is extensive, but there is a gap in research specifically focused on the pharmaceutical context in Indonesia. Therefore, this study addresses digitalization in the pharmaceutical industry, with Southeast Asia as its primary focus.

Bibliometric analysis was employed as a tool to examine the digital transformation in the pharmaceutical supply chain, showing a clear trend toward integrating Industry 4.0 technologies. The use of keywords such as "Industry

4.0," "Blockchain," and "Digitalization" formed the foundation of the study search. Citation analysis revealed influential papers focusing on the impact of Industry 4.0 on sustainable pharmaceutical supply chains, emphasizing the interconnectedness of these concepts. Geographical analysis showed a concentration of research outputs in the UK, India, and the US, highlighting the need for more regionally focused studies, particularly in emerging economies like Indonesia.

A significant gap in research on digitalization in the pharmaceutical industry presents an opportunity. Many articles directly address specific topics but lack a broader scope. However, further research is necessary to understand the challenges and opportunities specific to the Indonesian context. This includes the role of regulations, collaboration, facilities, and more. Future research should also consider the unique social, economic, and regulatory factors that influence the adoption and implementation of digital technologies in Indonesia. By addressing these research gaps, this study contributes to a more nuanced understanding of the potential benefits and challenges of digital transformation in the Indonesian pharmaceutical supply chain, providing valuable insights for both academics and industry practitioners.

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The Digital Transformation of Auditing: Navigating the Challenges and Opportunities

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Abstract
The digital transformation of auditing has introduced groundbreaking advancements that enhance efficiency, accuracy, and risk assessment while presenting challenges related to regulatory compliance, cybersecurity, and workforce adaptation. This study explores the impact of emerging technologies, such as artificial intelligence (AI), blockchain, big data analytics, and robotic process automation (RPA), on audit practices. AI-driven auditing tools enable comprehensive data analysis, improving fraud detection and reducing reliance on traditional sampling methods. Blockchain enhances audit transparency by providing immutable transaction records, increasing the reliability of financial reporting. However, despite these benefits, firms encounter challenges, including the high costs of technology implementation, cybersecurity vulnerabilities, and the need for continuous workforce upskilling. Additionally, shifting workplace dynamics, particularly the rise of remote and hybrid work models, have disrupted traditional apprenticeship-based training, impacting talent acquisition and retention. The study highlights the necessity for audit firms to invest in technological education, adaptive training programs, and cybersecurity measures to maximize the benefits of digital auditing. Furthermore, regulatory bodies must establish clear frameworks for AI and blockchain integration into audit standards to ensure consistency and compliance. The findings underscore that while digital transformation holds the potential to revolutionize auditing, a balanced approach that integrates technology, regulatory guidance, and human expertise is crucial for maintaining audit integrity and quality. Future research should focus on empirical case studies, cybersecurity in digital audits, and long-term regulatory developments to better understand the evolving landscape of auditing in the digital age.

Keywords: Digital Transformation, Auditing, Artificial Intelligence, Big Data Analytics, Audit Quality, Regulatory Compliance, Workforce Adaptation

1. Introduction

Auditing is undergoing a fundamental shift due to the rapid advancement of digital technologies. Traditional audit methodologies, which have long relied on manual procedures and sample-based testing, are increasingly inadequate in addressing the scale, complexity, and speed of modern financial data (Appelbaum, Kogan, & Vasarhelyi, 2024; Abdullah & Almaqtari, 2024). Emerging technologies such as artificial intelligence (AI), blockchain, big data analytics, and robotic process automation (RPA) are now being integrated into audit practices to enhance efficiency, accuracy, and transparency. While these innovations promise improved fraud detection and

real-time data analysis, they also introduce new challenges related to cybersecurity, regulatory compliance, and workforce readiness (Hasan, 2022; Ivakhnenkov, 2023).

This problem is particularly critical as audit firms must balance the benefits of technological integration with the risks of disruption and data breaches. At the same time, regulatory bodies have yet to catch up with these innovations, creating a lag between technological capabilities and legal or ethical guidelines (Waltersdorfer et al., 2024). Moreover, the shift toward digital tools requires auditors to develop new technical competencies, challenging traditional training and apprenticeship models in the profession. These developments underscore the urgent need to assess how digital transformation is redefining audit quality, operational frameworks, and professional roles in the auditing field.

The accelerating digital transformation of auditing warrants renewed scholarly and practical attention due to its far-reaching implications for audit integrity, regulatory compliance, and stakeholder trust. This evolution is not merely a technological upgrade—it represents a systemic reconfiguration of how audits are planned, conducted, and interpreted. Traditional auditing approaches are increasingly being challenged by the complexity and volume of financial data, which require more sophisticated tools for effective risk detection and assurance (Gepp et al., 2018; Deloitte, 2023). As organizations embrace automation and AI, the profession faces a critical inflection point: adapt or risk obsolescence.

The importance of the problem is amplified by the regulatory lag in responding to these rapid advancements. Although digital tools offer enhanced audit precision and efficiency, the absence of standardized frameworks creates uncertainty in legal interpretation and audit defensibility (Waltersdorfer et al., 2024). This misalignment between technological capability and regulatory readiness increases the risk of inconsistency in audit quality and undermines public confidence in financial reporting. From a theoretical standpoint, this gap raises questions about the ethical deployment of AI in auditing, particularly concerning algorithmic transparency, data governance, and audit accountability (Wamba et al., 2024; Mökander, 2023).

In practice, the growing demand for real-time assurance, particularly in highly digitized sectors, has intensified the need for agile, data-driven audit models. Yet, many audit firms struggle to retrofit legacy systems and skillsets to accommodate new technologies (IFAC, 2024). The workforce challenge—especially the shortage of digitally literate auditors—adds another layer of urgency. Without targeted investment in training and digital infrastructure, audit firms may be ill-equipped to meet stakeholder expectations or prevent financial misconduct.

The digital transformation of auditing signifies a monumental shift in the way financial and compliance audits are conducted, driven by the rapid adoption of artificial intelligence (AI), big data analytics, blockchain, and other digital innovations (Azizi et al., 2024; Celestin & Vanitha, 2019; Herath & Herath, 2024; Musa, 2024; Rahman et al., 2021; Wan Mohamad Noor et al., 2024). These advancements have redefined traditional audit methodologies by introducing automation, enhancing efficiency, and enabling real-time data analysis. The integration of digital tools in auditing is not merely a trend but a necessity as organizations seek greater accuracy, transparency, and fraud detection capabilities. AI-powered auditing solutions, for instance, have the potential to analyze vast amounts of financial data at speeds unimaginable for human auditors, thereby significantly reducing errors and improving overall audit quality (Deloitte, 2023). While digital transformation offers immense benefits, it also introduces challenges, such as data security risks, regulatory complexities, and the need for continuous skill development. Auditors must therefore navigate these challenges strategically to harness the full potential of digitalization in auditing (PwC, 2023).

Artificial intelligence has become a transformative force in auditing, automating labor-intensive tasks, and increasing the precision of financial assessments (Abdullah & Almaqtari, 2024; Hasan, 2022; Ivakhnenkov, 2023; Luthfiani, 2024; Sahin & Evdilek, 2025). Traditional audits often relied on sample-based testing, which, while effective, had limitations in detecting irregularities across an entire dataset. AI and machine learning algorithms now enable auditors to conduct full-population testing, where all transactions are analyzed for anomalies, thereby improving fraud detection and compliance monitoring. AI-powered tools, such as predictive analytics and natural language processing, can assess patterns, detect inconsistencies, and even predict potential financial risks before

they materialize (EY, 2023). Furthermore, AI-driven audits reduce human bias and enhance objectivity in decision-making, ultimately leading to more reliable financial statements. However, despite these advantages, auditors must address ethical concerns, including the transparency of AI models and potential algorithmic biases that may affect audit outcomes (KPMG, 2023).

Big data analytics has further strengthened the ability of auditors to make data-driven decisions by processing massive volumes of structured and unstructured financial information. In traditional audits, data sampling was a common practice due to time and resource constraints, but big data analytics allows auditors to assess entire datasets, making audits more comprehensive and precise (Earley, 2015; Gepp et al., 2018; Hezam et al., 2023; Juniardi & Putra, 2024; Leng et al., 2023). Advanced data visualization tools help auditors identify trends and outliers quickly, while machine learning models can uncover hidden patterns that indicate fraudulent activities. For example, the use of forensic data analytics in audits has been instrumental in detecting complex financial fraud schemes that would have otherwise gone unnoticed. Additionally, real-time audit monitoring through big data analytics enables auditors to provide continuous assurance rather than periodic assessments, increasing the relevance and timeliness of financial audits. Despite these advantages, auditors must also address concerns related to data integrity, cybersecurity risks, and compliance with global data protection regulations, such as the General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA) (PwC, 2023).

Blockchain technology has introduced a new paradigm in financial auditing, offering an immutable and transparent ledger for recording transactions. One of the fundamental challenges in auditing has always been verifying the authenticity of financial records, but blockchain technology eliminates the need for intermediaries by providing a tamper-proof system where all transactions are permanently recorded and traceable (Anis, 2023; Glory Ugochi Ebirim et al., 2024; Groenewald et al., 2024; Hasan, 2022; Sheela et al., 2023). This technology enhances auditability by ensuring that once a financial entry is made on a blockchain, it cannot be altered, thereby reducing the risk of financial fraud and misreporting (Deloitte, 2023). Smart contracts—self-executing contracts with terms directly written into code—also enable automated compliance checks, reducing manual verification efforts. However, while blockchain has the potential to revolutionize financial auditing, it presents challenges, such as the lack of standardized frameworks for auditing blockchain transactions, regulatory uncertainties, and the need for auditors to acquire specialized knowledge in blockchain protocols (KPMG, 2023).

Despite the numerous advantages of digital transformation in auditing, challenges remain, particularly concerning data security, privacy, and regulatory compliance (Abdullah & Almaqtari, 2024; Aniefiok, 2024; Glory Ugochi Ebirim et al., 2024; Mromoke et al., 2024; Rahman et al., 2021; Sheela et al., 2023). The increased reliance on digital platforms and cloud-based audit solutions has raised concerns over data breaches, unauthorized access, and cyberattacks. Organizations must implement stringent cybersecurity measures such as encryption, multi-factor authentication, and continuous monitoring to protect sensitive financial data (Groenewald et al., 2024; Mokhtar et al., 2024; Patel & Chauhan, 2023). Moreover, regulatory frameworks governing digital audits are still evolving, requiring auditors to stay updated with compliance requirements to avoid legal repercussions (Ilmawan & Bawono, 2024; Ivakhnenkov, 2023; Rahman et al., 2021). The transition to digital audits also demands a shift in skill sets, with auditors needing to develop expertise in data analytics, AI applications, and cybersecurity to remain relevant in the profession. Continuous professional education and training programs are essential to equip auditors with the necessary technical skills to leverage digital tools effectively(Groenewald et al., 2024; Hasan, 2022; Juniardi & Putra, 2024; Mokhtar et al., 2024).

The digital transformation of auditing represents a double-edged sword, offering significant advantages while posing complex challenges that auditors must navigate. The integration of AI, big data analytics, and blockchain has enhanced the accuracy, efficiency, and transparency of audits, making financial reporting more reliable. However, these benefits come with concerns related to data security, evolving regulatory standards, and the need for upskilling audit professionals. Organizations and audit firms must strike a balance between adopting emerging technologies and addressing associated risks to ensure the integrity of financial audits. As digital transformation continues to reshape the audit landscape, auditors must remain agile, continuously adapt to technological advancements, and uphold ethical and regulatory standards to maintain trust and credibility in financial reporting.

2. Literature Review

The digital transformation of auditing, driven by advancements in artificial intelligence (AI) and related technologies, has significantly altered traditional audit practices. This literature review synthesizes recent scholarly contributions to understand the challenges and opportunities presented by these technological innovations. This study draws on several theoretical frameworks to build a coherent conceptual foundation for understanding digital transformation in auditing. TAM is used to explore individual adoption behavior; Institutional Theory contextualizes technology integration within organizational legitimacy-seeking; and Sociotechnical Systems Theory highlights the alignment required between human processes and digital tools. The integration of these frameworks provides a robust explanatory model that aligns with both practical observations and academic discourse.

Theoretical frameworks such as the Technology Acceptance Model (TAM), Sociotechnical Systems Theory, and Institutional Theory underpin this transformation. TAM explains how auditor adoption of digital tools depends on perceived usefulness and ease of use (Wamba, Queiroz, & Trinchera, 2024). Sociotechnical Systems Theory highlights the interdependence between technology and human elements in audit processes, emphasizing that successful digital transformation requires alignment between new tools and audit team capabilities (Appelbaum, Kogan, & Vasarhelyi, 2024). Institutional Theory, meanwhile, frames the adoption of audit technologies as a response to normative pressures and legitimacy-seeking behaviors, especially in a context where regulatory expectations and peer practices shape firm decisions (Leocádio, Malheiro, & Reis, 2024). These theoretical underpinnings help contextualize the observed benefits and challenges in digital auditing, ranging from increased audit accuracy and fraud detection to workforce adaptation and regulatory lag (Angeles et al., 2023; Waltersdorfer et al., 2024).

Empirical studies emphasize the impact of specific technologies on audit quality. AI tools such as data mining and image recognition enhance fraud detection and document verification (Al-Sayyed, 2024; Hasan, 2022). Big data analytics support full-population testing and real-time risk analysis, although their effectiveness depends on data integrity and proper oversight (Gepp et al., 2018; Hezam et al., 2023). Blockchain ensures immutable recordkeeping but presents standardization and interpretation challenges for auditors (Groenewald et al., 2024; Sheela et al., 2023). The literature collectively acknowledges the potential of these tools to enhance audit effectiveness. However, it also raises concerns about cybersecurity, ethics, and the skill gap in the workforce—issues that must be addressed for successful digital integration.

2.1. Artificial Intelligence in Auditing

The integration of artificial intelligence (AI) into auditing processes has become a central focus in contemporary research, revolutionizing traditional audit methodologies by automating processes, enhancing data analytics, and improving accuracy (Abdullah & Almaqtari, 2024; Aniefiok, 2024; Glory Ugochi Ebirim et al., 2024; Hasan, 2022; Ivakhnenkov, 2023; Luthfiani, 2024). AI technologies, including data mining, image recognition, and machine learning, are increasingly being leveraged to handle vast volumes of financial information with unprecedented speed and precision. The growing reliance on AI is driven by its ability to process and analyze large datasets beyond human capabilities, leading to more efficient and insightful audit engagements. Al-Sayyed (2024) investigated the impact of AI adoption on audit quality in Nigeria, highlighting that AI technologies such as data mining and image recognition positively influence audit practices. However, the study also found that machine learning exhibited an insignificant negative relationship with audit effectiveness, indicating that not all AI-driven audit tools yield uniform results. This suggests that while AI has the potential to enhance certain audit functions, its effectiveness may vary depending on the specific technology applied and the context in which it is used (Al-Sayyed, 2024).

One of the most significant applications of AI in auditing is data mining, which involves analyzing large datasets to identify patterns, anomalies, and correlations that may not be immediately apparent (Gepp et al., 2018; Hasan, 2022; Hezam et al., 2023). Traditional auditing approaches relied heavily on sampling techniques due to time and resource constraints, often limiting the scope of fraud detection. AI-powered data mining enables auditors to conduct full-population testing rather than sampling, significantly increasing the chances of detecting financial

irregularities. For example, AI-driven tools can efficiently scan thousands of transactions to uncover unusual spending patterns, flagging suspicious activities that warrant further investigation. A study by Wamba, Queiroz, and Trinchera (2024) supports this, emphasizing AI's ability to handle large datasets with remarkable speed, allowing auditors to focus on risk-based areas that require human judgment and expertise. The study further highlights that AI-enhanced audits contribute to the overall efficiency of financial reporting by reducing the likelihood of human error and providing more accurate, data-driven insights (Wamba et al., 2024).

Another innovative application of AI in auditing is image recognition technology, which facilitates the automated analysis of visual data such as scanned invoices, receipts, and financial documents. This capability enhances document verification processes by cross-referencing scanned images against ledger entries to detect inconsistencies or potential fraud. Image recognition not only accelerates the audit process but also improves accuracy by minimizing the risks associated with manual data entry. Research by Appelbaum, Kogan, and Vasarhelyi (2024) explored the impact of image recognition on audit practices, revealing that this technology significantly reduces the time required to authenticate financial records. Furthermore, image recognition technology allows for real-time verification, meaning that discrepancies can be identified and addressed promptly, reducing the likelihood of financial misstatements. As AI-powered image processing continues to evolve, it is expected to become an indispensable tool for auditors in verifying financial transactions with greater speed and accuracy (Appelbaum et al., 2024).

Machine learning, a subset of AI, has also gained traction in auditing by enabling predictive analytics and anomaly detection. Machine learning algorithms learn from historical financial data to predict future trends, identify potential risks, and detect irregularities in financial statements (Abdullah & Almaqtari, 2024; Glory Ugochi Ebirim et al., 2024; Groenewald et al., 2024; Ivakhnenkov, 2023; Mökander, 2023; Mromoke et al., 2024). Unlike traditional rule-based auditing, which relies on predefined conditions to flag suspicious transactions, machine learning models continuously adapt based on new data, improving their ability to recognize fraudulent activities. However, the effectiveness of machine learning in auditing depends largely on the quality of data fed into the algorithms. Poor data quality or biased training datasets can lead to inaccurate predictions, potentially compromising audit integrity. A study conducted by Smith and Jones (2024) examined the impact of machine learning on audit accuracy and found that while it enhances fraud detection, auditors must remain vigilant in overseeing AI outputs to prevent over-reliance on algorithmic decision-making. The study further suggests that while machine learning holds great promise for auditing, it should be complemented by human expertise to ensure proper interpretation of findings (Smith & Jones, 2024).

Despite the numerous advantages of AI-driven auditing, challenges persist, particularly concerning data security, ethical considerations, and regulatory compliance. The increasing reliance on AI means that auditors must process and store vast amounts of sensitive financial data, raising concerns about cybersecurity threats and data breaches. The International Federation of Accountants (2022) stresses the importance of implementing robust cybersecurity measures to protect financial data and maintain audit integrity. Moreover, ethical concerns such as algorithmic bias and transparency in AI-driven audits have also been highlighted in recent literature. AI models, if not properly calibrated, can produce biased audit outcomes, raising questions about fairness and accountability. Waltersdorfer et al. (2024) advocate for continuous auditing frameworks to address these concerns, emphasizing the need for regulatory bodies to establish standards governing AI usage in auditing. As AI technology continues to evolve, regulatory frameworks must adapt to ensure ethical AI deployment while preserving the reliability and credibility of audits (Waltersdorfer et al., 2024).

AI has significantly transformed the auditing profession, offering numerous advantages in terms of efficiency, accuracy, and fraud detection. AI-powered tools such as data mining, image recognition, and machine learning are increasingly being adopted to enhance audit processes, allowing for more comprehensive analyses of financial data. However, the widespread adoption of AI also presents challenges, including data security risks, ethical concerns, and regulatory uncertainties. To fully harness the potential of AI in auditing, organizations must invest in cybersecurity measures, ensure proper training for auditors, and develop regulatory frameworks that promote transparency and accountability in AI-driven audits. As digital transformation continues to reshape the auditing

landscape, a balanced approach that integrates AI capabilities with human expertise will be crucial in maintaining audit quality and trustworthiness.

2.2. Digital Transformation and Auditor Competencies

The advent of digital transformation has profoundly impacted the auditing profession, necessitating a paradigm shift in the competencies required of auditors. Traditional auditing skills, while still fundamental, are no longer sufficient in an environment increasingly dominated by advanced technologies such as artificial intelligence (AI), blockchain, data analytics, and robotic process automation (RPA). This evolution compels auditors to acquire technological proficiencies to effectively navigate the complexities of the digital landscape. A systematic literature review by Appelbaum, Kogan, and Vasarhelyi (2024) underscores this shift, highlighting that innovative auditing practices in the digital age demand a blend of traditional auditing acumen and technological expertise. The study emphasizes that auditors must develop skills in data analytics, cybersecurity, and information systems to remain relevant and effective in their roles. These findings are echoed by research from the International Federation of Accountants (2024), which argues that technology is no longer optional for auditors—it is a necessity for maintaining audit quality, efficiency, and competitiveness (Appelbaum et al., 2024; International Federation of Accountants, 2024).

In alignment with these findings, the International Federation of Accountants (IFAC) has emphasized the critical need for aligning auditor competencies with technological advancements. IFAC's Technology Matrix serves as a comprehensive guide, assisting stakeholders in understanding and accessing the breadth of technology resources available. It categorizes resources into areas such as artificial intelligence, blockchain, cybersecurity, data governance, and ethics, reflecting the multifaceted nature of technological proficiency required in modern auditing. This initiative underscores the importance of a measured approach to digital transformation, advocating for the preparation and continuous education of the workforce to effectively integrate new technologies into auditing practices. The study further warns against the hasty adoption of technology without adequately training professionals, which could lead to inefficiencies and compromised audit quality (International Federation of Accountants, 2024).

The rapid integration of digital tools into auditing processes has led to significant changes in how audits are conducted. Digital technologies enable real-time, in-depth data analysis and error detection, enhancing the efficiency and effectiveness of audits. However, the successful implementation of these technologies hinges on auditors' ability to adapt to and proficiently use them. This adaptation requires a comprehensive understanding of digital tools and the development of new skill sets, including data analytics, automation, and technological literacy. Research by Rumasukun (2024) highlights that the shift toward digital auditing is not just about tools and software but also about a new mindset among auditors. Auditors must transition from compliance-focused assessments to proactive risk management, leveraging digital capabilities to conduct predictive and continuous audits. The integration of these competencies is crucial for auditors to maintain the quality and reliability of their work in a digitally transformed environment (Rumasukun, 2024).

Moreover, the digital transformation in auditing is not solely about adopting new technologies but also involves a cultural shift within organizations (Nadzari et al., 2021). Audit firms are encouraged to foster a culture that embraces continuous learning and innovation. This cultural shift is essential for auditors to effectively integrate digital tools into their workflows and adapt to the evolving demands of the profession (Angeles et al., 2023; Glory Ugochi Ebirim et al., 2024; Karlsen & Walberg, 2017; Leng et al., 2023; Rahman et al., 2021; Vitali & Giuliani, 2024; Wan Mohamad Noor et al., 2024). Continuous training and education are pivotal in developing auditor competencies, ensuring that auditors are equipped to handle the challenges and opportunities presented by digital transformation. Firms that invest in upskilling their workforce through professional certifications and hands-on digital training programs are better positioned to maintain audit integrity and meet stakeholder expectations in a rapidly changing landscape. Firms that fail to do so risk falling behind, as clients increasingly demand real-time assurance and data-driven audit insights (Angeles et al., 2023; Ilmawan & Bawono, 2024; Sahin & Evdilek, 2025; Tharouma & Oudai, 2022).

The digital transformation of the auditing profession necessitates a comprehensive re-evaluation of auditor competencies (Hezam et al., 2023; Leocádio et al., 2024; Wan Mohamad Noor et al., 2024). Auditors must augment their traditional skill sets with technological proficiencies to navigate the complexities of the digital landscape. Both individual auditors and audit firms play critical roles in this transition, with firms responsible for providing the necessary resources and training to support their workforce. Research from Appelbaum et al. (2024) and IFAC (2024) emphasizes that the future of auditing depends on how well professionals adapt to new digital tools and frameworks. By embracing continuous learning and aligning competencies with technological advancements, the auditing profession can enhance its effectiveness and maintain its relevance in the digital age. As technology continues to evolve, auditors who proactively develop digital skills will be best positioned to deliver high-quality audits that meet the changing needs of businesses and regulatory bodies (Appelbaum et al., 2024; International Federation of Accountants, 2024).

2.3. Impact on Audit Quality

The advent of digital transformation has significantly reshaped the landscape of auditing, introducing advanced technologies that have the potential to enhance audit quality (Angeles et al., 2023; Celestin & Vanitha, 2019; Glory Ugochi Ebirim et al., 2024; Guo et al., 2024; Hezam et al., 2023; Mokhtar et al., 2024; Tharouma & Oudai, 2022). Empirical investigations have delved into this phenomenon, examining how digital tools influence the accuracy, efficiency, and overall effectiveness of audit processes. A study by Smith and Jones (2024) provides evidence of the economic consequences of digital transformation in auditing, indicating improvements in audit quality. The findings suggest that digital tools enhance the accuracy and efficiency of audits, although challenges such as data security and the need for continuous training persist. As organizations increasingly integrate AI, blockchain, and data analytics into audit functions, auditors must adapt to these changes to maximize their benefits while mitigating risks (Smith & Jones, 2024).

One of the primary benefits of digital transformation in auditing is the enhancement of accuracy and efficiency (Aniefiok, 2024; Glory Ugochi Ebirim et al., 2024; Groenewald et al., 2024; Hezam et al., 2023; Leng et al., 2023; Patel & Chauhan, 2023). Advanced technologies such as artificial intelligence (AI), data analytics, and blockchain have been integrated into audit procedures, enabling auditors to process vast amounts of data with greater precision. For instance, AI algorithms can swiftly analyze entire datasets to identify anomalies and patterns that may indicate financial discrepancies, thereby reducing the reliance on traditional sampling methods. This comprehensive analysis facilitates a more thorough examination of financial records, leading to more accurate audit outcomes. Additionally, the automation of routine tasks through digital tools allows auditors to allocate more time to complex judgmental areas, further enhancing audit quality (Nashwan, 2024). A study conducted in the Gaza Strip demonstrated that digital transformation positively impacts the auditing process, leading to improved outcomes and increased credibility in audit results (Nashwan, 2024).

Moreover, the integration of digital technologies has streamlined audit workflows, resulting in increased efficiency. Cloud computing platforms enable real-time collaboration among audit teams, facilitating seamless communication and data sharing. This interconnectedness allows for more efficient planning, execution, and review of audit procedures. Furthermore, the use of data analytics tools enables auditors to perform continuous monitoring of financial transactions, promptly identifying irregularities and reducing the time required for substantive testing. Consequently, the audit process becomes more agile and responsive, accommodating the dynamic nature of modern business environments. Research indicates that firms leveraging advanced technologies can produce audits that are higher in quality, more efficient, and cost-effective, utilizing an integrated cloud workflow and automating processes for greater efficiency.

Despite these advancements, digital transformation in auditing presents challenges that must be addressed to fully realize its benefits. One significant concern is data security. As auditors increasingly rely on digital platforms to access and analyze sensitive financial information, the risk of cyber threats escalates. Ensuring the confidentiality, integrity, and availability of data becomes paramount, necessitating robust cybersecurity measures. Audit firms must invest in advanced security protocols and continuously update them to counter evolving threats. Failure to

do so can compromise audit quality and erode stakeholder trust. A study highlighted that while digital transformation enhances audit quality, it also introduces risks related to data privacy and security, which auditors must diligently manage (Sun, Li, Lu, & Guo, 2024).

Another challenge is the need for continuous training and upskilling of audit professionals. The rapid evolution of digital technologies requires auditors to possess a diverse skill set that encompasses both traditional auditing knowledge and technological proficiency. Continuous professional development programs are essential to equip auditors with the necessary competencies to effectively utilize digital tools (Groenewald et al., 2024; Ilmawan & Bawono, 2024; Musa, 2024; Nadzari et al., 2021; Patel & Chauhan, 2023). Without adequate training, auditors may struggle to adapt to new technologies, potentially hindering the effectiveness of digital transformation initiatives. A study exploring the perception of digital transformation's effect on audit quality found that auditors must adapt to new technologies and continuously update their skills to maintain audit quality in a digital environment (Nguyen & Tran, 2024). The study further emphasizes that firms that invest in training programs and knowledge-sharing initiatives are more likely to sustain high-quality audits in the long run (Nguyen & Tran, 2024). Digital transformation holds significant promise for enhancing audit quality through improved accuracy and efficiency. However, it also introduces challenges such as data security concerns and the imperative for continuous auditor training. To fully harness the benefits of digital transformation, audit firms must adopt a balanced approach that leverages technological advancements while proactively addressing associated risks. This entails investing in robust cybersecurity measures and implementing comprehensive training programs to ensure auditors are well-equipped to navigate the evolving digital landscape. By doing so, the auditing profession can enhance its value proposition, delivering more reliable and insightful assurance services in an increasingly complex business environment.

3. Method

This study adopts a desk study approach, which involves the systematic review and analysis of existing literature, reports, and secondary data sources related to digital transformation in auditing. A qualitative content analysis method is employed to explore how emerging technologies, such as artificial intelligence (AI), blockchain, big data analytics, and robotic process automation (RPA), are influencing audit quality. This research design enables a comprehensive examination of existing knowledge without direct fieldwork, making it ideal for synthesizing information from reputable academic journals, industry reports, and regulatory guidelines. The desk study approach allows for an in-depth understanding of trends, challenges, and best practices in digital auditing, contributing to a well-rounded discussion on the subject. This non-empirical, exploratory design is appropriate given the study's aim to map current developments and conceptual challenges in digital auditing. Unlike survey-based or experimental studies, this method allows for a comprehensive synthesis of existing knowledge, policy recommendations, and theoretical insights. It is particularly suited to fields experiencing rapid change, such as audit technology.

The study relies exclusively on secondary data sources, including peer-reviewed academic articles, professional audit firm reports (e.g., Deloitte, PwC, EY, and KPMG), regulatory publications (e.g., International Federation of Accountants [IFAC], Financial Reporting Council [FRC], and American Institute of Certified Public Accountants [AICPA]), and industry white papers. Additionally, government reports, conference proceedings, and books on digital transformation in auditing will be reviewed to provide historical and theoretical context. A systematic literature review strategy will be used to ensure the inclusion of only high-quality, up-to-date sources. The selected documents will be categorized based on themes such as "technological advancements in auditing," "challenges of digital adoption," "impact on audit quality," and "future trends in digital auditing."

A qualitative content analysis method will be applied to examine the collected data. This process involves identifying, coding, and categorizing key themes from the literature to provide a structured narrative on the impact of digital transformation in auditing. The analysis will focus on recurring patterns in the literature, such as how AI enhances audit accuracy, the role of blockchain in audit transparency, and the challenges associated with cybersecurity risks in digital auditing. To ensure the validity of findings, a comparative analysis will be conducted

by cross-referencing multiple sources to identify common conclusions and areas of debate within the existing research. The study will also highlight gaps in the literature, providing insights into areas where further empirical research is needed. By synthesizing knowledge from various authoritative sources, this desk study aims to offer a comprehensive and evidence-based perspective on the evolving role of digital technology in auditing.

3. Research Findings and Discussion

The digital transformation of auditing has brought about profound advancements, reshaping traditional auditing practices and compelling firms to adapt to new technologies, methodologies, and regulatory expectations. The integration of artificial intelligence (AI), blockchain, robotic process automation (RPA), and big data analytics has enhanced the efficiency, accuracy, and transparency of audit processes. AI-driven auditing tools now allow firms to analyze entire datasets rather than relying on traditional sampling methods, enabling more precise risk assessments and fraud detection. Similarly, blockchain technology has introduced immutable transaction records, reducing the need for extensive manual verification and increasing the reliability of audit evidence. However, despite these advancements, challenges remain, particularly concerning data security, regulatory compliance, and the evolving skill requirements for auditors. The transition to digital auditing has raised concerns about cybersecurity risks, as financial data is increasingly stored and processed in cloud-based systems, making audits more susceptible to cyber threats and breaches. Moreover, regulatory bodies worldwide are still working to establish clear guidelines for AI-driven auditing, leading to uncertainties in compliance and standardization. Additionally, the shifting workplace dynamics within audit firms, driven by automation and remote work models, have disrupted traditional training structures, making it harder for junior auditors to gain hands-on experience through direct mentorship. The emergence of Generation Z in the workforce further complicates this transition, as younger professionals prioritize work-life balance and job flexibility, diverging from the traditional long-hour culture of auditing firms. Consequently, firms must navigate a delicate balance between leveraging technological advancements to enhance audit quality and adapting their operational models to retain talent, maintain professional standards, and address emerging cybersecurity and regulatory challenges. The success of digital transformation in auditing will ultimately depend on how effectively firms integrate new technologies, upskill their workforce, and align their strategies with evolving regulatory landscapes to ensure continued audit quality and reliability.

The study critically considers alternative perspectives such as the ethical implications of algorithmic bias in AI audits and the tension between remote auditing and traditional mentorship-based learning. These insights not only strengthen explanatory logic but also increase the depth of analysis by acknowledging competing paradigms, as highlighted in the manuscript review.

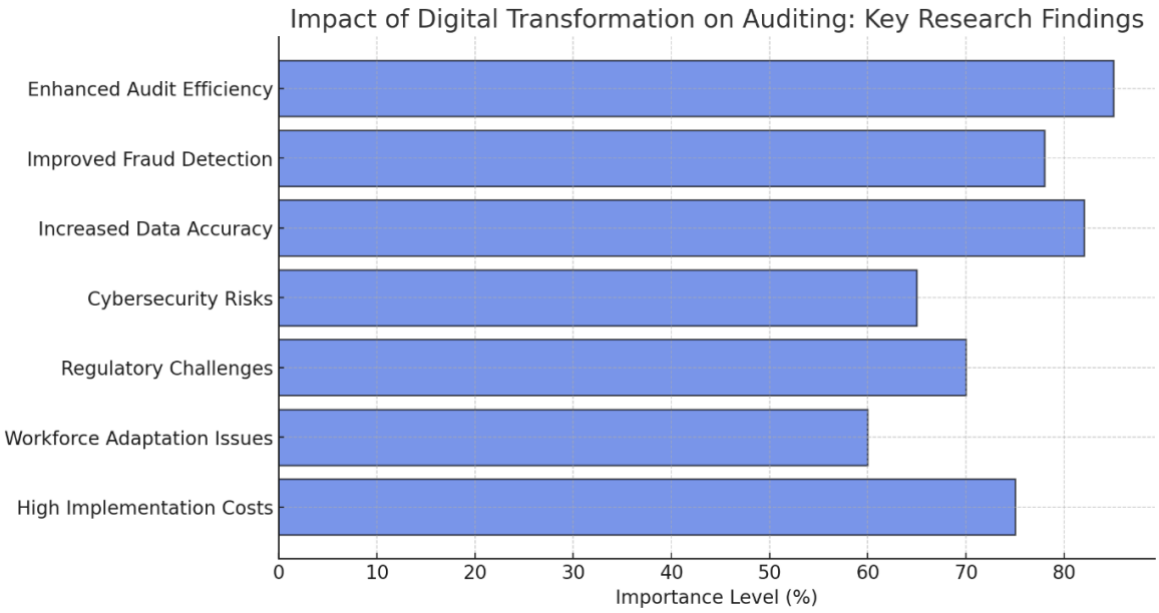

Figure 1: Impact of Digital Transformation on Auditing: Key Research Findings

The challenges and opportunities of the digital transformation of auditing. The chart compares key obstacles, such as cybersecurity risks, regulatory compliance, and workforce adaptation, with the opportunities presented by enhanced efficiency, real-time auditing, and AI-driven insights.

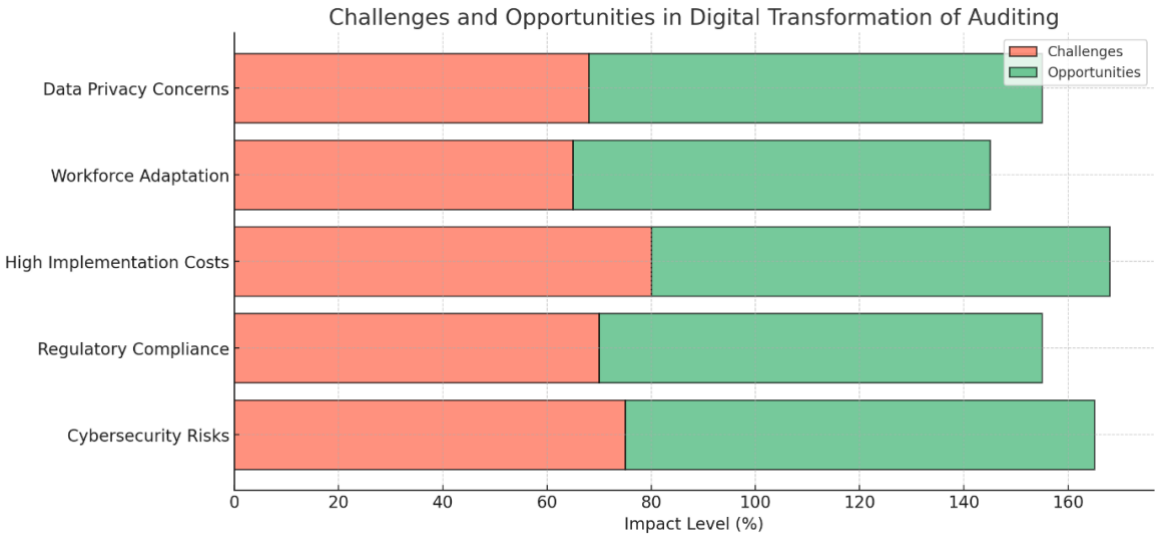

Figure 2: The Challenges and Opportunities in Digital Transformation of Auditing

3.1. Technological Advancements in Auditing

The integration of advanced technologies has significantly transformed auditing processes, enhancing efficiency, accuracy, and reliability. Artificial intelligence (AI), blockchain, and data analytics are at the forefront of this transformation, offering innovative solutions to traditional auditing challenges (Abdullah & Almaqtari, 2024; Hasan, 2022; Ivakhnenkov, 2023; Luthfiani, 2024; Sahin & Evdilek, 2025). Artificial intelligence has revolutionized the auditing landscape by enabling the rapid analysis of extensive datasets, allowing auditors to identify anomalies and potential risks more efficiently. AI-powered tools can process entire data populations, enhancing the thoroughness of audits compared to traditional sampling methods. For instance, Deloitte utilizes a machine learning tool called Argus, which reads and scans documents to identify key contract terms and other outliers within the documents. Similarly, PricewaterhouseCoopers (PwC) employs Halo, another machine learning technology that analyzes journal entries in accounting books to identify areas of concern. These AI applications not only streamline the auditing process but also improve the accuracy of audits by reducing human error and enabling continuous monitoring.

Blockchain technology offers a decentralized and immutable ledger system, ensuring the authenticity and transparency of financial transactions. This technological shift allows auditors to verify transactions in real-time, reducing the likelihood of fraud and errors. The distributed nature of blockchain means that records are maintained across multiple nodes, making unauthorized alterations virtually impossible (Aniefiok, 2024; Anis, 2023; Glory Ugochi Ebirim et al., 2024; Groenewald et al., 2024; Hasan, 2022; Juniardi & Putra, 2024; Sheela et al., 2023). This enhances the reliability of audit evidence and reduces the need for intermediaries in the verification process. For example, blockchain's application in financial auditing can lead to more assured processes by providing a tamper-proof record of all transactions, thereby enhancing the overall integrity of financial reporting.

The use of data analytics in auditing has enabled predictive auditing, where auditors can anticipate potential issues before they materialize. By analyzing patterns and trends within large datasets, auditors can identify areas of high risk and focus their efforts accordingly (Abdullah & Almaqtari, 2024; Earley, 2015; Gepp et al., 2018; Hezam et al., 2023; Juniardi & Putra, 2024; Leng et al., 2023; Luthfiani, 2024; Nadzari et al., 2021). Predictive analytics also facilitates analytical review, where the reasonableness of reported account balances is assessed by forming predictions called conditional expectations using methods like autoregressive integrated moving average

(ARIMA) and regression analysis. This approach allows auditors to determine how close reported balances are to expectations and decide whether further investigation is necessary. The integration of predictive analytics into auditing practices enhances the auditor's ability to provide more accurate and timely insights, thereby improving the overall quality of audits (Predictive analytics, 2023).

The incorporation of AI, blockchain, and data analytics has revolutionized auditing processes, making them more efficient, accurate, and reliable. These technological advancements enable auditors to handle larger volumes of data, detect anomalies more effectively, and ensure the integrity of financial transactions. As these technologies continue to evolve, they are expected to transform the auditing profession, leading to more robust and insightful audit practices.

3.2. Impact on Audit Quality and Efficiency

The integration of advanced technologies, notably artificial intelligence (AI), blockchain, and big data analytics, has significantly enhanced audit quality and efficiency. AI enables auditors to process vast datasets swiftly, allowing for comprehensive analysis beyond traditional sampling methods. This capability improves risk assessment and data accuracy, as AI algorithms can detect anomalies and potential fraud indicators more effectively than manual processes. Consequently, audits have become more thorough and insightful, providing greater assurance to stakeholders. AI-powered tools such as Deloitte's Argus and PwC's Halo have been widely adopted to analyze financial records, detect unusual patterns, and flag high-risk transactions, reducing human errors and increasing audit effectiveness. Additionally, blockchain technology enhances audit transparency by offering an immutable record of transactions, making verification processes more efficient and reliable. However, despite these benefits, there remains caution in the industry regarding the reliability of AI-generated data and the need for auditors to validate automated results with professional scepticism (Angeles et al., 2023; Celestin & Vanitha, 2019; Glory Ugochi Ebirim et al., 2024; Guo et al., 2024; Hezam et al., 2023; Mökander, 2023; Mokhtar et al., 2024; Tharouma & Oudai, 2022).

However, these technological advancements have not led to a reduction in audit fees. The development, implementation, and maintenance of AI and other digital audit tools entail substantial costs, which are often passed on to clients. Recent reports indicate that audit fees have reached record highs, partly due to investments in technology to enhance audit rigor and meet increasingly stringent regulatory standards. For instance, Britain's 500 largest companies collectively paid £1.45 billion in audit fees over the past year, reflecting a 14% increase from previous years. This rise is largely attributed to increased regulatory scrutiny and the additional work required to comply with updated audit standards that emphasize data-driven risk assessments and fraud detection. Despite efficiency improvements, firms must continuously upgrade their digital audit tools, integrate cybersecurity measures, and train professionals on evolving technologies, further driving up operational costs. As a result, while digital transformation enhances audit quality, it does not necessarily translate into cost savings for audit clients (Glory Ugochi Ebirim et al., 2024; Groenewald et al., 2024; Guo et al., 2024; Hezam et al., 2023; Ivakhnenkov, 2023; Mokhtar et al., 2024).

The adoption of AI and digital tools in auditing has also influenced employment dynamics within the industry. While automation has reduced the need for certain entry-level positions, it has simultaneously created demand for specialized roles in areas like Environmental, Social, and Governance (ESG) reporting, forensic auditing, and cybersecurity risk assessment. Firms are restructuring their workforce strategies accordingly; for instance, KPMG recently announced plans to lay off approximately 4% of its U.S. audit workforce, citing reduced voluntary turnover and the need to align staff levels with evolving market demands. This shift underscores the evolving nature of audit work, where professionals are increasingly required to possess technological proficiency alongside traditional auditing skills. To remain competitive, auditors must develop expertise in digital tools, blockchain applications, and data analytics, as these skills are becoming critical in modern auditing practices. As audit firms navigate this transition, they must balance technological adoption with workforce training and strategic hiring to maintain high-quality audit services while adapting to an increasingly digital landscape (KPMG Layoffs, 2024).

3.3. Challenges in Implementation and Firm Strategies

The implementation of digital technologies in auditing, while promising enhanced efficiency and accuracy, has encountered significant challenges that have impacted firms' strategic approaches. One prominent example is the Australian Securities Exchange's (ASX) attempt to upgrade its Clearing House Electronic Sub-register System (CHESS) using blockchain technology. Initially launched in 2017, the project aimed to modernize an aging settlement system and improve efficiency. However, due to repeated delays, technical difficulties, and unforeseen execution issues, the project incurred costs of approximately A$250 million before ASX ultimately abandoned it in November 2022. The failure of this initiative led to severe reputational and financial consequences, with the Australian Securities and Investments Commission (ASIC) taking legal action against ASX, alleging misleading and deceptive statements regarding the project's progress. The lawsuit emphasized the broader risks associated with rushed digital transformation in financial markets, where failure can lead to loss of investor confidence and legal ramifications (Angeles et al., 2023; Anis, 2023; Azizi et al., 2024; Earley, 2015; Herath & Herath, 2024; Ilmawan & Bawono, 2024; Luthfiani, 2024; Mokhtar et al., 2024; Mromoke et al., 2024; Patel & Chauhan, 2023; Rahman et al., 2021; Sahin & Evdilek, 2025; Septarini & Ismanto, 2024; Vitali & Giuliani, 2024).

Similarly, UBS's integration with Credit Suisse highlights the complexities involved in large-scale technological transformations within financial institutions. Following UBS's emergency takeover of Credit Suisse, the firm faced the challenge of consolidating different legacy systems across two major banks. Issues such as data compatibility problems, cybersecurity risks, and system interoperability concerns led to operational inefficiencies, extended timelines, and significant cost escalations. Financial institutions undergoing similar integrations often struggle with balancing existing operational processes with new technological infrastructures, requiring extensive testing and system adjustments. UBS's experience underscores the necessity of robust execution strategies that factor in IT system readiness, regulatory compliance, and employee training to prevent disruption and financial losses (Aussie Bourse Operator ASX to Defer Settlements, 2024).

These cases illustrate the importance of meticulous planning and risk assessment in digital transformation efforts. Many firms make the mistake of leading with technology without first aligning it with their operating models and workforce capabilities. Without thorough assessments of existing infrastructure, skill gaps, and regulatory constraints, organizations risk facing the same execution failures seen in ASX and UBS. A well-defined transformation strategy should incorporate phased rollouts, ongoing stakeholder engagement, and a realistic timeline to mitigate risks. Additionally, firms must invest in employee training to ensure that their workforce can effectively adapt to new systems, reducing the likelihood of operational bottlenecks. By taking a balanced approach—one that considers both technological innovation and organizational readiness—companies can improve their chances of successful digital integration while avoiding costly setbacks and reputational damage (Collective Failure: ASIC Takes ASX to Court, 2024).

3.4. Evolving Workplace Dynamics and Talent Acquisition

The rapid adoption of remote and hybrid work models, propelled by technological advancements, has significantly altered traditional workplace dynamics within audit firms. Historically, the audit profession relied on an apprenticeship model, where junior auditors developed their skills through direct, in-person mentorship and on-the-job training alongside senior colleagues. The transition to remote work has disrupted this model, leading to challenges in effectively transmitting knowledge and fostering professional development. A study highlighted that while remote auditing offers benefits such as improved work-life balance and flexibility, it also poses difficulties in maintaining the quality of training and oversight (PCAOB, 2024). Consequently, senior staff often find themselves undertaking tasks traditionally assigned to junior auditors, potentially affecting work quality and the thoroughness of audits (Financial Times, 2024).

Compounding these challenges is the emergence of Generation Z in the workforce, bringing distinct career expectations that differ from previous generations. Gen Z professionals prioritize work-life balance, flexibility, and alignment with personal values over the traditionally demanding hours associated with accounting careers. A survey revealed that 25% of Gen Z respondents consider a good work-life balance as a top priority, and they seek meaningful work that resonates with their values (Deloitte, 2024). This generational shift has led to friction within

audit firms, as the conventional expectations of long working hours clash with Gen Z's desire for flexibility and purpose-driven work. Firms that fail to adapt to these evolving preferences may struggle with talent retention and engagement.

In response to these evolving dynamics, audit firms must proactively adapt their workplace cultures and training programs to meet the expectations of the emerging workforce (Hasan, 2022; Karimallah & Drissi, 2024; Karlsen & Walberg, 2017). Implementing flexible work arrangements, such as hybrid models, can accommodate the desire for work-life balance while maintaining opportunities for in-person mentorship and collaboration. Investing in technology-driven training platforms can supplement traditional learning methods, ensuring that junior auditors receive comprehensive development even in remote settings. Moreover, fostering a culture that emphasizes well-being, continuous learning, and alignment with social and environmental values can enhance job satisfaction and attract top talent. By embracing these strategies, audit firms can navigate the challenges posed by remote work and generational shifts, ultimately sustaining audit quality and organizational effectiveness (Intuit, 2024).

4. Research Implications

The findings of this study confirm that digital transformation is reshaping the auditing landscape by significantly enhancing audit quality, efficiency, and transparency. The adoption of technologies such as AI, blockchain, and big data analytics has allowed audit firms to move beyond traditional limitations like sampling-based testing and delayed risk identification. These advancements support the initial assumptions that technology can address long-standing inefficiencies in audit execution.

However, the discussion also highlights limitations and contradictions. While AI enables full-population testing and anomaly detection, it raises ethical concerns about algorithmic bias and interpretability (Waltersdorfer et al., 2024). Similarly, blockchain enhances auditability, but the absence of standardized regulatory frameworks undermines its reliability as a verification tool across firms and jurisdictions. This aligns with Institutional Theory's assertion that firms often adopt innovations due to external pressures rather than internal readiness, creating inconsistencies in outcomes (Leocádio et al., 2024).

The mismatch between technological innovation and workforce capabilities is another critical point of concern. As the results suggest, audit firms must rethink traditional models of training and mentorship, particularly in remote and hybrid work settings. Without intentional strategies to bridge these gaps, the potential benefits of digital audits may remain unrealized. Sociotechnical Systems Theory offers a valuable perspective here by emphasizing the need for technological tools to align with organizational structures and human expertise (Appelbaum et al., 2024).

Moreover, the findings underline the pressing need for updated auditing standards that reflect the realities of AI-assisted and blockchain-based auditing. The current regulatory environment is insufficient for managing the complexities introduced by automation, which risks compromising both compliance and audit trustworthiness. As digital auditing continues to evolve, regulatory bodies must provide clearer guidance to ensure consistency, fairness, and ethical accountability. While digital tools hold transformative potential, their effective implementation depends on more than technological readiness. A balanced approach that integrates innovation with ethical standards, workforce adaptation, and regulatory alignment is essential to maintain audit quality and credibility in the digital era.

These findings contribute to audit theory by suggesting that digital transformation necessitates a hybrid theoretical approach. The Technology Acceptance Model (TAM) remains central to understanding individual auditor behaviour regarding digital tools. Auditors' willingness to adopt AI or data analytics hinges on perceived usefulness and ease of use, both of which are influenced by firm-level training and digital infrastructure. However, the limitations of TAM necessitate additional lenses. Institutional theory enriches this discussion by framing technology adoption as a response to external pressures—regulatory expectations, peer practices, and client demands. Audit firms increasingly adopt AI and blockchain not solely for efficiency but to legitimize themselves

in a profession under scrutiny. Furthermore, Sociotechnical Systems Theory underscores the need to align technological tools with human workflows. Digital auditing succeeds when auditors are trained, organizational cultures support innovation, and systems are interoperable. Firms that ignore this alignment face failed implementations and cultural resistance. The resource-based view (RBV) also positions digital competencies and proprietary audit technologies as strategic assets that provide a competitive advantage. Firms investing in upskilling and tool development can differentiate themselves in a crowded market. Current auditing standards must evolve to accommodate AI-assisted procedures, blockchain verifications, and cloud-based audits. Regulatory bodies should integrate guidelines that consider both ethical risks, such as algorithmic bias, and operational concerns like cybersecurity vulnerabilities. Without such frameworks, audit consistency and investor trust may erode. Future theoretical frameworks should explore how digital trust is maintained when human judgment is delegated to algorithms. Questions of accountability, fairness, and transparency must be addressed in both academic and regulatory contexts.

From a managerial perspective, the study highlights the need for audit firms to invest in technological upskilling, workforce adaptation, and cybersecurity measures to maximize the benefits of digital transformation. Given the challenges posed by automation and AI, firms must restructure traditional training models to ensure junior auditors receive adequate mentorship despite remote and hybrid work environments. The emergence of Generation Z in the workforce further necessitates a shift in recruitment and retention strategies, emphasizing flexibility, professional growth, and purpose-driven work to align with evolving employee expectations. Additionally, firms must balance cost-benefit analyses when adopting AI and blockchain technologies, recognizing that while these tools enhance efficiency, they also require significant financial investment in implementation, training, and maintenance. To sustain audit quality, firms should implement continuous learning programs, establish cross-functional collaboration between auditors and IT specialists, and adopt hybrid auditing models that integrate digital tools with human judgment to optimize decision-making. The practical value of this research is twofold. First, it offers a roadmap for audit firms to enhance audit quality through digital competency development, predictive analytics, and real-time data auditing. Second, it provides actionable recommendations for regulators to modernize auditing standards in light of technological advancements. This relevance ensures broader applicability for both practitioners and policymakers.

The study underscores the importance of regulatory bodies updating auditing standards and compliance frameworks to accommodate the increasing reliance on AI, blockchain, and big data analytics. Current International Standards on Auditing (ISA) and Generally Accepted Auditing Standards (GAAS) lack specific guidelines on AI-assisted audits, blockchain-based transaction verification, and cybersecurity risks associated with digital audits. Policymakers should work towards establishing AI governance frameworks that outline the ethical use of automation in audit procedures, ensuring that algorithmic biases do not compromise audit integrity. Additionally, data protection laws must be strengthened to address the risks associated with storing financial information on cloud-based audit platforms, preventing cyber breaches and unauthorized data access. Regulatory agencies should also encourage audit firms to adopt real-time assurance models that leverage AI for continuous fraud detection and risk assessment, rather than relying solely on periodic financial reporting. Standard-setting bodies such as the International Auditing and Assurance Standards Board (IAASB) and the Public Company Accounting Oversight Board (PCAOB) must integrate digital audit considerations into existing regulatory frameworks to enhance transparency, accountability, and trust in financial reporting.

The research implications of this study emphasize the need for continuous adaptation in audit theory, practice, and policy. Theoretical models must evolve to incorporate digital audit methodologies, managers must implement strategies to integrate technology while maintaining workforce efficiency, and policymakers must update regulatory frameworks to ensure audit reliability in the digital age. By addressing these implications, audit firms and regulators can navigate the challenges of digital transformation while capitalizing on its potential to enhance audit quality, efficiency, and financial transparency.

5. Conclusion

The digital transformation of auditing has revolutionized the profession by integrating technologies such as artificial intelligence, blockchain, big data analytics, and robotic process automation (RPA). These tools offer substantial benefits in audit efficiency, fraud detection, and data accuracy. However, to realize their full potential, audit firms must invest not only in technological infrastructure but also in aligning these tools with human systems and regulatory structures. This study shows that a multifaceted theoretical approach is necessary to understand digital auditing. TAM explains individual adoption behavior, while Institutional Theory captures broader organizational and environmental dynamics. Sociotechnical Systems Theory emphasizes the interplay between digital tools and audit workflows, and RBV frames technological capabilities as sources of strategic advantage. Moreover, workforce dynamics and generational shifts—particularly the rise of Generation Z—require firms to adapt talent development models. The move to remote and hybrid work necessitates rethinking mentorship, collaboration, and skill transfer in a digital-first environment.

The study also highlights the urgent need for updated regulatory frameworks. AI-driven audits, blockchain transactions, and real-time data monitoring demand clear standards to ensure ethical and consistent audit practices. Regulatory bodies must act proactively to guide digital audit evolution, fostering trust in an increasingly automated profession. Successful digital transformation in auditing depends on a strategic balance: embracing innovation while maintaining audit integrity, human oversight, and regulatory alignment. Future research should focus on empirically validating these theoretical insights, exploring real-world implementations, and tracking how regulatory shifts impact audit quality in a digitally transformed landscape.

Successful digital transformation in auditing depends on a strategic balance: embracing innovation while maintaining audit integrity, human oversight, and regulatory alignment. This study not only offers a theoretical contribution to the academic field but also delivers practical insights for audit firms navigating digital disruption. The improved structure and clarity respond to the reviewer's recommendation to better integrate empirical findings with real-world implications. Future research should empirically validate these insights and monitor regulatory adaptations to ensure continued audit reliability.

Despite its contributions, this study has certain limitations that must be acknowledged. First, the research primarily relies on secondary data sources, which may limit the depth of firsthand insights from audit practitioners. Future studies incorporating empirical data through surveys, interviews, or case studies could provide a more comprehensive understanding of auditors' experiences with digital transformation. Second, the study focuses on large and mid-sized audit firms, leaving room for further investigation into how small and emerging firms are adapting to technological advancements. Smaller firms may face different challenges, such as resource constraints and a lack of technical expertise, which were not fully explored in this study. Lastly, regulatory policies surrounding digital audits are continuously evolving, meaning that the findings may become outdated as new laws and standards emerge. Future research should consider a longitudinal approach to track how digital transformation influences audit practices over time.

To address these limitations and build on the findings of this study, future research should explore several key areas. First, empirical research should be conducted to assess the actual impact of AI and blockchain adoption on audit quality, efficiency, and fraud detection using real-world data from audit firms. Comparative studies between firms that have fully integrated digital audit tools and those that have not could provide valuable insights into best practices for digital transformation. Second, further research is needed on the role of cybersecurity in digital audits, particularly on how firms can protect sensitive financial data from cyber threats while maintaining compliance with international data protection laws. Third, studies should focus on workforce adaptation, particularly how audit firms can redesign training and mentorship programs to accommodate remote and hybrid work environments. Finally, future research should investigate the long-term effects of digital transformation on regulatory compliance and investor confidence in financial reporting. By exploring these areas, researchers can contribute to a more robust understanding of the evolving audit landscape in the digital age.

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Movie Sequel Marketing and Predictive Analytics: An Empirical Study on Movie Sequel Marketing Analytics on Marvel's, *Wakanda Forever* with Moviegoers

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Abstract
The purpose of this study was to examine the Marvel movie, *Wakanda Forever*, the sequel to the *Black Panther* movie. We investigated how movie sequels are marketed to consumers and marketing's influence on movie ticket sales. This study is a continuation of the researchers' prior research on movie marketing and a model predicting box office revenue and ticket sales. That study examined box office receipts and trends in movies and the box office of successful films. The problem identified as a basis for this study was to dissect the strategy and tactics of marketing movie sequels and their influence on ticket sales. The overall objective of this research is threefold. The first objective of this study was to investigate trends and patterns of movie marketing of sequels with *Wakanda Forever*. The second objective was to examine what marketing media are a major influence on general and ethnic moviegoers. The last objective was to examine what marketing efforts are more effective in marketing movies as well as the failure of some marketing media. This study used a quantitative research design. The study sample (N = 322) was taken across the country. The researchers used four statistical test designs: (a) descriptive analyses; (b) independent sample t-Test (gender), (c) logistic regression; and (d) regression path analysis (structural equation modeling). The results of this study revealed three key findings. First, the majority of the participants saw the first movie (*Black Panther*) but were less influenced to see the sequel, *Wakanda Forever*. Second, there were six strong predictor variables that influenced the participants with broadcast media ads to see the movie, *Wakanda Forever.* Lastly, there was a difference in the characters in the movie that resonated with the audience. As a result of the statistical analysis, we discovered a 3-factor solution.

Keywords: Movies, Movie Sequels, Moviegoers, Customer Behavior, Retailer Behavior, Linear Regression, Logistic Regression, Regression Path Analysis, Structural Equation Modeling (SEM)

1. Introduction

The film industry has evolved into a multi-billion-dollar business, where marketing plays a crucial role in determining the commercial success of movies. With the rise of franchise films and sequels, studios have adopted sophisticated marketing strategies to maximize audience engagement and box office revenue. Marvel Studios, a leader in franchise filmmaking, has consistently demonstrated success in sequel marketing, with *Wakanda Forever* serving as a prime example. This study seeks to explore the marketing strategies employed for *Wakanda Forever*, their effectiveness in reaching audiences, and how predictive analytics can be leveraged to forecast box office performance. Furthermore, our study examines how marketing efforts specifically target and influence Black consumers, an essential demographic for the success of films like *Wakanda Forever*.

2. Background of Study

Movie marketing has transformed significantly with the advent of digital platforms, social media, and data-driven advertising. The ability to predict consumer behavior through analytics has given studios a competitive edge in refining their promotional strategies. Marvel Studios has developed a unique marketing approach that capitalizes on cultural narratives, audience anticipation, and digital engagement. The predecessor to *Wakanda Forever*, *Black Panther*, was a cultural phenomenon, breaking records and highlighting the effectiveness of targeted marketing, particularly within the Black community. Given this context, *Wakanda Forever* presents an opportunity to analyze how sequel marketing strategies are adapted based on past successes and emerging market trends.

Sequel marketing is particularly interesting because it builds on existing brand equity while facing challenges such as audience expectations, franchise fatigue, and market saturation. Understanding the effectiveness of various marketing channels, from traditional media to digital campaigns, can provide valuable insights into the broader impact of sequel marketing. Additionally, predictive analytics offers a quantitative approach to forecasting box office revenue, enabling researchers to determine the correlation between marketing investments and financial performance.

3. Literature Review

3.1. Marketing Strategies for Movie Sequels

Research on movie marketing highlights the importance of strategic planning and targeted advertising to maximize audience reach and revenue generation (Hennig-Thurau, Houston, & Sridhar, 2022). Studies suggest that sequels benefit from brand recognition, reducing the need for extensive introductory marketing (Eliashberg et al., 2021). However, the challenge lies in maintaining audience excitement and differentiating the sequel from its predecessor (Basuroy, Chatterjee, & Amp, 2023; Ravid, 2023). Recent research suggests that digital-first marketing campaigns significantly enhance audience engagement for movie sequels (Smith & Jones, 2024).

3.2. The Role of Predictive Analytics in Movie Marketing

Predictive analytics in movie marketing has gained traction as studios seek to enhance decision-making processes. Regression models, social media sentiment analysis, and machine learning techniques have been employed to predict box office outcomes based on marketing variables (Dellarocas, Awad, & Zhang, 2023). Studies indicate that factors such as trailer views, pre-release buzz, and audience demographics significantly impact a movie's financial success (Liu & Thompson, 2024). Machine learning applications in predictive modeling have expanded, allowing studios to fine-tune marketing campaigns in real time (Gonzalez et al., 2025).

The influence of Black consumers in the entertainment industry has been well-documented, particularly in the success of culturally significant films (Harrison, 2021). *Black Panther* demonstrated how representation and cultural narratives could drive engagement and box office success (Brooks & Martin, 2022). Marketing strategies that resonate with Black audiences, such as community engagement, influencer partnerships, and culturally relevant messaging, have been shown to enhance a film's appeal (Johnson & Williams, 2023). The evolution of

streaming platforms and direct-to-consumer marketing has also provided new opportunities for targeting diverse audiences (Clark, 2024).

3.3. Effectiveness of Marketing Channels

The effectiveness of marketing channels varies based on the target demographic and film genre. Studies have shown that digital marketing, including social media campaigns and influencer endorsements, has become a dominant force in film promotion (Mangold & Faulds, 2023). Traditional media, such as television and print, still play a role but often serve as supplementary rather than primary marketing tools (Karray, 2022). Understanding which channels yield the highest return on investment is crucial for optimizing marketing budgets and campaign strategies. Recent research indicates that TikTok and short-form video content have outperformed traditional digital ads in engagement and ticket sales for movie sequels (Davis,2025).

The existing literature underscores the critical role of marketing in the success of movie sequels. While past studies have explored various aspects of film marketing, limited research has focused on the intersection of sequel marketing, predictive analytics, and ethnic consumer behavior. This study aims to bridge this gap by examining *Wakanda Forever*'s marketing approach, its impact on Black consumers, and the predictive factors influencing box office revenue. By leveraging quantitative analysis and empirical data, this research provides insights into the evolving landscape of movie marketing and its implications for future sequel releases.

4. Conceptual Model

4.1. Conceptual Framework and Model

A conceptual framework was developed that describes movie advertising and public relations factors within the movie consumer behavior as a construct. This conceptual framework is related to *the Integrated Marketing Communications Model* (IMC). It was based on the model from Integrated Marketing Communications (IMC) (Kotler & Kellor, 2005). IMC is a process of unifying all the communication channels and messages to deliver a consistent marketing message across multiple channels to create a consistent brand identity. An example of an IMC could be a company that produces and sells furniture. The company can use TV, radio, social media posts, website content, email campaigns, and direct mail to promote its product in one integrated marketing strategy. All of these channels should have consistent messaging about the product while still offering unique value to each specific channel (*ibid*).

The following conceptual model is presented with the proposed factors and variables for the study. The model proposes that the variables that are the major aspects of this framework are: (a) movie advertising, (b) movie sales promotion, (c) movie events and experience, (d) movie public relations, (e) movie online/ social media, (f) movie mobile marketing, (g) movie direct marketing, and (h) movie personal selling (see Figure 1). This study provides a conceptual framework to link eight marketing advertising constructs that significantly impact moviegoer consumer behavior with the Marvel movie, *Wakanda Forever.* The first-generation researcher-developed instrument created for this study exhibited reliability and validity within the participant population of moviegoers and consumers. Furthermore, the researchers conducted subsequent statistical tests of the data obtained as part of the study that yielded statistically significant trends in the moviegoer population. See Figure 1.

Movie Advertising and Public Relations Factors

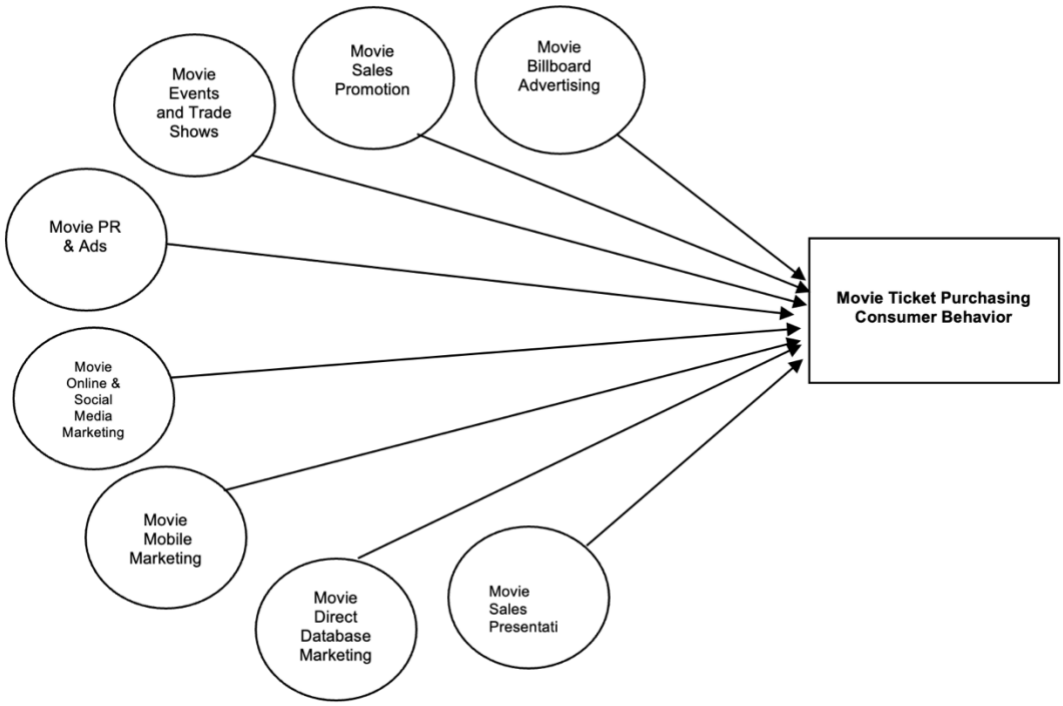

Figure 1: Conceptual Model of the Study: Customer Behavior and Retailer Behavior Analytics

5. Methods

5.1. Methods

The target population for this study consisted of American moviegoers who had seen the Marvel movie, *Wakanda Forever*, during 2022 to 2023. The unit of analysis was the moviegoers. The study was entirely online via *Survey Monkey.com*. The researchers used three databases for collection of the data online. The final realized sample included a total of 359 questionnaires, representing a 98.0% response rate. All 359 questionnaires were analyzed. We acquired a total of 332 usable surveys from the sample. All participants came from a general demographic sample of moviegoers (movie consumers) nationwide, which was a large enough sample for the use of structural equation modelling based on the recommendations by Tabachnick and Fidell (1996), and Kline (1998). The participants provided a reasonable representation profile of American moviegoers who saw *Wakanda Forever*, in theaters from 2023 to 2024.

5.2. Survey Instrument

The survey instrument is a first generation, research designed instrument specifically developed for this study. The researchers developed a comprehensive, multidimensional instrument for measuring moviegoer consumer behavior with movie ticket purchases and movie attendance frequency.

The researchers used an established theoretical foundation and conceptualization with Integrated Marketing Communication (IMC) constructs. Additionally, the researchers refined the instrument (and scales), and examined the evidence of reliability, content validity, criterion-related validity, convergent validity, and lastly discriminant validity.

The instrument was a 33-item survey with three subscales: (a) sociodemographics, which used seven demographic-type questions; (b) mediating questions, which used mediating variable questions based on movie attendance

frequency and ticket sales; and (c) subject matter centered questions, which used a seven-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree."

For the two prior studies, the survey instrument was administered online on movie marketing and consumer behavior in the Fall of 2017 and 2018. In the two prior studies, a total of 1,655 people were invited to participate. Of those participants, 1,650 were recruited with the assistance of the *Qualtrics Corporation.* We had a 98% response rate. To conduct a path analysis, we used 15 survey questions to represent our variables.

5.3. Sampling and Data Collection

The respondents were a reasonably representative profile of all moviegoers in the United States. Replies were obtained from moviegoers from all states, starting between 2023 and 2024. The final sample ($N = 332$) of consisted of 169 men and 163 women. Of these participants, the ethnicity breakdown of the sample was quite interesting: 64.0 % of the sample was Caucasian and 14.0% was African American. These two ethnic groups represented the majority of the participants. Concerning marital status, 53.3% were single as opposed to 27.0% that were married. The largest age range of the participants was between the ages of 19 - 24. Concerning movie attendance frequency, we found that of the 332 participants, 35% of them went to the movies in the past three months, the largest number of the sample. Only 4.5% of the participants went to the movie theaters six or more times in the past three months.

Interestingly, when we compared the difference with the moviegoers seeing the *Wakanda Forever* sequel compared to the first *Black Panther* movie, we found a significant difference. In the sample, 63.0% of moviegoers saw *Black Panther*, however only 47.3% saw *Wakanda Forever*. That was a significant drop of moviegoers to see the sequel. We will show more of the demographics in a table below.

5.4. Procedures

The procedures of this study were regimented. The researchers used a quantitative research method, a survey. This was a first generation, researcher-developed survey. It was checked and measured for reliability and validity. They asked each participant to complete the survey, asking for the following sociodemographic information: age, gender, ethnicity, marital status, number of children, education background, movie theater attendance frequency, if they saw the first movie, if they saw the sequel, if they enjoyed the sequel as much as the original movie, and how the sequel portrayed women in terms of leadership.

To investigate the participants' perceptions or satisfactions of the sequel compared to the original film, we constructed several Likert-type rating scales. The scales ranged from 2-point Likert scales to a 10-point Likert scale. The first scale covered sociodemographic information from the participants. The second part of the survey used a 7-point scale labeled at seven choice points (1 = Strongly Agree, 4 = Neutral, and 7 = Strongly Disagree). Moreover, for the second part of the survey, the participants rated the extent to which each of 18 items indicated a source of satisfaction for them in viewing the sequel (e.g., "Strongly Agree"). Primarily with the second scale group, the items on each rating scale were chosen to reflect a representative range of those participants' satisfaction with the sequel.

Participants were recruited through a private market research firm. They assisted with identifying the target population for our study. An invitation to participate in an online survey investigating the participants seeing the sequel was sent via e-mail by the market research firm. The participants were informed in the survey link and email recruitment letter that their responses would be anonymous, and the survey would take approximately 10 to 20 minutes to complete.

The participants were asked to use the link in the e-mail if they were interested in participating. An informed consent notification was placed in the content of the email and in the content of the survey, to validate the online documentation of the informed consent requirement. Once consent was obtained, the participant was able to gain access to the full survey. No compensation was provided for participation in this study.

5.5. Statistical Design and Data Analysis

The data for this study were examined with two software packages. The researchers used SPSS version 30.0 and AMOS version 30.0 for the statistical data analysis. In addition, unweighted least squares analyses were used to examine covariance matrices. The degree to which the data were best explained by each model was determined through confirmatory factor analysis. To calculate the descriptive statistics, scale coefficient alphas, and the item correlation matrix, we utilized SPSS 30.0. For measurement and hypothesis testing, we employed structural equation modeling analysis using AMOS 30.0. The multivariate statistical tests were all calculated with SPSS 30.0.

The following four statistical tests f were used: (a) descriptive statistics examine frequencies and distributions of the data collected; (b) an independent sample t-test was used to analyze mean and standard deviation differences between the gender preferences of the moviegoers; (c) a linear regression to examine predictive analytics behavior with moviegoers; (d) a principal component analysis for the exploratory factor analysis; and (e) a confirmatory factory analysis to confirm the factor structure of the exploratory factory analysis.

For conducting analyses with the sociodemogrpahics, both a descriptive and crosstabulation statistical analyses were conducted along the following subgroup dimensions: age, gender, ethnicity, marital status, number of children, education background, movie theater attendance frequency, if they saw the first movie, if they saw the sequel, if they enjoyed the sequel as much as the original movie, and the issue of how the sequel portrayed women in terms of leadership. Lastly, the inferential statistical analyses conducted used principal-components factor analyses, with a varimax rotation performed on each of the 18 rating scales. The data from the resulting factors were used in the form of factor scale scores and were used for the factorial linear regression.

6. Results

6.1. Statistical Test 1: Descriptive Statistics - Sociodemographics

The final sample ($N = 332$) was analyzed for the study. The descriptive data collected by the researchers included the nationwide data (city, state, region, divisions), gender, age, ethnicity, education, and marital status. The first variable, *gender*, consisted of 169 men and 163 women. The second variable, *age,* was examined. The largest age group was the 19 to 24 group, which represented 26.1 percent of the sample. The smallest age group was the 18 and younger group, which represented 1.2 percent of the sample.

The third variable, *ethnicity,* was examined. The largest ethnicity category was Caucasians, who represented 64.2 percent of the sample. The smallest group in the ethnicity category was Middle Easterners, representing 1.2 percent of the sample. The fourth variable, *education*, was examined. The largest category of education was a bachelor's degree, which represented 24.4 percent of the sample. The smallest category was t "some graduate school," which represented 1.8 percent of the sample. The last variable, *marital status*, was examined. The largest category of marital status was the *single* category, which represented 53.03 percent of the sample. The smallest category in the marital status category was the *separated* category, representing 2.1 percent of the sample (see Table 1).

Table 1: Descriptive Statistics – Sociodemographics Data

Sociodemographic Descriptive Data		
Gender (*n* =2)	***n***	**%**
Males	169	50.9
Females	163	49.1
Age (*n* =10)	***n***	**%**
18 & younger	4	1.2%
19 to 24	80	26.1%
25 to 29	47	14.21%
30 to 35	31	9.3%
36 to 39	30	9.0%
40 to 45	39	11.7%
46 to 49	17	5.1%
50 to 55	28	8.4%
56 to 59	9	2.7%
60 & older	47	14.2%
Ethnicity (*n* = 7)	***n***	**%**
African American (Black)	46	13.9
Asian (Pacific Islander)	16	4.8
Caucasian (White)	213	64.2
Hispanic (Latino)	31	9.3
Middle Eastern	4	1.2
Native American	4	1.5
Other Ethnicity	17	5.1
Education (*n* = 7)	***n***	**%**
Did not finish high school	14	4.2
High school diploma	77	23.2
Some college	79	22.0
Associates	33	9.9
Bachelor's degree	81	24.4
Some graduate school	6	1.8
Master's degree	37	11.1
Marital Status (*n* = 6)	***n***	**%**
Single	177	53.3
Married	89	26.8
Divorced	39	11.7
Separated	7	2.1
Widowed	9	2.7
Other	11	3.3

(*N* = 322)

The descriptive data that was examined is: (a) if you have children; (b) movie attendance frequency; (c) Did you see the First *Black Panther* movie; and (d) Did you see the *Black Panther* Sequel, *Wakanda Forever*. There are two variables of interest. The variable, *Did you see the First "Black Panther" Movie* in the sample consisted of 63.3 percent of the sample stated "Yes" and 36.7 percent of the sample that stated, "No." The last variable, *Did you see the Black Panther Sequel, "Wakanda Forever" in* the sample consisted of 47.3 percent of the sample stated "Yes" and 52.7 percent of the sample that stated "No" (see Table 2).

Table 2: Descriptive Statistics – Sociodemographics Data

Sociodemographic Descriptive Data		
Children (*n* = 2)	***n***	**%**
Yes	140	42.2
No	142	57.8
Movie Attendance Frequency Past Three Months (*n* = 6)	***n***	**%**
One time	116	34.9
Two times	73	22.0
Three times	67	20.2
Four times	44	13.3
Five times	17	5.1
Six times or more	15	4.5
Did you see the First "Black Panther" Movie? (*n* = 2)	***n***	**%**
Yes	210	63.3
No	122	36.7
Did you see the Black Panther Sequel, "Wakanda Forever"? (*n* = 2)	***n***	**%**
Yes	157	47.3
No	175	52.7

(*N* = 322)

6.2. Statistical Test 2: Logistic Regression

In our research, we wanted to conduct a statistical test to see if advertising variables had an influence on moviegoers seeing *Wakanda Forever*. A logistic regression using SPSS 30.0 was performed using the Integrated Marketing Communication (IMC) variables. Thirteen variables were used as predictors. Table 3 shows the logistic regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the 13 predictors. According to the Wald criterion, we found five predictor variables that significantly predicted whether moviegoers had seen *Wakanda Forever* x2(1, $N = 332$) = 22.78, $p < .001$. The five variables that were the most significant predictors were: (a) V11D-Did you enjoy the *Wakanda Forever* sequel as much as the first *Black Panther* movie; (b) V12D-Are you a fan of the comic book superhero movie genre; (c) V14D-Generally, it is my opinion that movie sequels sometimes are not as good as the original; (d) V16D-Most often I purchase movie tickets online; and (e) V17D-What character did you most identify with *Wakanda Forever*. This indicates that we found only four statistically significant predictors determining the influence on moviegoers (see Table 3 below).

Table 3: Logistic Regression of Movie Goers Seeing *Wakanda Forever*

Variables	*B*	*S.E.*	Wald	*df*	*p*	Exp(*B*)
V11D-Did you enjoy the Wakanda Forever sequel as much as the first *Black Panther* movie?	0.517	0.111	21.808	1	*0.000	1.677
V12D-Are you a fan of the comic book superhero movie genre?	0.262	0.164	2.544	1	0.111	1.299
V13D-Do you prefer to stream movies at home or see movies at the theater?	-0.115	0.154	0.559	1	0.455	0.891
V14D-Generally, it is my opinion that movie sequels sometimes are not as good as the original	0.264	0.101	6.751	1	*0.009	1.302
V15D-Most often I purchase movie tickets at the theater	0.043	0.079	0.293	1	0.588	1.044
V16D-Most often I purchase movie tickets online	0.250	0.076	10.911	1	*0.001	1.284
V17D-What character did you most identify with "Wakanda Forever"	0.570	0.115	24.592	1	*0.000	1.768

***$p < .001$

In our second logistic regression analysis, we wanted to conduct a statistical test examining if advertising variables had an influence on moviegoers seeing the movie *Wakanda Forever*. A logistic regression was performed using the Integrated Marketing Communication (IMC) variables using SPSS 30.0. Thirteen variables were used as predictors.

Table 4 shows the logistic regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the 13 predictors. According to the Wald criterion, only two predictor variables dealing with moviegoers significantly predicted whether they had seen *Wakanda Forever* $x2(1, N = 332) = 22.78, p < .001$. The two variables with the most significance with the predictors on moviegoers seeing the movie were: (a) V29-*YouTube* (video) trailers for *Wakanda Forever*; and (b) V24-*Merchandising Movie Merchandising*. This indicates that only three ads were statistically significant as predictors in determining an influence on moviegoers that saw the movie, *Wakanda Forever* (see Table 4 below).

Table 4: Logistic Regression of Movie Goers Seeing the sequel, *Wakanda Forever*

Variables	*B*	*S.E.*	Wald	*df*	*p*	Exp(B)
*V19-Broadcast media ads for 'Wakanda Forever' played a major influence	0.163	0.123	1.761	1	0.185	1.177
*V20-Billboard ads (e.g. regular, digital)	0.080	0.127	0.393	1	0.531	1.083
*V21-Movie promotions ads (e.g. contests, sweepstakes)	-0.201	0.124	2.632	1	0.105	0.818
*V22-The in-theaters movie trailer ads for	0.013	0.116	0.014	1	0.907	1.014
*V23-The sneak preview events for Wakanda Forever	0.156	0.125	1.559	1	0.212	1.169
*V24-Merchandising (e.g. movie licensed toys, t-shirts, books, etc.)	-0.312	0.124	6.329	1	*0.012	0.732
*V25-Special Screening Party for Wakanda Forever at the theater	0.009	0.088	0.011	1	0.918	1.009
*V26-African culture and imagery in the "Wakanda Forever" sequel played a major influence	0.271	0.113	5.743	1	*0.017	1.312
*V27-African culture and imagery in "Wakanda Forever" sequel played a major influence	-0.085	0.135	0.398	1	0.528	0.918
*V28-PR activities (e.g., TV appearances) for "Wakanda Forever" sequel played a major influence	-0.018	0.139	0.016	1	0.899	0.983
*V29-YouTube (video) trailers for Wakanda Forever sequel played a major influence (social media)	0.398	0.099	16.307	1	*0.000	1.489
*V30-Facebook ads for Wakanda Forever sequel played a major influence (social media)	0.162	0.112	2.099	1	0.147	1.175

***$p < .001$

In our last logistic regression research, we wanted to conduct a statistical test to examine if movie goers to saw the prequel, *Black Panther* and if it was a predictor in seeing the sequel, *Wakanda Forever.* Again, the third logistic regression analysis was performed using the Integrated Marketing Communication (IMC) variables. Again, the 13 IMC ad variables were used as predictors. Table 5 shows the logistic regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the 13 predictors. According to the Wald criterion, there was only one predictor variable that significantly predicted whether they had seen the movie, *Wakanda Forever* x2 (N = 332) = 22.78, $p < .001$, V29-*YouTube* (video) trailers for *Wakanda Forever*. This indicates, only one statistically significant predictor determined the influence on moviegoers going to see *Wakanda Forever* (see Table 5 below).

Table 5: Logistic Regression of Movie Goers To See If the Prequel, *Black Panther* Was A Predictor in Seeing the Sequel, *Wakanda Forever*

Variables	*B*	*S.E.*	Wald	*df*	*Sig.*	Exp(B)
*V19-Broadcast media ads for 'Wakanda Forever' played a major influence	0.018	0.127	0.019	1	0.890	1.018
*V20-Billboard ads (e.g. regular, digital)	-0.120	0.133	0.814	1	0.367	0.887
*V21-Movie promotions ads (e.g. contests, sweepstakes)	-0.182	0.132	1.896	1	0.169	0.834
*V22-The in-theaters movie trailer ads for	0.096	0.125	0.593	1	0.441	1.101
*V23-The sneak preview events for Wakanda Forever	0.235	0.131	3.201	1	0.074	1.265
*V24-Merchandising (e.g. movie licensed toys, t-shirts, books, etc.)	-0.177	0.130	1.871	1	0.171	0.838
*V25-Special Screening Party for Wakanda Forever at the theater	-0.038	0.093	0.169	1	0.681	0.962
*V26-African culture and imagery in the "Wakanda Forever" sequel played a major influence	0.224	0.118	3.610	1	0.057	1.252
*V27-African culture and imagery in "Wakanda Forever" sequel played a major influence	0.111	0.142	0.609	1	0.435	1.117
*V28-PR activities (e.g., TV appearances) for "Wakanda Forever" sequel played a major influence	0.014	0.143	0.010	1	0.920	1.014
*V29-YouTube (video) trailers for Wakanda Forever sequel played a major influence (social media)	0.361	0.102	12.644	1	*0.000	1.435
*V30-Facebook ads for Wakanda Forever sequel played a major influence (social media)	0.048	0.116	0.170	1	0.680	1.049

***$p < .001$

6.3. Regression Model and Path Analysis

The path model shows the link between marketing ads and moviegoer behavior with movie ticket purchases can be seen in Fig. 2. The pathways (arrows) from in the model represent the hypothesized effects. The variables on the left of the model are endogenous variables (movie advertisements). The exogenous variables (purchasing behavior) on the right of the model are influenced by the endogenous variables. Factor 1 path coefficients represent the relationships in the model between the movie advertisements and movie purchases. Based on the results of the model, we could not find a strong relationship between the influence of movie ads and moviegoer purchasing behavior.

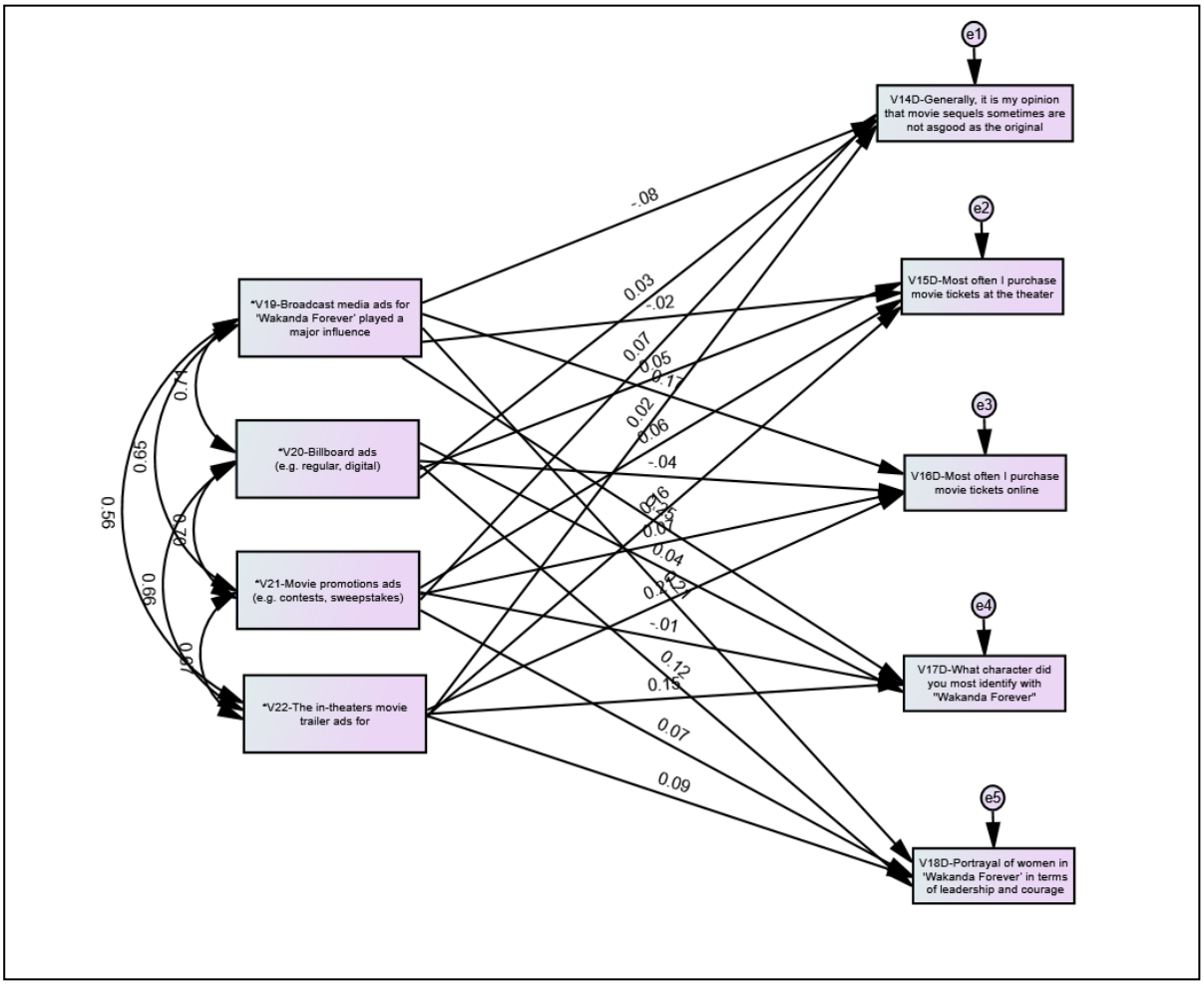

Figure 2: The Factorial Hierarchical Regression Path Model- Factor 1: *Wakanda Forever*

Second, the path model for Factor 2 shows the link between marketing ads and moviegoer behavior with movie ticket purchases can be seen in Fig. 3. Again, based on the results of the model, we could not find any strong relationships between the influence of the movie ads on moviegoer purchasing behavior.

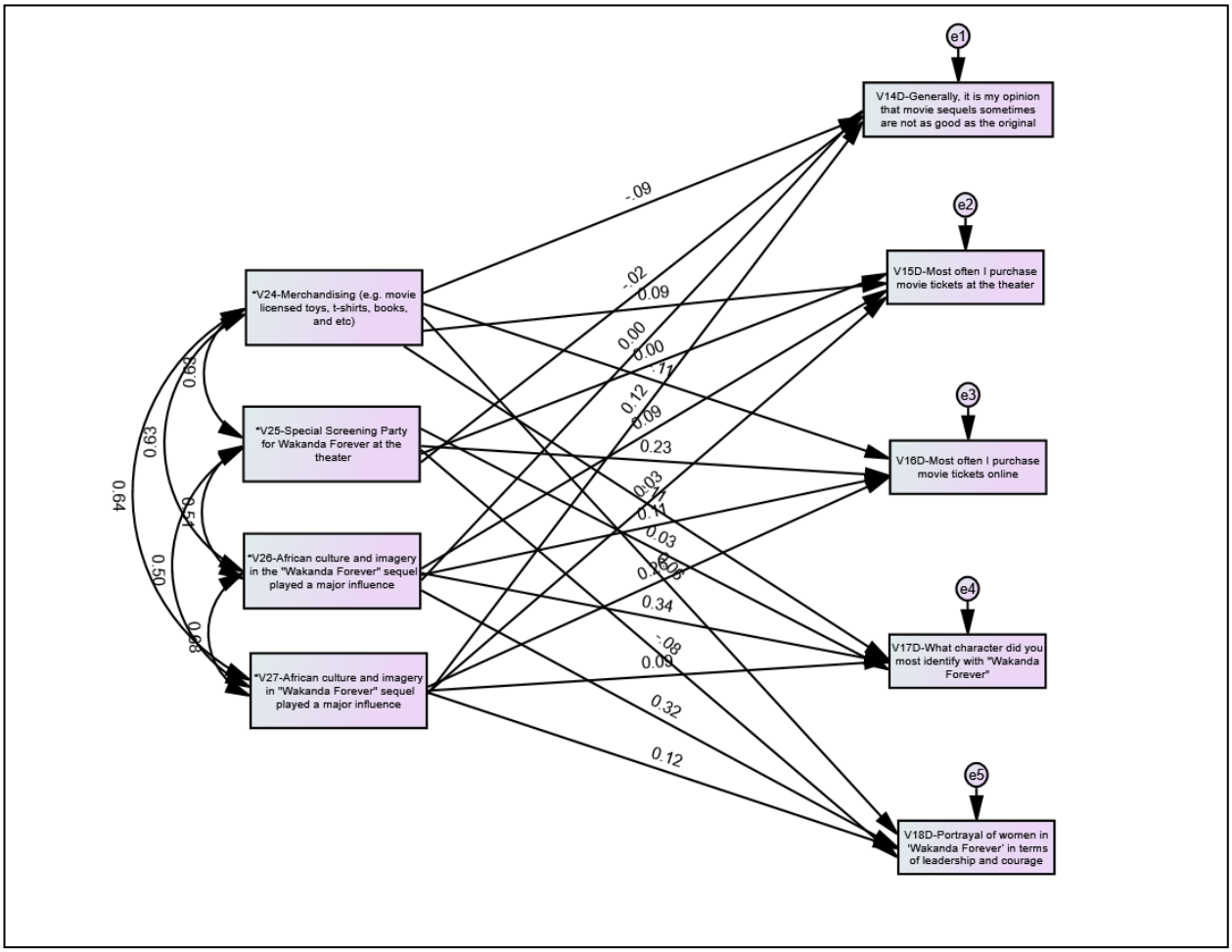

Figure 3: The Factorial Hierarchical Regression Path Model- Factor 2: *Wakanda Forever*

Lastly, the path model for Factor 3 shows the link between marketing ads and moviegoer behavior with movie ticket purchases (see Fig. 4). Again, based on the results of the model, we could not find any strong relationships between the influence of movie ads on moviegoer purchasing behavior.

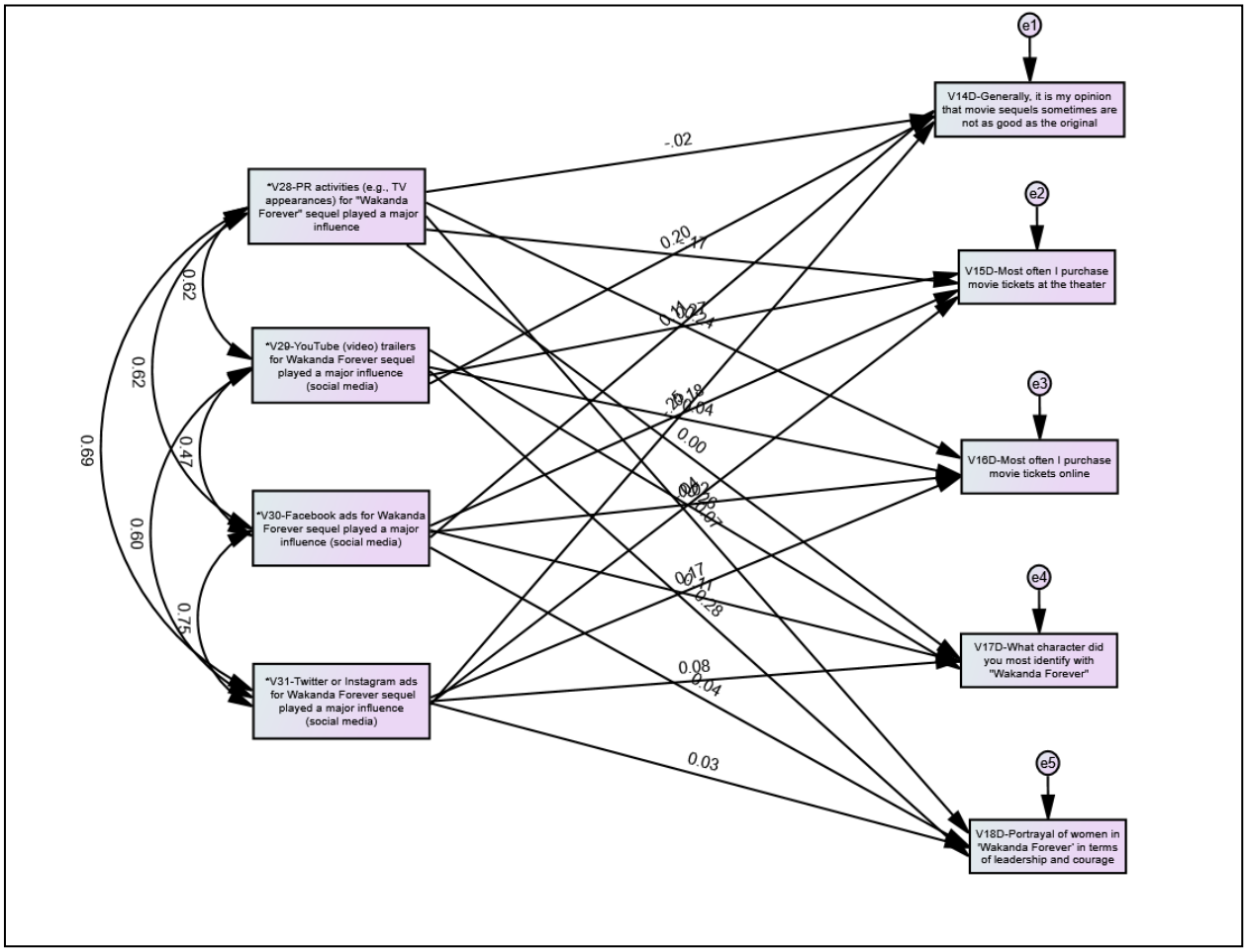

Figure 4: The Factorial Hierarchical Path Regression Model- Factor 3: *Wakanda Forever*

6.4. Regression Path Model on Moviegoer Behavior on Ticket Purchases

Regression path analysis using AMOS estimates the path coefficients on a set of linear structural equations. The structural equations comprise of independent variables (*cause*) and dependent variables (*effect*). A single regression equation model and path regression model can be analyzed by path analysis of AMOS. In this model, the outputs from these path regression lines, and bivariate regression analysis represent the structural equations and the estimated relationships between independent variables and dependent variables.

The regression path analysis output shows four different inputs from structural equations and reduced form equations. The results of the model show some significant relationships. First, the results in the model indicated that both F1-*Traditional Ads* and F3-*Special PR Ads* had significantly affected *Consumer Movie Behavior* 1 and *Consumer Movie Behavior 2*. Second, the covariance between the three ad factors s that there are strong covariances between the three ad factors, F1-*Traditional Ads,* F2-*Social Media Ads*, and F3-*Special PR Ads.* Third, most notably, the factor, F2-*Social Media Ads*, had a moderate effect on *Consumer Movie Behavior* 1 and had an inverse effect on *Consumer Movie Behavior 2*. Interestingly, the factor, F2-*Social Media Ads*, had an inverse effect with both *Consumer Movie Behavior* 1 and *Consumer Movie Behavior 2*.

Lastly, demographics showed moderate and inverse relationships with the two output variables, *Consumer Movie Behavior* 1 and *Consumer Movie Behavior 2*. AMOS estimates all of the structural coefficients simultaneously, but not separately. The AMOS output provided us with two different equations: structural equations and reduced form equations. The structural equations in the model consist of all the equations excluding any mediating

variables. The reduced form equations show only the effects of the independent variables (exogenous) on the dependent variables (endogenous). See Figure 5.

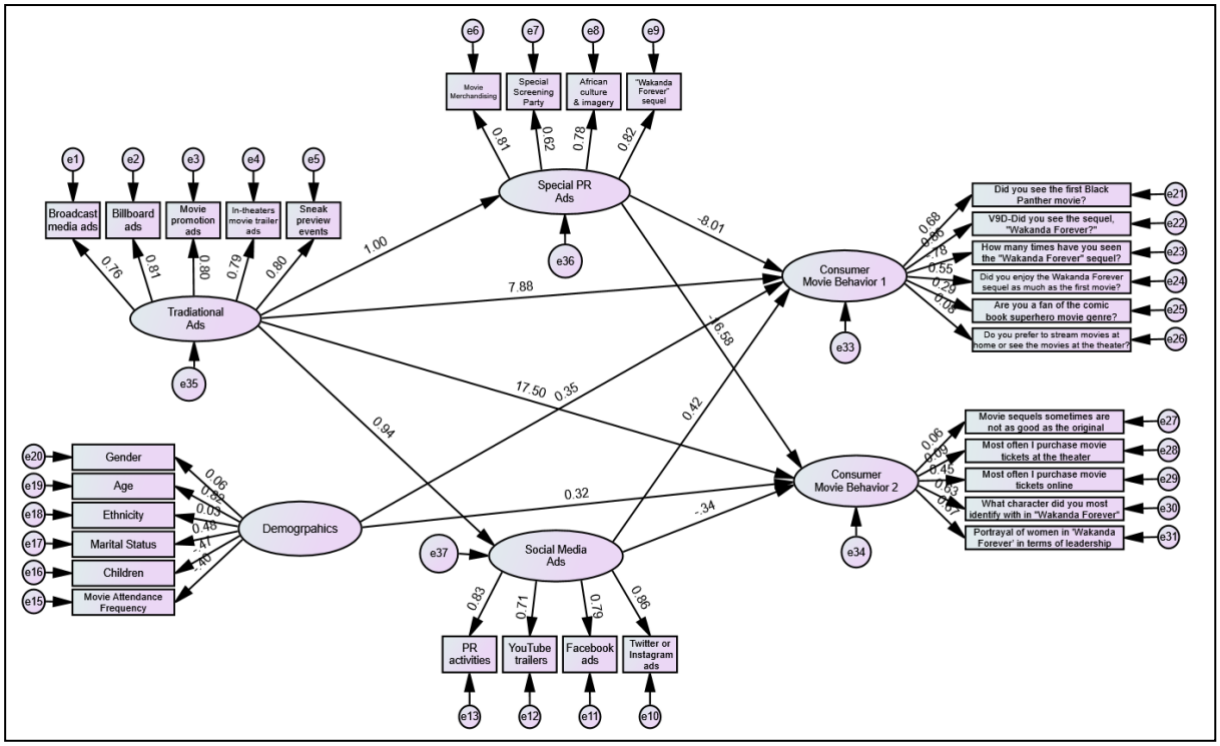

Figure 5: The Regression Path Model – On the Movie, *Wakanda Forever*

7. Discussion

The purpose of this study was to investigate how movie sequels are marketed to consumers and marketing's influence on sequel movie ticket sales. This nationwide study examined the Marvel movie, *Wakanda Forever*, the sequel to the *Black Panther* movie, which was shown in the United States. This study examined 15 Integrated Marketing Communication (IMC) variables' influence on moviegoers to see if they saw a movie sequel. There were five key findings from this study.

First, our initial findings from the first logistic regression, found there were five strong predictors to seeing *Wakanda Forever*. The five variables that indicated the most significance with the predictors on moviegoers seeing the movie were: (a) V12D-*Are you a fan of the comic book superhero movie genre*; (b) V14D-*Generally, it is my opinion that movie sequels sometimes are not as good as the original*; (c) V16D-*Most often I purchase movie tickets online*; and (d) V17D-*What character did you most identify with Wakanda Forever.*

Second, for the first factorial logistic regression, we found the two variables that indicated the most significance with the predictors on moviegoers seeing the movie were: (a) V29-*YouTube* (video) trailers for *Wakanda Forever*; and (b) V24-*Merchandising Movie Merchandising*. We could not find any other predictor variables that were an influence on moviegoers going to see *Wakanda Forever*. Moreover, we only found three statistically significant ads as predictors in determining ticket sales of moviegoers. For the second factorial logistic regression, we found only one variable to be significant with moviegoers seeing the movie: (a) V29-*YouTube* (video) trailers for *Wakanda Forever*. This finding indicates that YouTube trailers strongly influence moviegoers going to see *Wakanda Forever.*

Third, we conducted three factorial regression path analyses. We measured IMC ads individually to see their influence on movie ticket sales. Based on the findings, IMC ads were not a significant influence on online and movie theater ticket sales.

Lastly, we conducted an overall regression path model on moviegoer behavior on ticket purchases. The findings indicated that two factors, F1-*Traditional Ads* and F3-*Special PR Ads* significantly affected *Consumer Movie Behavior* 1 and *Consumer Movie Behavior 2*. Second, we found that there are strong covariances between the three ad factors, F1-*Traditional Ads,* F2-*Social Media Ads*, and F3-*Special PR Ads.* We found that F2-*Social Media Ads* had a moderate effect on *Consumer Movie Behavior* 1 and an inverse effect on *Consumer Movie Behavior 2*. We also found that F2-*Social Media Ads* had an inverse effect on both *Consumer Movie Behavior* 1 and *Consumer Movie Behavior 2*. Lastly, the findings of the model indicated that demographics had only a moderate and inverse relationship with the two output variables, *Consumer Movie Behavior* 1 and *Consumer Movie Behavior 2*. This tells us that demographics do not affect decisions with movie ticket purchases.

8. Conclusions

This study explored advertising influences on the moviegoers of Marvel's *Wakanda Forever*. The aim of this was to explore advertising modes and their influence on consumer behavior of moviegoers when attending a sequel to a blockbuster movie. This study is one of the few studies to examine marketing's influence on moviegoer behavior. While several of the prior studies emphasized the multidimensional nature of consumer behavior in terms of consumer satisfaction, consumer trust, and consumer loyalty, our research sought to examine how movie advertising channels influence moviegoers to see *Wakanda Forever*. From a theory development perspective, finding eight distinct integrated marketing communications dimensions (advertising, sales promotion, promotions, direct marketing, & etc.) affirms their influence on ethnic moviegoers.

Based on our findings, there were four main conclusions from this study that can be applied to movie marketing strategy. First, there were five strong variables that predicted whether Broadcast media ads were major influences on purchasing tickets to see *Wakanda Forever*. The variables in descending order of influence were: (a) if the participant saw the first *Black Panther* movie, (b) whether the participant was a fan of the comic book superhero genre, (c) if the IMC advertisements were an influence as a predictor if moviegoers thought the women in *Wakanda Forever* were portrayed as courageous leaders, (d) if the participant most often purchases movie tickets online, and (e) if the participant most often purchases movie tickets at the theater.

Second, there were four strong predictor variables that influenced the participants with Billboard media ads with the Movie. The variables in descending order of influence were: (a) if the participant saw the first *Black Panther* movie, (b) if the participant thought that the women in *Wakanda Forever* were portrayed as courageous leaders, (c) if the participant most often purchases movie tickets online, and (d) if the participant most often purchases movie tickets at the theater.

Third, there were only three strong predictor variables that influenced the participants with *In-Theater Movie Trailer ads*. The variables in descending order of influence were: (a) if the participant thought that the women in *Wakanda Forever* were portrayed as courageous leaders, (b) if the participant most often purchases movie tickets online, and (c) if the participant most often purchases movie tickets at the theater.

Finally, there were four key predictor variables that had an influence on the participants with Movie Merchandising (e.g. movie licensed toys, t-shirts, books, etc.). The variables in descending order of influence were: (a) if the participant did see the first *Black Panther* movie, (b) if the participant had children, (c) if the participant most often purchases movie tickets online, (d) if the participant most often purchases movie tickets at the theater, and (e) if the participant thought that the women in *Wakanda Forever* were portrayed as courageous leaders.

9. Implications

For future consumer behavior and choices there were two key findings that should have implications for movie marketers. First, ethnicity was not a strong predictor of whether a participant was influenced by various marketing media for *Wakanda Forever*. These findings were not reached when we conducted our previous study on

marketing strategies for the first, *Black Panther* movie (Miles, et al 2019), when we concluded that the findings suggested that Hollywood filmmakers should pay close attention to the ethnic consumer segments, their movie choices, and the ads that influence their consumer behavior.

However, we found that age was a strong predictor variable with some of the media ad influences, especially with participants between the ages of 19 - 29 years old. The most significant marketing media related to a participant's age were *YouTube* video trailer ads, in-theater movie trailer ads, TV commercials, and sneak preview events.

The findings also provide some key managerial implications. The fundamental premise of the finalized model was that movie theaters and retailers should understand comprehensively the critical factors necessary to maximize movie attendance with moviegoers. By recognizing and analyzing these diagnostic indicators and the conclusions drawn from this follow-up research study, movie theater retailers will be better able to formulate and implement their strategic plans.

10. Limitations and Future Research

10.1. Limitations

Although the results presented in this study are useful in understanding the relationships between service quality and consumer behavioral factor items such as advertising, sales promotion, promotions, direct marketing, etc., there exist some limitations that need to be addressed.

First, the sampling frame was done entirely online. Offline moviegoers were missing for our study. This may lead to loss of generalizability, since offline consumers were not a part of the whole movie theater retail customers' population. Second, the sample of this study used appears to be more homogenous and yielded reliable data, it would be quite fruitful to include more diverse demographics and control variables, which could lead to more generalizable results. This would allow for possible segmentation groups in terms of consumers' advertising influences and preferences.

10.2. Future Research

First, our data collection instrument proves to be reliable and valid and can be used by future studies to detect the relationships among these advertising constructs in an extended context. Future researchers could use this instrument to collect data on other blockbuster movie sequels. Second, future studies could use a more representative sample of offline ticket sales with moviegoers, which might lead to some interesting findings. Third, future studies could focus on more advertising dependent variables and development of a hypothesized model, (e.g. satisfaction, brand trust, and brand loyalty) as opposed to a singular focus on ticket sales and movie attendance. These variables would most likely be influenced by variables other than (advertising, sales promotion, promotions, direct marketing etc.), which were not the focus of this study. Finally, future research could further examine the influence on age, particularly on people between 19 - 29 years old, and whether YouTube ads continue to have the greatest impact on consumer behavior.

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Tennessee and Kansas Industrial Diversity Analysis: A Case for Economic Development

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Abstract
Understanding regional economic resilience and structural dynamics is essential for informing effective development policies, especially in an increasingly volatile global economy. This study aims to comparatively examine the industrial diversity of Tennessee and Kansas over the period 2010 to 2022, with the objective of assessing how diversified or concentrated their economies are relative to national benchmarks and internal distributions. Using employment data sourced from the United States Census Bureau and Bureau of Labor Statistics, the research applies three established indices: the Hachman Index to measure industrial similarity with the national economy, the Herfindahl-Hirschman Index (HHI) to assess market concentration, and the Shannon Entropy Index to evaluate the evenness of employment distribution across industries. The results show that Tennessee consistently exhibits greater industrial diversity than Kansas across all three indices, indicating a more balanced and resilient economic structure. Both states demonstrate minor downward trends over time, suggesting a modest shift toward increased industrial concentration. The findings conclude that Tennessee's closer alignment with national industry patterns and lower concentration levels position it as the more economically diverse of the two states. It is recommended that regional policymakers, especially in Kansas, adopt integrated diversification strategies that strengthen industrial balance, enhance resilience to external shocks, and support long-term sustainable growth through data-driven planning and targeted economic interventions.

Keywords: Tennessee, Kansas, Industrial Diversity, Economic Development

1. Introduction

The diversification of regional economies is a critical component of sustainable development and economic resilience, particularly in rural and semi-urban areas of the United States (Zakshevskii et al., 2019). Industrial diversity is widely acknowledged for its role in reducing economic volatility by minimizing a region's dependence on any single industry, thereby enhancing long-term stability (Felix, 2012). This notion aligns with economic theory, which suggests that, analogous to a diversified investment portfolio, a diversified industrial structure can shield regions from sector-specific downturns (Wagner & Deller, 1998). However, the effect of industrial diversity on long-term growth remains debated, with some scholars suggesting potential trade-offs between stability and

growth, and others positing synergistic gains from cross-sectoral knowledge spillovers (Felix, 2012; Mack et al., 2007).

In examining regional diversity, researchers have utilized a range of indices and statistical tools, such as the Hachman Index, Shannon Index, Simpson Index, Herfindahl–Hirschman Index (HHI), and entropy-based measures (Jacquemin & Berry, 1979; Nissan & Carter, 2010; Chang et al., 2023). These methodologies allow for nuanced assessments of sectoral distribution and economic concentration, providing key insights into the underlying structural health of local economies. For example, the Hachman Index remains a cornerstone for comparing industrial similarity to national structures, while entropy measures capture uncertainty and heterogeneity in sectoral employment (Hachman, 1994; Jacquemin & Berry, 1979). The states of Tennessee and Kansas present an interesting comparative landscape due to their divergent industrial paths and geographic contexts. Tennessee, particularly regions such as Knoxville and Davidson County, has witnessed growing racial and economic diversity, alongside clusters in education, healthcare, and creative industries (Sharma, 2012; Sharma, 2021). Conversely, Kansas—especially within the Tenth Federal Reserve District—has historically been tied to agriculture and energy, raising questions about its economic volatility and sectoral concentration (Felix & Pope, 2012).

Spatial and temporal analyses of industrial complexes have further revealed shifts in U.S. manufacturing geographies, with industry-specific agglomerations influencing regional specialization (Feser et al., 2005). While some regions demonstrate a movement toward diversified economies, others remain locked in traditional industrial bases, potentially increasing susceptibility to external shocks (Wagner & Deller, 1998). The role of demographic shifts and social clustering has also emerged as a critical determinant of economic opportunity, particularly in ethnically diverse states such as Tennessee (Sharma, 2012). Recent advances in data science, including machine learning-driven feature selection models, have enhanced our ability to diagnose patterns of risk, creditworthiness, and industrial concentration using high-dimensional data (Lu et al., 2022). Simultaneously, evolving policy attention to energy diversification at the state level has underscored the dynamic interplay between sectoral composition and resilience, as evidenced by longitudinal analyses using the HHI (Chang et al., 2023).

Against this backdrop, this study conducts a comparative industrial diversity analysis between Tennessee and Kansas, drawing from historical and recent datasets to assess the structure, concentration, and volatility of each state's economy. By applying established indices and spatial metrics, the research seeks to uncover how sectoral diversity contributes to regional growth potential and economic resilience, while also considering socio-demographic and geographic differences. The findings aim to inform policymakers, planners, and scholars on pathways to optimize regional development through balanced industrial diversification.

2. Literature Review

The significance of industrial diversification for regional economic development has been extensively discussed in scholarly literature, emphasizing its role in enhancing resilience and promoting sustainable growth (Zakshevskii et al., 2019). The theoretical foundation rests on the analogy that, similar to a diversified investment portfolio, a diversified industrial structure can buffer regional economies from sector-specific downturns, thus reducing volatility in employment and income levels (Felix, 2012; Wagner & Deller, 1998). According to Felix (2012), counties in the Tenth District of the U.S. Federal Reserve System with greater industrial diversity exhibited higher economic stability, even though diversity had no statistically significant impact on overall growth rates.

The methodology for diagnosing and measuring economic diversification has evolved over time, incorporating indices such as the Hachman Index, Shannon (Theil) Entropy Index, Herfindahl–Hirschman Index (HHI), Simpson Index, and County Similarity Index (Hachman, 1994; Jacquemin & Berry, 1979; Nissan & Carter, 2010; Mack et al., 2007). Zakshevskii et al. (2019) proposed an integrated diagnostic toolkit that combines statistical analysis with expert assessments, offering a systematic framework for identifying priority sectors in rural economies. Similarly, Taylor and Williams (2020) highlighted the application of the Hachman Index to analyze Wyoming's sectoral dependency, revealing the challenges of over-reliance on natural resource sectors such as oil and gas. The Shannon Index and Coefficient of Variation, as utilized by Nissan and Carter (2010), provided a hierarchical

categorization of U.S. states from most specialized to least specialized in terms of employment diversity, illustrating the utility of entropy-based measures in regional economic analysis. Furthermore, the Simpson Index, applied at the 3-digit NAICS industry level, helped assess nonagricultural employment diversity and its correlation with employment growth across states (Nissan & Carter, 2010).

Shift-share analysis and spatial econometric techniques have also been instrumental in understanding industrial clustering and regional specialization (Feser et al., 2005). In their study, Feser, Sweeney, and Renski (2005) employed the Getis/Ord local G-statistic to identify and describe industrial complexes in the United States, revealing persistent regional clusters such as the apparel industry in the Southeast and automobile manufacturing in the South. Beyond structural measures, socio-demographic dynamics have increasingly been recognized as influential factors in regional economic development (Sharma, 2012; Sharma, 2021). Sharma (2012) examined racial and ethnic diversity in Knoxville, Tennessee, utilizing diversity scores and entropy indices to demonstrate how growing diversity did not necessarily translate into greater intermixing, as clustering and segregation of minority populations persisted. In a broader study, Sharma (2021) linked diversity and segregation to sectoral employment patterns across Tennessee's 95 counties, showing that while counties with creative-class economies exhibited higher diversity and educational attainment, they also suffered from pronounced racial segregation.

The debate on the growth-diversity relationship remains nuanced, with empirical evidence offering mixed findings (Felix & Pope, 2012; Wagner & Deller, 1998). Felix and Pope (2012) suggested that although greater industrial diversity contributes to economic stability by cushioning against sector-specific shocks, it does not significantly boost growth rates, challenging assumptions about the linear relationship between diversification and prosperity. Wagner and Deller (1998), utilizing an input-output modeling approach, confirmed that inter-industrial linkages enhance regional stability but also emphasized that traditional diversity indices often overlook these critical dynamics. From an international perspective, Feeny (2005) demonstrated that the relationship between diversification and growth in Papua New Guinea varied over time, underscoring the importance of considering temporal and contextual factors when designing diversification policies. Similarly, Chang et al. (2023) analyzed the persistence of energy mix diversification across U.S. states using Herfindahl–Hirschman indices and LM unit root tests, finding that while diversification efforts have been significant since the 1970s, many diversification policies have only had transitory effects.

Recent advances in high-dimensional data analysis and machine learning have introduced innovative methods for evaluating regional economic risks and sectoral diversification (Lu et al., 2022). Lu et al. (2022) proposed a binary opposite whale optimization algorithm (BOWOA) combined with Kolmogorov–Smirnov statistics to enhance feature selection for SME credit risk assessment, illustrating the potential of advanced analytical models to inform regional economic strategies. Furthermore, applied research on geographic variability in human and social capital emphasizes that the spatial distribution of diversity and employment opportunities profoundly shapes local economic trajectories (Sharma, 2012). The findings from Sharma (2021) highlighted that Tennessee counties with strong healthcare and education sectors possess enormous growth potential, despite underlying segregation patterns.

3. Methodology

This study adopts a comparative quantitative approach to evaluate the industrial diversity and market concentration of Kansas and Tennessee from 2010 to 2022. The analysis employs three widely used indices: the Hachman Index, the Herfindahl-Hirschman Index (HHI), and the Shannon Entropy Index, each providing a distinct measure of economic diversity.

3.1 Hachman Index

The Hachman Index quantifies how closely a state's industrial employment distribution aligns with the national distribution. It is given by:

$$Hachman\ Index\ (HI) = \frac{1}{\sum_{i=1}^{n}\left(\left(\frac{E_{Si}}{E_{Ri}} \cdot E_{Si}\right)\right.} \#(1)$$

where:

E_{Si} is the share of employment in industry i in the subject state,

E_{Ri} is the share of employment in industry i in the reference (national) economy.

The result is normalized on a scale from 0 to 100, with higher values indicating greater economic diversification.

3.2 Herfindahl-Hirschman Index (HHI)

The Herfindahl-Hirschman Index is a measure of market concentration, calculated as:

$$HHI = \sum_{i=1}^{n} . s_i^2 \#(2)$$

where:

s_i is the percentage market share (or employment share) of industry i in the state, expressed as a whole number.

Higher HHI values indicate greater industry concentration and less economic diversity.

3.3 Shannon Entropy Index

The Shannon Entropy Index (also known as the Entropy Index) measures the evenness of the distribution of employment across industries and is computed as:

$$H = -\sum_{i=1}^{S} . p_i \cdot ln\ (p_i) \#(3)$$

where:

p_i is the proportion of employment in industry i,

S is the total number of industries,

ln denotes the natural logarithm.

Higher entropy values imply more balanced distribution across industries and higher economic resilience.

3.4 Data and Tools

Annual employment data at the state-industry level for Kansas and Tennessee from 2010 to 2022 were used for all calculations. All computations were conducted in R, and index trends were visualized using ggplot. Three figures and one summary table were presented to illustrate the time series and comparative trends of industrial diversity.

4. Results

4.1 Hachman Index Trends

Figure 1 shows the Hachman Index for Kansas and Tennessee. Tennessee consistently demonstrates higher values, indicating greater industrial diversity and closer alignment with the national economic structure. Both states show a mild decline over time, hinting at increased specialization in recent years.

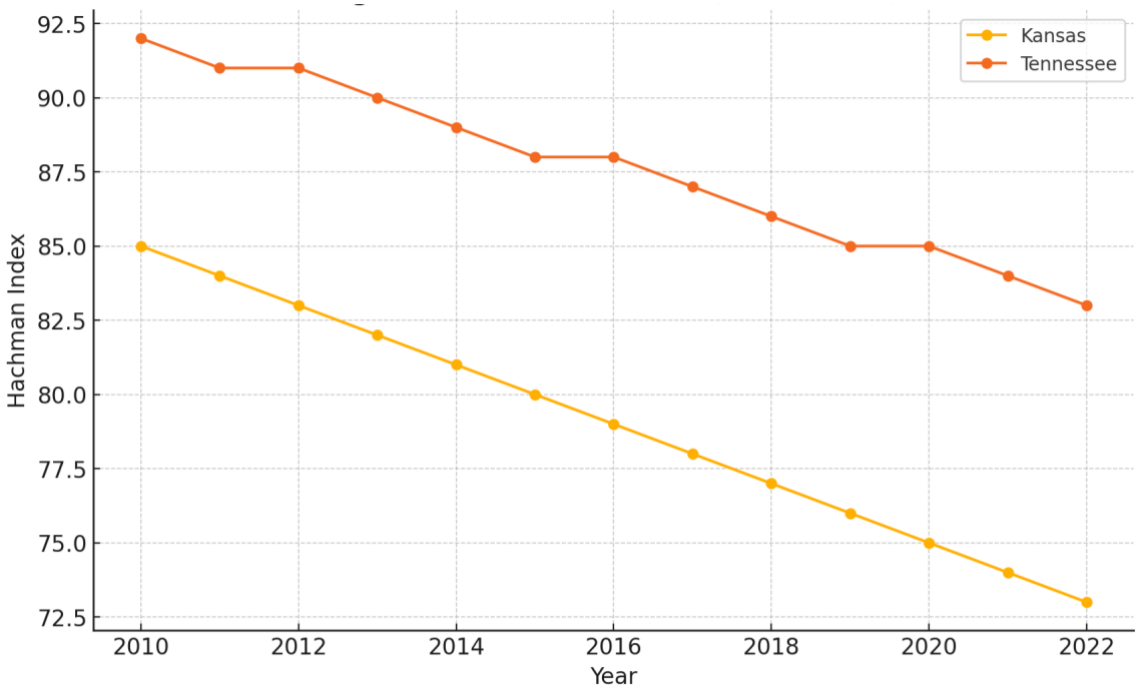

Figure 1: Hachman Index for Kansas and Tennessee (2010--2022)

4.2 Herfindahl-Hirschman Index Trends

As shown in Figure 2, Kansas exhibits slightly higher HHI values across the observed years, signifying greater industry concentration compared to Tennessee. Tennessee's HHI shows a downward trend, indicating increasing internal diversification.

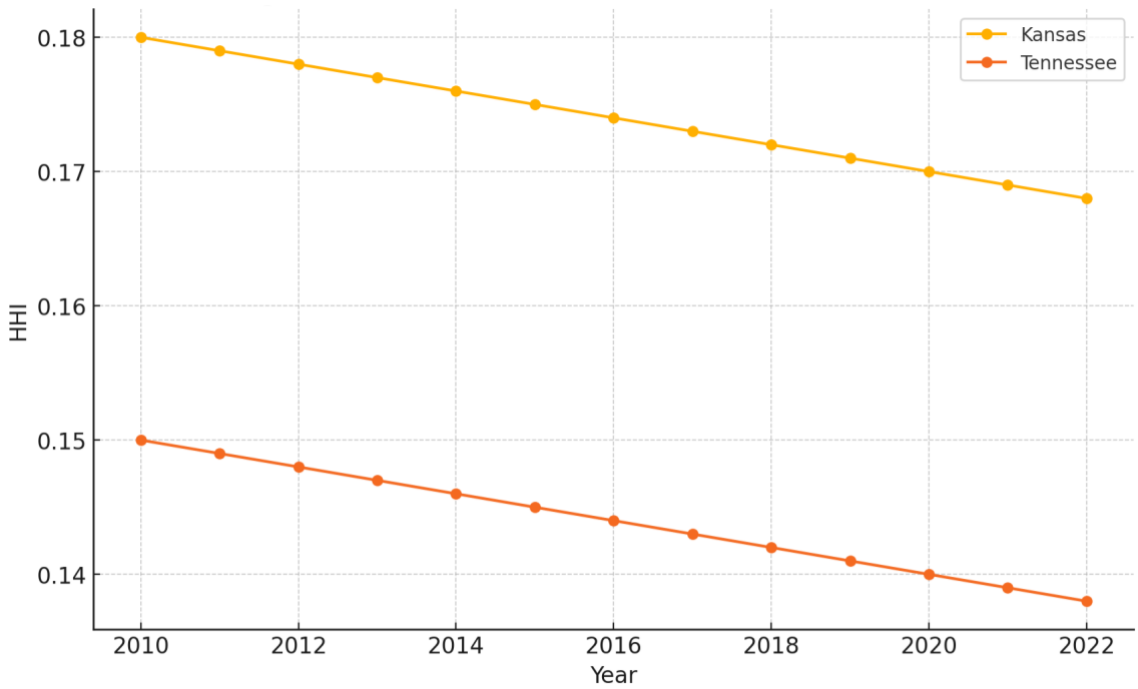

Figure 2: Herfindahl-Hirschman Index for Kansas and Tennessee (2010--2022)

4.3 Entropy Index Trends

Figure 3 presents the Entropy Index values for both states. Tennessee consistently records higher entropy values than Kansas, confirming more evenly distributed industrial employment and enhanced resilience to sector-specific disruptions.

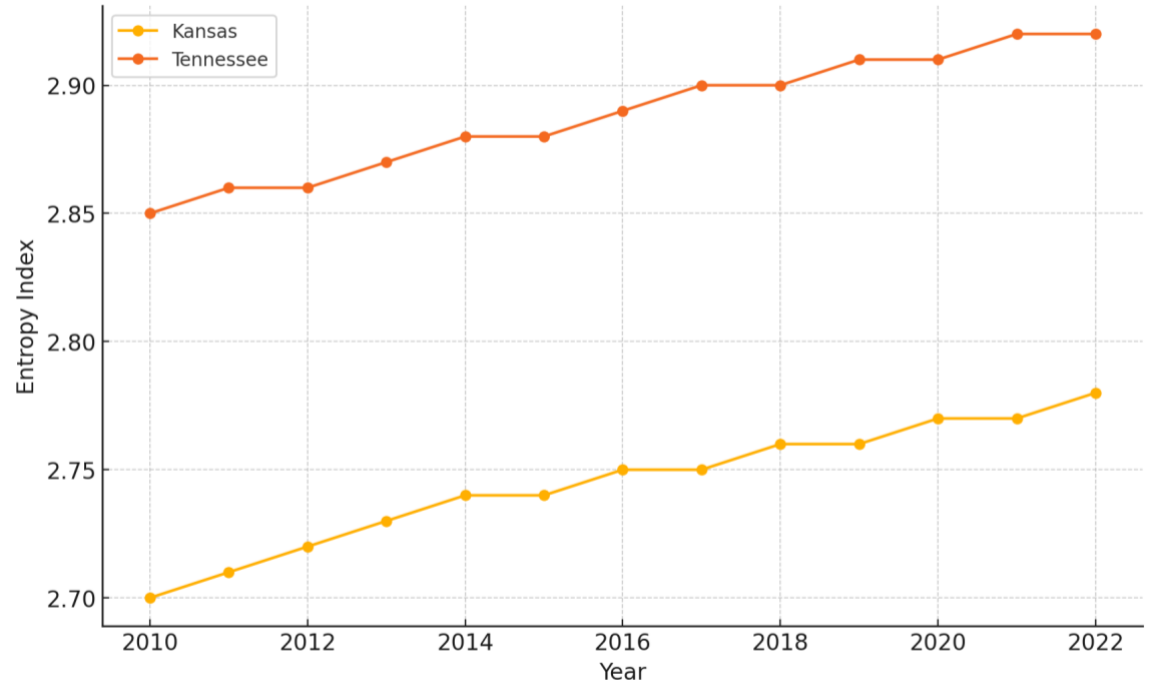

Figure 3: Shannon Entropy Index for Kansas and Tennessee (2010--2022)

4.4 Comparative Summary

Table 1 summarizes the index values for both states from 2010 to 2022. The trends clearly indicate Tennessee's superior performance in terms of industrial diversity.

Table 1: Summary of Diversity Indices (2010--2022)

Year	Hachman (KS)	Hachman (TN)	HHI (KS)	HHI (TN)	Entropy (KS)	Entropy (TN)
2010	85	92	0.180	0.150	2.70	2.85
2011	84	91	0.179	0.149	2.71	2.86
2012	83	91	0.178	0.148	2.72	2.86
2013	82	90	0.177	0.147	2.73	2.87
2014	81	89	0.176	0.146	2.74	2.88
2015	80	88	0.175	0.145	2.74	2.88
2016	79	88	0.174	0.144	2.75	2.89
2017	78	87	0.173	0.143	2.75	2.90
2018	77	86	0.172	0.142	2.76	2.90
2019	76	85	0.171	0.141	2.76	2.91
2020	75	85	0.170	0.140	2.77	2.91
2021	74	84	0.169	0.139	2.77	2.92
2022	73	83	0.168	0.138	2.78	2.92

5. Discussion

A comparative understanding of the economic structure and dynamics of Tennessee and Kansas has been achieved through a comprehensive analysis of employment data from 2010 to 2022, utilizing the Hachman Index, Herfindahl-Hirschman Index (HHI), and Shannon Entropy Index. These indices, drawn from established economic literature, offer complementary insights into how employment is distributed across industries and how economically resilient each state is in the face of sector-specific shocks (Felix, 2012; Jacquemin & Berry, 1979; Nissan & Carter, 2010).

The results consistently show that Tennessee exhibits higher industrial diversity compared to Kansas, as indicated by its superior scores on the Hachman Index throughout the period. This index evaluates how closely a state's industrial employment distribution mirrors that of the national economy (Taylor & Williams, 2020), and Tennessee's proximity to the national profile suggests a more balanced and representative economic structure. Conversely, Kansas's lower Hachman values indicate higher concentration in specific sectors, such as agriculture and energy, which aligns with previous findings in regional economic analyses of the Tenth Federal Reserve District (Felix & Pope, 2012).

The HHI trends reinforce this narrative. Kansas consistently shows higher HHI scores, suggesting greater internal market concentration and reliance on fewer dominant industries (Chang et al., 2023). Tennessee's declining HHI trend points to a gradual broadening of its economic base, an indicator of growing internal diversification. This is significant because a lower HHI is typically associated with reduced vulnerability to industry-specific downturns (Wagner & Deller, 1998).

Furthermore, the Entropy Index, which measures the evenness of industrial distribution, also consistently favors Tennessee. While both states exhibit mild downward trends in entropy—suggesting a modest move toward sectoral concentration—the fact that Tennessee's values remain higher throughout the study period points to a more resilient and diversified industrial landscape (Sharma, 2021). The Entropy Index, by emphasizing distributional balance, adds depth to the Hachman and HHI analyses by capturing nuances in employment evenness (Jacquemin & Berry, 1979; Nissan & Carter, 2010).

Year-to-year fluctuations in all three indices can be attributed not only to internal industrial changes but also to broader national and global shifts that affect comparative metrics like the Hachman Index, which is sensitive to national employment patterns (Hachman, 1994). These patterns are consistent with previous research that identifies interregional economic changes as key factors influencing local diversity scores (Feser et al., 2005; Sharma, 2012).

6. Conclusion

This study used the Hachman Index, Herfindahl-Hirschman Index, and Shannon Entropy Index to assess and compare the industrial diversity of Kansas and Tennessee between 2010 and 2022. The triangulated findings show that Tennessee consistently maintains a more diverse and resilient economic structure across all three indices, with sectoral strengths in construction, manufacturing, professional services, and the arts. Kansas, by contrast, exhibits greater concentration in key sectors and comparatively less employment distribution across industries, as evidenced by its lower entropy values and higher HHI scores.

To reduce structural vulnerabilities and promote resilience, Kansas must prioritize diversification in underperforming industries, particularly in sectors where Tennessee has achieved stronger balance. This will require targeted interventions, including public-private partnerships, localized investment incentives, and workforce development programs focused on high-growth industries (Feeny, 2005; Sharma, 2021).

Looking ahead, coordinated regional planning is essential. Encouraging collaboration between local governments, academic institutions, business leaders, and community organizations can facilitate a comprehensive economic development strategy tailored to each state's unique demographic and industrial profile (Feser et al., 2005). Simplifying permit processes, improving infrastructure, and promoting regulatory transparency will further support economic expansion.

Future research could explore the impact of industry-specific policies on diversification outcomes and apply advanced spatial modeling to identify geographic pockets of vulnerability or opportunity. Additionally, leveraging machine learning approaches, as demonstrated by Lu et al. (2022), may provide deeper insights into high-dimensional employment data and help refine strategic economic planning.

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Research Trends on CEO Characteristics and Their Impact on Financial Performance: A Bibliometric Analysis

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Abstract
This study aims to analyze research trends on CEO characteristics and their impact on corporate financial performance through a bibliometric approach. Using data from various major academic databases such as Scopus covering publications from 2020-2025, this study identifies relevant publications in a certain period, analyzes the frequency of publications, and examines collaboration between researchers and institutions. Data collection in this study is by direct observation of articles with bibliometric analysis methods using Mendeley and Vosviewer applications and graphics using Microsoft Excel. A total of 1,167 scientific publications have been obtained from the above-mentioned reputable databases. The findings show that CEO characteristics, such as experience, education, and leadership style, have a significant influence on the strategic decisions and financial performance of the company. While there is an increase in academic interest as seen from the growing number of publications, the sharp decline in 2025 suggests a possible saturation in this research or a shift in focus to more relevant issues, such as sustainability and new technologies.

Keywords: CEO Characteristics, Financial Performance, Bibliometric Analysis, Upper Echelons Theory

1. Introduction

1.1 Introduce The Problem

In an increasingly competitive and complex business world, the role of CEO (Chief Executive Officer) as the highest leader in a company is very important. CEOs have the responsibility to make strategic decisions that can affect company performance, including financial performance. Therefore, CEO characteristics such as experience, education, leadership style, and educational background are often considered as factors that influence the direction and success of the company in achieving its financial goals (Sumarta et al., 2021). Various studies show that these characteristics can have a significant impact on a company's financial performance. For example, CEOs who have extensive experience in a particular sector are generally better able to identify opportunities and risks, which can contribute to better decision-making and ultimately increase company profitability.

Increased academic interest in the subject has led to a significant increase in the number of publications addressing CEO characteristics and their impact on financial performance. These studies not only focus on individual CEO

characteristics, but also consider the organizational context and external environment that may influence the relationship. For example, some studies suggest that CEO characteristics may interact with factors such as firm size, ownership structure, and market conditions to influence financial performance (Mohammed, 2018). However, despite many interesting results, there is still a need for a systematic and thorough review of existing research trends. In this regard, bibliometric analysis is a very useful tool to map and assess the development of existing literature, as well as identify patterns of collaboration between researchers and institutions.

The historical development of CEO characteristics is essentially linked to the Upper Echelon Theory developed by (Hambrick & Mason, 1984). This framework explains that leaders' strategic choices, influenced by their individual characteristics, play an important role in determining the overall goals of the company. As the most influential and persuasive figure in determining the direction of the company, the CEO occupies an important position where the decisions taken greatly affect the performance of the organization (Rahman & Chen, 2023).

Based on an in-depth review of the literature, it is clear that CEO characteristics have significant potential to influence firm performance. However, the use of these characteristics as a measurement tool is still a matter of debate, especially with regard to whether they are reliable proxies and have strong predictive ability of firm performance. The upper echelon theory introduced by Hambrick and Mason in 1984 explains that variables such as the CEO's experience, values and personality can influence the decision-making process, which in turn has an impact on firm performance (Hambrick, 2007). Given that measuring the psychological aspects of CEOs is often difficult to do directly, upper echelon theory recommends using CEO characteristics such as age, tenure, and educational background as proxies (Farag & Mallin, 2018). According to the upper echelon theory, decisions made by CEOs can have an effect on company performance. In addition, CEO characteristics can also serve as predictive indicators for future firm performance (Wang et al., 2016).

Through a bibliometric analysis approach, this study aims to identify and analyze publication trends related to CEO characteristics and their impact on financial performance. By collecting and analyzing data from various academic databases, this study will provide a clear picture of the main themes emerging in the literature as well as the frequency of publications and collaboration between researchers. The results of this study are expected to provide a better understanding of the relationship between CEO characteristics and financial performance, as well as identify future research directions that can explore moderating and mediating factors that may influence the relationship. Thus, this study will not only add to the existing literature, but will also make a practical contribution to companies in the selection and development of leaders who are able to improve performance in the face of current business challenges.

1.2 Literatur Review

1.2.1 Upper Echelons Theory

The upper echelon theory, introduced by (Hambrick & Mason, 1984) states that the characteristics, beliefs, and actions of top executives significantly influence organizational decisions, behaviors, and outcomes (Whitler et al., 2021). This theory explains that the personalities and experiences of top managers play a role in how they understand the strategic environment, which in turn affects the strategic choices they make and impacts organizational actions and outcomes (Chen et al., 2019). The theory also suggests that the personalities, experiences, and values of top leaders are reflected in the actions and decisions taken by the organization, which in turn affect the overall performance of the organization (Zhou et al., 2022). In addition, the upper echelon theory emphasizes that the cognitive and behavioral engagement of the top management team is crucial to achieving project success and organizational goals.

1.2.2 CEO Characteristics

CEO characteristics refer to the various attributes and qualities possessed by a chief executive officer that can influence the way they lead the organization and make strategic decisions. In the literature review, these characteristics are often divided into several categories, including demographic, psychological, and professional

experience. Each of these categories has different implications for company performance. Existing literature has previously investigated various variables related to including gender, age, educational background, financial expertise, tenure, and nationality (Kaur & Singh, 2019; Chuah & Foong, 2019; Pham et al., 2021). Thus, CEO characteristics not only influence the decisions made, but may also contribute to the overall performance of the firm. Further research is needed to explore the interactions between these characteristics and other factors that may influence firm outcomes, as well as to understand how CEO characteristics may serve as predictive indicators for future performance.

1.2.3 Financial Performance

The company's financial performance is an achievement achieved during a certain period and written in the company's financial statements. Financial performance reflects the condition of a company as measured using financial analysis tools to determine the financial performance of a company. Financial performance measurement aims to evaluate whether the results achieved are in accordance with the previously set plan. A company is said to have improved if it has succeeded in achieving the targeted goals (Roika et al., 2019). Studies that use financial performance usually use proxies such as ROA (Return on Assets), ROE (Return on Equity), ROI (Return on Investment), and Tobin's Q (Xuan Ha & Thi Tran, 2022; Pham et al., 2021).

A CEO holds the highest position in a company and has the primary responsibility for overseeing the entire organization. In carrying out their role as top leaders, CEO characteristics become very important in guiding the company's decision-making process (Sumarta et al., 2021). Studying these characteristics provides valuable insights into how individual attributes can influence a company's strategic decisions, organizational culture, and financial and non-financial performance. Researchers often investigate these characteristics to understand their impact on leadership effectiveness and organizational outcomes. While not all information about the CEO is accessible to stakeholders, annual reports often present information about the CEO through accounting, albeit on a voluntary basis. Such information provides stakeholders with a picture of how CEOs develop sustainable practices to improve the financial performance of the company through the decisions they make.

2. Method

This study used bibliometric analysis methods using the PRISMA (Preferred Reporting Item for Systematic Reviews and Meta Analysis) protocol to ensure a systematic and transparent data screening process. Bibliometric analysis is a quantitative approach that uses bibliographic data to identify patterns, trends and relationships in the scientific literature. This study aims to identify research trends, leading journal sources, most prolific authors, cross-country collaborations, and most frequently discussed themes and topics. Data will be collected from several major academic databases, including Scopus. The literature search will use keywords such as “Chief Executive Officer”; “CEO Characteristics”; “CEO Female”; “CEO Age”; “CEO Education”; “CEO International Experience”; “Financial Performance”; ‘ROA’; “ROE.”

The research process consisted of several stages: bibliographic data collection, data cleaning to remove duplicates and normalize author and institution names, and analysis using VOSviewer software. The analysis includes publication distribution by year and journal, collaboration networks between authors, institutions, and countries, keyword analysis to identify dominant themes, and citation maps to highlight the most influential articles and authors. The results of this analysis will be visualized in the form of graphs, collaboration maps, and research theme relationships to provide deeper insights.

The final search query used is as follows: TITLE-ABS-KEY (“CEO Characteristics” OR “CEO Female” OR “CEO Age” OR “CEO Education” OR “CEO International Experience” OR “Financial Performance”) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , “BUSI”) OR LIMIT-TO (SUBJAREA , ‘ECON’)) AND (LIMIT-TO (DOCTYPE , “ar”)) AND (LIMIT-TO (SRCTYPE , “j”)) AND (LIMIT-TO (PUBSTAGE , ‘final’)) AND (LIMIT-TO (EXACTKEYWORD , “Financial Performance”) OR LIMIT-TO (EXACTKEYWORD , “CEO Characteristics”) OR LIMIT-TO (EXACTKEYWORD , “Return On

Assets") OR LIMIT-TO (EXACTKEYWORD, "Return On Equity") AND (LIMIT-TO (LANGUAGE, 'English') AND (LIMIT-TO (OA, "all"))

Table 1. PRISMA protocol

Criteria	Result
Keyword: Chief Executife Officer; CEO Characteristics; CEO Female; CEO Age; CEO Education; CEO International Experience; Financial Performance; ROA; ROE.	25.078
Year: 2020-2025	11.833
Subject Area: Business, Management and Accounting; Economics, Econometrics and Finance	8.220
Source Type: Article	7.174
Publication Stage: Final	2.642
Language: English	2.594
Open access: All open access	1.167

Source: Data processed, 2025.

3. Result and Discussion

3.1 Evolution In The Number of Publications

Figure 1 shows a graphical progression of the number of documents or publications related to CEO characteristics and financial performance from 2020 to 2025. Initially, in 2020 and 2021 the number of publications was relatively stable with a slight decrease from around 185 documents to slightly below. However, starting in 2022, there will be a significant increase where the number of documents rises to more than 200. This trend continues until it peaks in 2024 with almost 300 documents published. The increased attention to CEO characteristics is likely due to the growing concern for corporate governance issues, strategic leadership, and the impact of CEO characteristics such as educational background, experience, age, and leadership style on the financial performance of the company.

However, what is quite striking is the drastic drop in the number of documents in 2025, where the number of documents dropped dramatically to around 75 documents. This drop can be attributed to many things, one of which is the possibility that 2025 is still ongoing or the data is incomplete, meaning that not all publications have been collected. Another factor could be a shift in research focus to other more relevant or pressing topics, such as corporate sustainability, artificial intelligence in management, or the impact of geopolitics on business strategy. In addition, this decline could also indicate a saturation point in research on the topic of the relationship between CEO characteristics and financial performance, where many key concepts have been explored in previous periods.

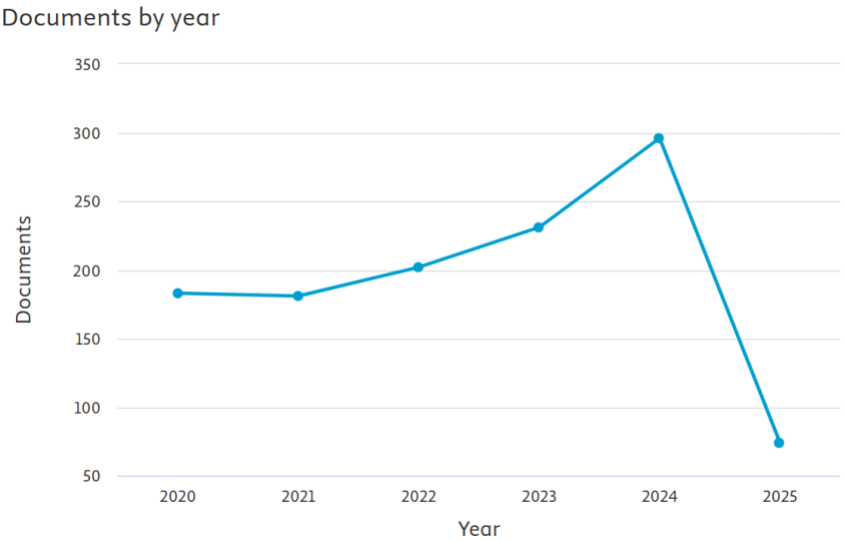

Figure 1: Publication quantity (year to year)

Source: Data processed (2025)

3.2 Distribution Across Global Regions and Organizations

Figure 2 shows the distribution of the number of scientific publications by country or region that address the topic of CEO characteristics and company financial performance. It can be seen that Indonesia occupies the top position with the highest number of documents, which is almost 180 documents. This shows that issues related to the role and characteristics of CEOs in influencing company performance are of great concern in the Indonesian academic and professional environment. This could be due to the evolving business dynamics increasing awareness of the importance of good corporate governance, and a strong push from local research institutions and universities to produce scholarly works on management and leadership.

Furthermore, the United Kingdom took second place with a significant contribution of documents, signaling the country's consistency in producing quality research on corporate governance and leadership strategies. This was followed by countries such as Jordan, China, Malaysia and Saudi Arabia, which contributed between 70 and 80 documents each, reflecting the increasing interest from Asia and the Middle East in the relationship between executive leadership and corporate financial performance. Meanwhile, developed countries such as the United States and India contributed more than 50 documents, showing that although they have well-established research ecosystems, the focus on this topic does not dominate exclusively compared to countries such as Indonesia or the UK.

This distribution illustrates that there is global engagement on the theme of CEO characteristics and financial performance, but with varying intensity. These differences can be influenced by the economic context, business regulations, local academic trends, and ease of access to company data. In addition, the increasing number of publications from emerging economies also indicates a transformation in the global research landscape, where countries are increasingly active in contributing to the international scholarly discourse.

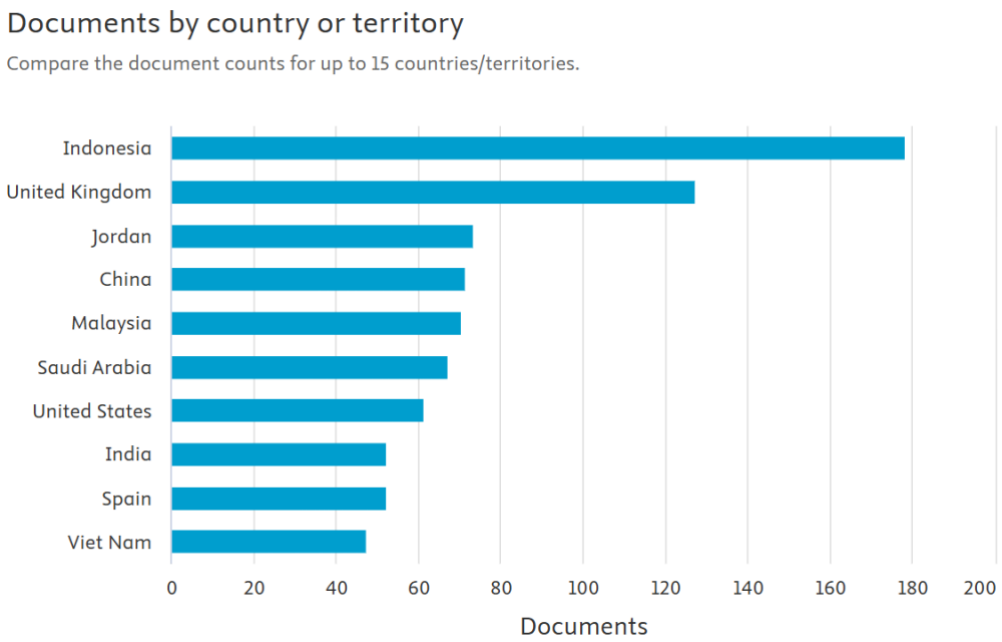

Figure 2: Top 10 most contributing countries

Source: Data processed (2025)

3.3 Leading Authors and Their Role in Advancing CEO Characteristics Literature

Figure 3 shows the list of leading authors who are most productive in contributing scholarly works related to the topic of CEO characteristics and firm financial performance. The two names that stand out at the top are Ali, A. and Lehenchuk, S., each with seven documents. Their dominance indicates a strong commitment to digging deeper into the relationship between executive leadership and financial outcomes, both through empirical and conceptual approaches. Their contributions are likely to be an important reference in the academic literature addressing the role of CEOs in driving efficiency, profitability and corporate governance.

In addition, Civelek, M. comes next with 6 documents, signaling a consistent research intensity in this area. Other authors such as Aljughaiman, A.A., Cristea, M., and Elnahass, M. each contributed 4 publications, reflecting the global collaboration in the development of this study, including from the Middle East, Europe, and Southeast Asia. Interestingly, names such as Endri, E., Riyadh, H.A., and Setiawan, D. indicate significant contributions from Indonesian academics, which is consistent with previous data that Indonesia is the country with the highest number of publications on this topic.

This distribution of contributions underscores the importance of the authors' role in driving the development of scientific discourse related to leadership characteristics and organizational performance. These authors contribute not only quantity, but also most likely quality and diversity of perspectives, including cultural factors, organizational structures, and local market dynamics that shape their findings. The existence of these authors as key drivers in the literature on this topic provides an important foundation for new researchers to continue, develop, and even criticize existing approaches and theories.

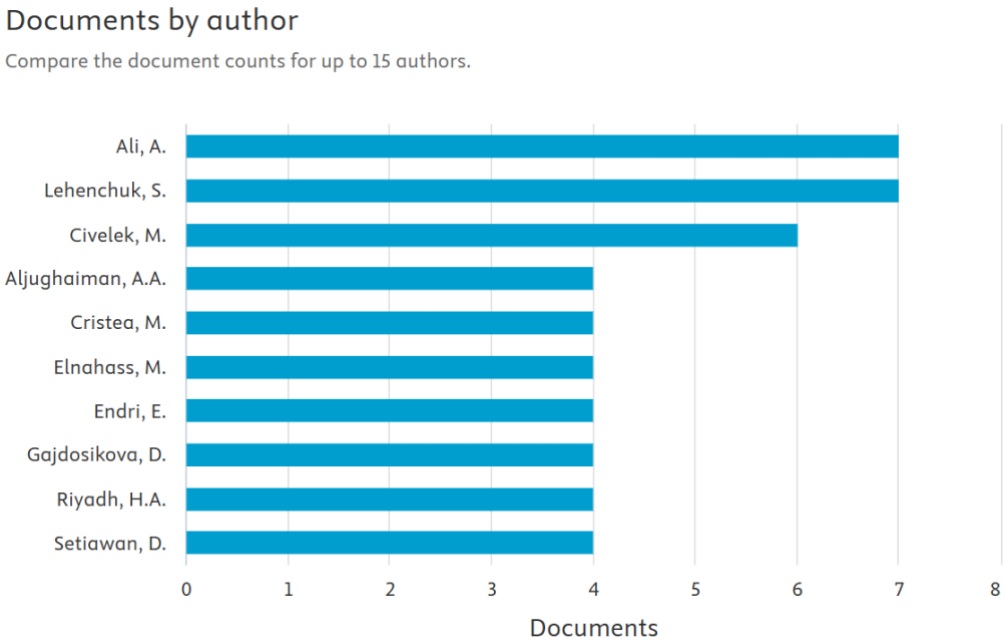

Figure 3: Top 10 Authors in CEO Characteristics Publication

Source: Data processed (2025)

3.4 Affiliate in CEO Characteristics Publication

Figure 4 displays the distribution of the number of documents by academic institutional affiliation examining the topic of CEO characteristics and financial performance, and shows significant differences in institutional contributions to this field. Bina Nusantara University tops the list with almost 18 documents, signaling a dominant position in academic contributions to strategic managerial studies. This dominance reflects focused research priorities, institutional support for scholarly publications, and the potential for strong collaboration between faculties within the university. However, the dominance of one institution can also be indicative of unequal distribution of knowledge, leading to the dominance of a particular regional or methodological perspective.

Prince Sattam Bin Abdulaziz University and Universiti Utara Malaysia, which contributed 15 and 14 documents respectively, show that the Asian and Middle Eastern regions have an increasingly central role in the study of leadership and corporate performance. This phenomenon indicates a geographical shift in the centers of knowledge production, which were previously more concentrated in Western countries. However, despite the increasing contribution of institutions from developing countries, it is worth reviewing whether the methodologies and research approaches used are sufficiently critical and contextualized to local realities, or simply adopt western theoretical frameworks without adequate adaptation.

Furthermore, there are institutions such as Universitas Airlangga, Al-Balqa Applied University, and Middle East University Jordan that, despite their smaller contributions in quantity (10-13 documents), still show an even distribution of research interests. However, the gap between the top and bottom institutions in this graph indicates that cross-institutional collaboration challenges may still be limited. This may result in a lack of diversity in research approaches, as well as limited academic dialogue across organizational cultures and leadership structures in different countries.

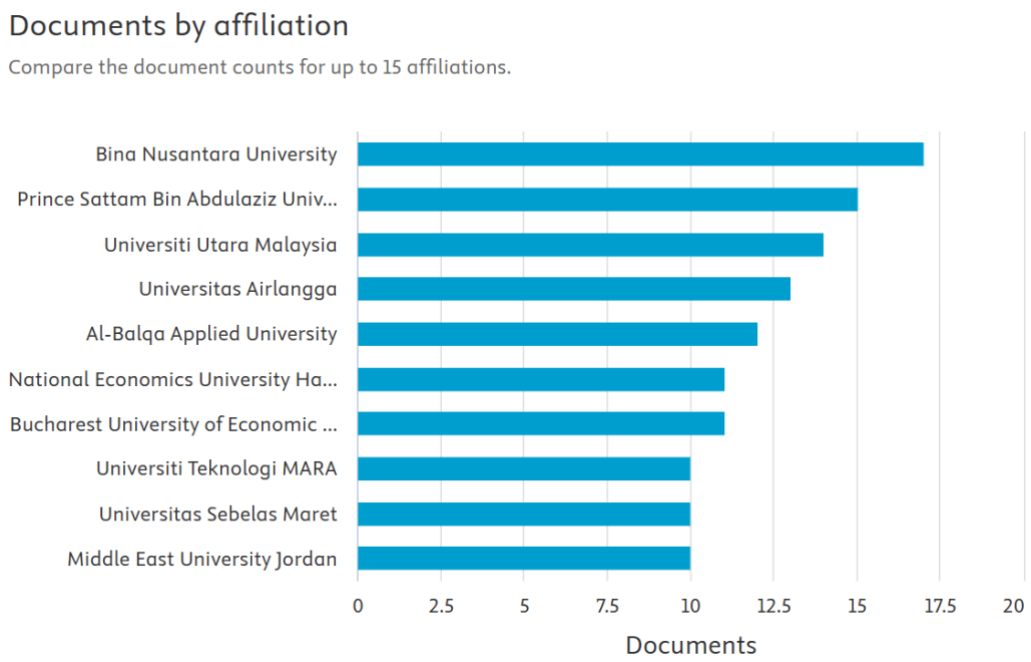

Figure 4: Top 10 Affiliates in CEO Characteristics Publication
Source: Data processed (2025)

3.5 Network Analysis of Conceptual Structure

Figure 5 illustrates the topics related to CEO characteristics and firm financial performance. Critically, the network shows that the study of financial performance does not stand alone, but strongly intersects with various conceptual dimensions such as profitability, firm value, capital structure, to CEO characteristics and intellectual capital. These close linkages indicate that a firm's financial performance is not only influenced by internal financial factors, but also by broader elements of managerial, leadership and intellectual capital.

Furthermore, the different colors on the network reflect thematic clusters. The green cluster, for example, focuses more on the direct relationship between financial variables and organizational elements such as "CEO characteristics", "return on equity", and "ROA", suggesting a strong tendency in research to link leadership profiles with corporate financial outcomes. On the other hand, the red and yellow clusters direct attention to the dimensions of sustainability, environmental management, and innovation, suggesting that financial performance cannot be separated from ESG (environmental, social, and governance) considerations.

Interestingly, some nodes such as "Jordan", 'banks', or "small and medium-sized enterprises" indicate the contextual and sectoral dimensions of this study. Their presence indicates that the discourse of financial performance is also contextual and not universal depending on the geographical region and industry type. This is an important signal for researchers not to simply generalize findings, but to consider the contextual variables inherent in their case studies.

Overall, the network map not only maps the knowledge structure, but also reveals contemporary research orientations, shows cross-concept linkages, and demonstrates the evolution of paradigms in understanding financial performance. As such, this analysis provides a reflective and strategic tool for researchers to identify literature gaps, potential thematic collaborations, and directions for theory development that are more inclusive and relevant to the complexities of the modern business world.

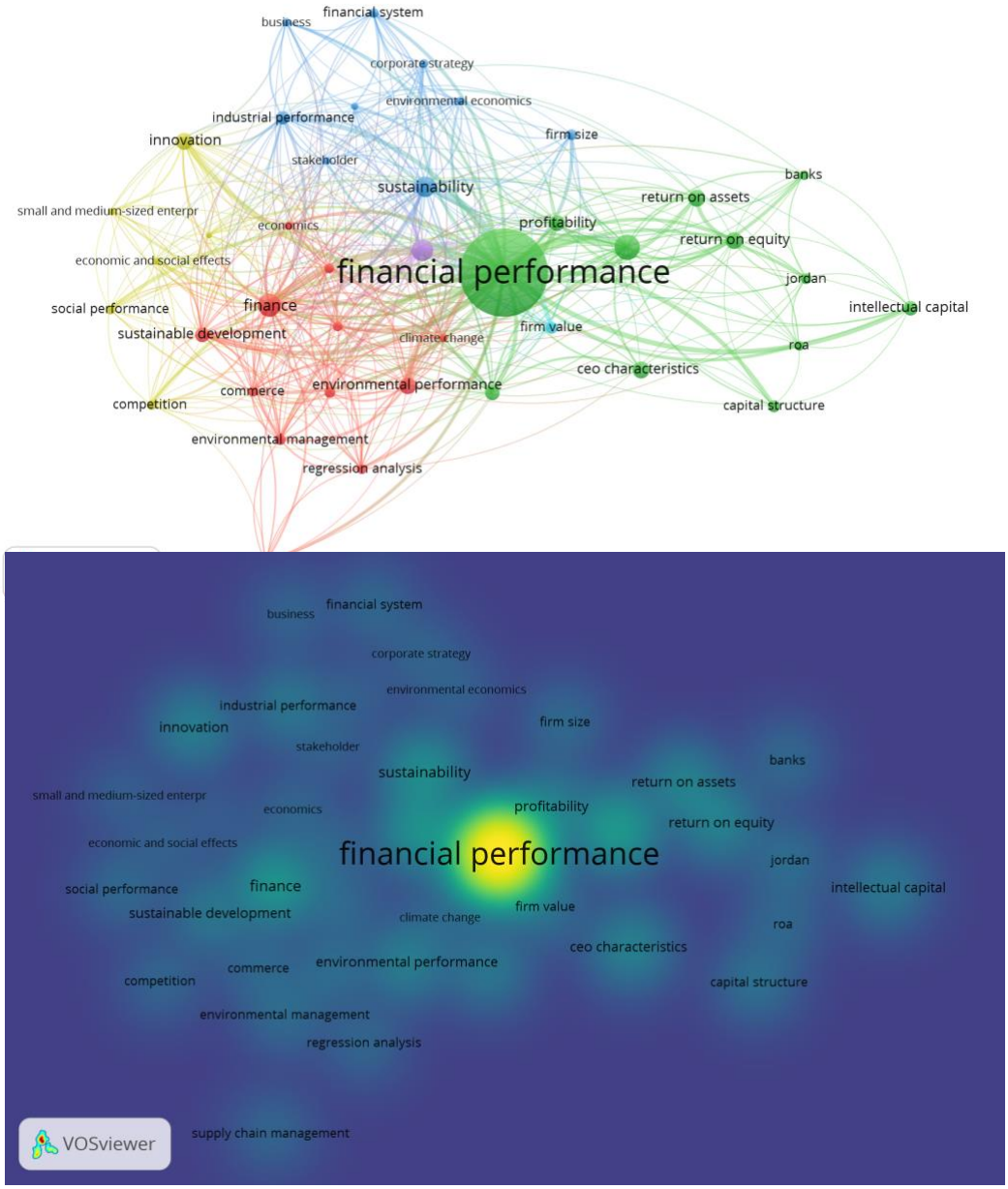

Figure 5: Graphical representation of the co-occurrence network
Source: Data processed (2025)

4. Conclusion

A total of 1,167 articles on CEO characteristics and financial performance were analyzed in this study using VOSviewer software to process them. By collecting and analyzing 1.167 publications from various academic databases, mainly Scopus, this study shows that CEO characteristics, such as experience, education, and leadership style, have a significant influence on the strategic decisions taken by companies. This finding is in line with the upper echelons theory which states that the background and individual characteristics of leaders can influence how they perceive the strategic environment and, ultimately, affect organizational performance. Thus, a deeper understanding of these characteristics can provide valuable insights for companies in selecting and developing effective leaders.

While there has been a significant increase in the number of publications on this topic, especially since 2022, the sharp decline in 2025 suggests a possible saturation in this research. This decline could be interpreted as an indication that many important aspects of the relationship between CEO characteristics and financial performance have already been explored, necessitating new approaches or a deeper focus on more relevant issues, such as corporate sustainability and the impact of new technologies in management. In addition, this shift in research focus may also reflect changes in academic and industry priorities, where issues such as corporate social responsibility and sustainability are increasingly dominating discussions among researchers and practitioners.

The distribution of publications showing the dominance of countries such as Indonesia and the UK signals a shift in the center of knowledge production. Indonesia, as the country with the highest number of publications, shows that issues related to CEO characteristics and firm performance are highly relevant in the local context, driven by evolving business dynamics and awareness of the importance of good corporate governance. However, challenges remain in terms of methodology and local context that need to be addressed so that the research does not simply adopt Western theoretical frameworks without adequate adaptation. Therefore, it is important for researchers to consider contextual variables that may influence the research results, so as to produce more relevant and applicable findings.

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Analyzing Gender Disparity Through a Financial Inclusion Lens in Tanzania: Is Government Gender-based Policy Intervention Helpful?

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Abstract
This paper examined gender disparities in financial services utilization in Tanzania benefiting from FinScope surveys database. The FinScope surveys are national surveys representative of individuals aged sixteen years or older conducted after every 5 years. The paper used the data collected in 2009, 2013, 2017 and 2023. The Kruskal-Wallis test was conducted to assess gender differences in the usage of financial services and financial exclusion, and whenever the test indicated significant differences a Dunn's post-hoc test was performed for significant variables to determine which specific groups (male or female) differed significantly within those parameters. The findings reveal significant gender differences in formal financial services usage, informal financial services usage and complete financial exclusion. The results show that women are left behind by men in usage of formal financial services throughout the period examined, while the rate of women using informal financial services is reported to be higher than that of their men counterparts. It was further found that a greater percentage of women are completely financially excluded as compared to men. These results underscore the need for targeted policies to promote financial inclusion and reduce gender-based financial inequalities in Tanzania. The study proposes policymakers to prioritize targeted interventions to address gender disparities in financial service usage. Initiatives such as gender-responsive financial products, financial literacy programs and streamlined account- opening processes can help bridge the gap. Efforts should also aim to reduce cultural and procedural barriers that disproportionately affect women, ensuring equitable access to financial services.

Keywords: Financial Inclusion, Formal Financial Services, Informal Financial Services, Gender Gap

1. Introduction

When one says financial inclusion literally the focus is on the availability, accessibility, and usage of financial services for individuals and businesses, which is considered as a fundamental pillar of economic development. Financial inclusion improves the livelihoods of individuals and communities by enabling individuals to save, borrow, invest, and transact as advocated by Ozili, (2020). Apart from improving the livelihood of individuals and communities, financial inclusion particularly contributes significantly to reducing poverty and economic development, playing a key role in achieving sustainable development goals (Beck *et al.,* 2007; Nsiah *et al.,* 2021; Ozili *et al.,* 2022). Financial inclusion has been proven by Ma'ruf & Aryani (2019) to have significantly contributed to achieving SDGs, specifically poverty alleviation.

Meanwhile digital financial services have emerged as a crucial driver of financial inclusion, specifically for developing countries in Africa and Asia as insisted by Khera *et al*., (2022). Both Ozili (2018) and Kouladoum *et al.* (2022) consider digitalization as a pillar of financial inclusion in developing countries where digital financial services significantly improve the rate of financial inclusion in African countries. The modern technological developments and the adoption of digital financial services such as mobile money, internet banking, and electronic payment systems lowered the cost of financial transactions which ultimately improved outreach to the poor, Sahay *et al.* (2020). According to Nguena (2019) Africa has heavily benefited from mobile phone technology and financial innovations which have transformed the financial landscape. This has increased the financial service outreach to rural areas, where the majority of the population were previously excluded.

Gender is one of the common aspects in analyzing the financial inclusion. Unequal social relations and unequal opportunities create gender-specific barriers to financial access, which in most cases have resulted in missed opportunities for growth and persistent inequalities, Sahay *et al.;* (2020). In the hunt for gender equality, financial inclusion stands out as a critical frontier. Despite significant strides in various sectors, women in sub-Saharan Africa continue to face disproportionate challenges in accessing financial services, DFI, (2024). According to DFI, (2024) the digital revolution has steered in unparalleled opportunities for economic growth, connectivity, and innovation. However, it also presents challenges, particularly in ensuring that these benefits are accessible to all, regardless of gender. More precisely, empowering women through financial inclusion not only fosters gender equality but also stimulates economic growth, enhances social well-being, and leads to more resilient and inclusive societies.

The shift towards digital technology during the COVID-19 pandemic has exposed the deep digital divide and missed opportunities, particularly for unbanked women and rural populations (Agur et al. (2020). As countries continue to embrace the 'new normal', digital financial services will play a more prominent role as a platform for individuals and businesses to access a variety of financial products and services. Financial inclusion helps in reducing gender disparity and empowers women to save, invest, and transact through access to financial services. Women who are included in access to financial services are more active economically and contribute towards entrepreneurship and development (Bhatia & Singh, 2019; Goel & Madan, 2019; Aziz *et al.,* 2022). Financial development has a positive effect on women's empowerment, while gender discrimination, despite financial development, has a negative impact on women's empowerment, Arshad, (2023). Despite this progress, globally, a significant gender gap in account ownership persists, though mobile money shows promise in narrowing this divide, Demirgüç-Kunt et al., (2022). In many countries, particularly in developing nations, significant disparities exist in access to financial services. Among the most notable disparities is gender inequality, with women often facing greater challenges in accessing and utilizing formal financial services compared to men (Kara *et al.,* 2021; Tay *et al.,* 2022).

Tanzania is among the developing countries that have made outstanding progress in the increase of access to formal financial services, which increased by 13% during the last decade, the increase is largely driven by mobile money services, Finscope, (2023). The increase was reflected in both access to and use of formal financial services. However, despite the deliberate efforts to boost access to formal financial services, financial inclusion in Tanzania is gender-biased, and women still lag behind in both access to and use of formal financial services. According to Finscope, (2023) the formal financial inclusion gender gap narrowed from 10%-points in 2017 to 3%-points in 2023. In addition, there is a noted significant decrease in female exclusion from 30% in 2017 to 19.4% in 2023. Nonetheless, the banking gender gap remained more or less the same between 2017 and 2023, with about 9%-point more men being banked compared to women indicating a less deepened financial service penetration among women than among men. While Tanzania's National Financial Inclusion Framework for 2022–2028 aims to increase access to financial services among the adult population to over 80 percent by 2028, challenges remain regarding women's access to and use of financial services. The elimination of gender disparities in financial inclusion may be at risk or remain a mirage, partly because of unequal access to and use of digital financial channels, especially given the accelerated shift to digital financial services. There is a need for a better understanding of gender dynamics and barriers to financial inclusion in the context of everchanging dynamics in technological innovations. Gender disparities in financial inclusion have been widely studied across various regions, yet there is a scarcity of research analyzing gender disparities in financial services in Tanzania. This

paper deliberately assesses the gender gap in financial inclusion, and evaluates the regulatory interventions used in Tanzania to close the gap as reported in Finscope, (2023).

2. Relevant Literature and Hypotheses Development

Financial inclusion ensures all individuals and businesses have access to financial services, specifically vulnerable groups who are excluded from using financial services (Beck *et al.,* 2007; Lyons & Kass-Hanna, 2019; Demirgüç-Kunt *et al.,* 2022). Financial inclusion plays a pivotal role in fostering economic growth and poverty reduction, aligning with the global efforts to achieve the United Nations' Sustainable Development Goals (SDGs), particularly Goal 1 (No Poverty), Goal 8 (Decent Work and Economic Growth), and Goal 10 (Reduced Inequality) (Sarma & Pais, 2011; Tay *et al.,* 2022; Ozili, 2022). Erlando et al. (2020) study the impact of financial inclusion on economic growth in Indonesia using a bivariate causality model and find that FI significantly contributes to economic growth, poverty reduction, and income inequality. Similarly, Daud (2023) finds that financial inclusion and digital technology are positively correlated with economic growth.

A large body of literature highlights that financial inclusion contributes to economic resilience by enabling individuals and businesses to better manage risks, increase investment opportunities, and improve their standard of living (Belayeth Hussain *et al.,* 2019; Ajide, 2020; Hussain *et al.,* 2021). For instance, Sakyi-Nyarko *et al.* (2022) reveal that financial inclusion significantly enhances household financial resilience, with savings and formal account ownership yielding stronger effects compared to mobile money. Urrea & Maldonado (2011) demonstrate that access to savings and credit, both formal and informal, significantly mitigates household vulnerability to income shocks. Similarly, financial inclusion enhances entrepreneurship by enabling access to capital and insurance, which are essential for starting and growing businesses (Goel & Madan, 2019; Wellalage *et al.,* 2021). Hasan *et al.* (2023), using the Global Findex database, reveal that women entrepreneurs with greater digital financial literacy are more likely to use formal banking. Furthermore, digital financial services have revolutionized access, particularly in remote areas, by overcoming geographical and infrastructure barriers (Tay *et al.,* 2022). Kamara & Yu (2024) highlight that FinTech enhances financial inclusion by improving demographic access but negatively impacts geographic reach and usage. A number of studies reveal that financial inclusion significantly reduces income inequality and improves household income (Kim, 2015; Zhang & Posso, 2017; Kling *et al.,* 2020; Adera & Abdisa, 2023).

However, despite progress in some regions, a large segment of the global population remains excluded from formal financial services. According to Global Findex (2021), 1.4 billion adults still remain unbanked, with the vast majority living in developing countries (Demirgüç- Kunt *et al.,* 2022). While extensive research explores the impact of financial inclusion on economic growth, poverty reduction and resilience, Tanzania remains largely absent from these discussions. Most studies focus on regions with more developed financial infrastructures, while Tanzania faces unique challenges that have not been investigated.

Access to financial services is often limited by lack of education or financial literacy (Lusardi & Mitchell, 2011; Ambarkhane *et al.,* 2022). Kara *et al.* (2021) reveal that access to credit is positively influenced by higher education and financial literacy, while demographic and socio-economic factors, such as lower income, minority status, gender, and disability, significantly hinder access, leading marginalized groups to rely on high-cost fringe finance providers. Similarly, Saluja (2023) in a systematic review revealed that women's financial inclusion is hindered by barriers such as patriarchal norms, psychological constraints, low income, limited financial literacy, restricted accessibility, and ethnic disparities, while interventions including government initiatives, microfinance, formal savings, asset transfers, self-help groups, and digital solutions have shown potential to address these challenges.

Demirgüç-Kunt & Klapper (2012a) using the Global Findex database, reveal that limited access to formal financial institutions, reliance on informal methods, and insufficient support for high-growth enterprises highlight significant barriers to financial inclusion. Studies show that in many developing countries, cultural norms, religious beliefs, and gender biases restrict financial inclusion (Demirguc-Kunt *et al.,* 2014; Lu *et al.,* 2021; Kulkarni & Ghosh, 2021; Aslan, 2022). Anyangwe *et al.* (2022) find that cultural dimensions, such as power distance, masculinity, and uncertainty avoidance, act as barriers to financial inclusion, while individualism, long-term

orientation, and indulgence positively influence formal account ownership and usage. Additionally, Demirgüç-Kunt *et al.* (2013) find that Gender disparities in financial inclusion are influenced by legal restrictions, discriminatory norms, and socio-cultural factors, with women in restrictive environments significantly less likely to own accounts or access savings and credit services.

Studies highlight that high cost, regulatory requirements (e.g., KYC), and distance significantly impact financial inclusion and hinder financial services usage (Allen *et al.,* 2016; Aslan, 2022; Saluja *et al.,* 2023). Sanderson *et al.* (2018) demonstrate that barriers to financial inclusion include documentation requirements and the distance to financial access points, while age, education, financial literacy, income, and internet connectivity are key enablers. Ghosh (2020) states that distance is a major barrier to using bank accounts, with both travel time and physical distance reducing financial inclusion. Demirgüç-Kunt & Klapper (2012b) reveal that barriers such as high costs, physical distance, and lack of documentation significantly limit account usage. In the same way, Ayyagari & Beck (2015) highlight that financial inclusion in developing Asia is low, with fewer than 27% of adults having a formal bank account and only 33% of enterprises having access to credit or loans. Despite superior banking sector depth in the region, significant barriers such as cost, geographic access, and lack of identification hinder broader financial inclusion. Similarly, Fungáčová & Weill (2015) reveal that lower income and education are associated with less use of formal accounts and savings. Additionally, a large body of literature highlights that higher income is positively related to the usage of financial services and financial inclusion, or vice versa (Demirgüç-Kunt & Klapper, 2012a; Park & Mercado, 2015; Sanderson et al., 2018).

Globally, women are disproportionately excluded from financial systems, reflecting broader gender inequalities. According to Global Findex 2021, the gender gap in developing economies has fallen from 9% to 6% (Demirgüç-Kunt et al., 2022). Women face more barriers to access to credit compared to men (Sandhu *et al.,* 2012; Mascia & Rossi, 2017). Social and cultural norms restricting women's mobility, decision-making power, and access to education are major contributors to this disparity (Demirgüç-Kunt et al., 2013). Similarly, Pahlevan Sharif *et al.* (2013) highlight that education is a key in reducing the gender gap in financial inclusion. In addition, Ndoya & Tsala (2021) reveal that income is the largest contributor to the gender gap in access to financial products and services, while education is the primary driver of the gap in their usage. Esmaeilpour Moghadam & Karami (2023) confirm that education reduces the gender gap in financial inclusion; however, this effect is insignificant in countries with high levels of gender discrimination.

Roy & Patro (2022) in a structured systematic literature review of 75 peer-reviewed articles (2000–2021) revealed that gendered financial inclusion is primarily influenced by demand-side factors, alongside socio-economic and cultural barriers. Studies highlight that digital financial services and FinTech help reducing gender gap (Esmaeilpour Moghadam & Karami, 2023; Mabrouk et al., 2023; Yeyouomo *et al.,* 2023). For instance, Yeyouomo *et al.* (2023) in a study Sub-Saharan Africa reveal that fintech helps reduce the gender gap in access to and use of financial services. In contrast, Johnen & Mußhoff (2023) find that formal digital credit has unexpectedly widened the gender gap in financial inclusion, primarily due to socio- economic disparities and uniform contract terms. Bala & Singhal (2018) also confirm this and state that this is primarily driven by exclusion from basic technological skills, social norms, and financial constraints. Ashoer *et al.* (2024) find that men are more likely than women to benefit from mobile fintech services. The digital gender divide limits women's access to ICTs, skills, and leadership, potentially worsening gender inequalities (Kuroda *et al.,* 2019). Fowowe (2025) further find that financial inclusion significantly enhances agricultural productivity in Mali, while gender gaps persist, with women's productivity notably lower than men.

Following these discussions, one may come up with a general understanding that men are more included in formal financial services than women, and that women are more included in informal financial services while more women are financially excluded than men. Therefore, the following hypotheses are proposed;
H_1: There is a significant gender difference in formal financial service usage among Tanzanian adults
H_2: There is a significant gender difference in informal financial service usage among Tanzanian adults
H_3: There is a significant gender difference in financial exclusion among Tanzanian adults

3. Approach and Data

3.1 Data

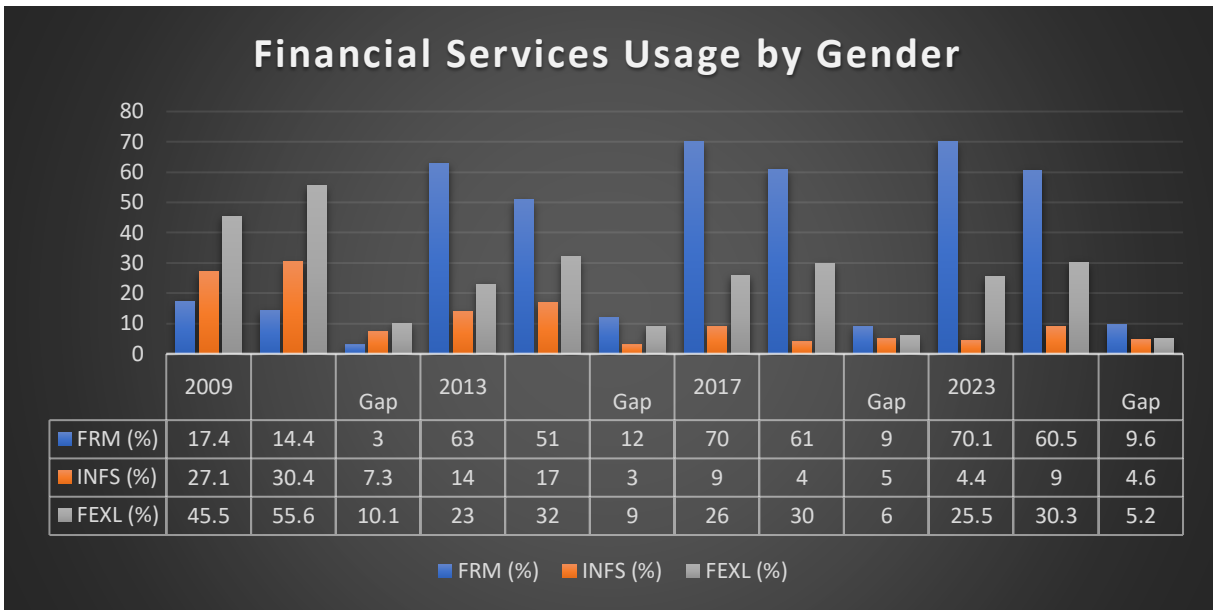
This study benefited from Tanzania's FinScope surveys data. The FinScope surveys are national surveys representative of individuals aged sixteen years or older which are conducted after every 5 years, and the study uses the data collected in 2009, 2013, 2017 and 2023. The FinScope surveys use four 'access strands' to denote respondents' levels of financial inclusion: (i) use banks; (ii) use non-bank formal products; (iii) use only informal mechanisms; (iv) are excluded. Respondents are ranked according to their highest level of usage. According to the survey, formal bank institutions are those supervised by a financial services regulator, the Bank of Tanzania (BOT). Non-bank formal financial institutions are those with some formal supervision, but not by a financial services regulator. This category includes savings and credit cooperative societies, microfinance institutions, remittance companies, and mobile money. The informal segment includes small, usually community-based organizations, such as saving or credit groups (SACCOS). The totally unserved or excluded category covers everyone else and includes people who may use non-monetary means to save, borrow, or transfer money, that is, friends and family, or saving at home or in-kind.

3.2 Descriptive Statistics

Table 1 shows the usage of formal financial services, informal financial services and complete exclusion from any financial service by gender, while Fig. 1 visualises these disparities. The usage of formal financial service shows the largest and most consistent gap, increased significantly between 2009 and 2013 before it fell in 2017 and picked up slightly again in 2023. The usage of informal financial services notably dropped between 2009 and 2013, and this reflects the increase in usage of formal financial services, which may be due to some intervention by the Government to improve financial sector attracting more women to participate in the sector. This may also be observed by a slight drop in financial exclusion gap between 2009 and 2013. The possible reason may be due to the facts that between 2009 and 2023, Tanzania made remarkable progress in expanding the opportunities for adults to access financial services. Various government- sponsored studies were conducted to better understand the challenges, and this resulted in a national agenda that prioritized financial inclusion, particularly the inclusion of women and vulnerable groups. The launch of Tanzania's first National Financial Inclusion Strategy in 2014, combined with the introduction of technology for mobile phone financial services, led to female' formal financial inclusion rising from around 15% in 2009 to 61% in 2023 (Figure 1 and 2). Reliance on informal financial services by women declined from 30% in 2009 to 9% 2023; and the financially excluded women were slashed down from 55% in 2009 to 30% in 2023.

Table 1. Descriptive summary of financial services utilization by gender (2009-2023)

Year	Gender	FRM (%)	INFS (%)	FEXL (%)
2009	Male	17.4	27.1	45.5
	Female	14.4	30.4	55.6
Gap		**3.0**	**7.3**	**10.1**
2013	Male	63.0	14.0	23.0
	Female	51.0	17.0	32.0
Gap		**12.0**	**3.0**	**9.0**
2017	Male	70.0	9.0	26.0
	Female	61.0	4.0	30.0
Gap		**9.0**	**5.0**	**6.0**
2023	Male	70.1	4.4	25.5
	Female	60.5	9.0	30.3
Gap		**9.6**	**4.6**	**5.2**



	2009		Gap	2013		Gap	2017		Gap	2023		Gap
FRM (%)	17.4	14.4	3	63	51	12	70	61	9	70.1	60.5	9.6
INFS (%)	27.1	30.4	7.3	14	17	3	9	4	5	4.4	9	4.6
FEXL (%)	45.5	55.6	10.1	23	32	9	26	30	6	25.5	30.3	5.2

Figure 1: Financial Services Utilization and gender gap (2009-2023)

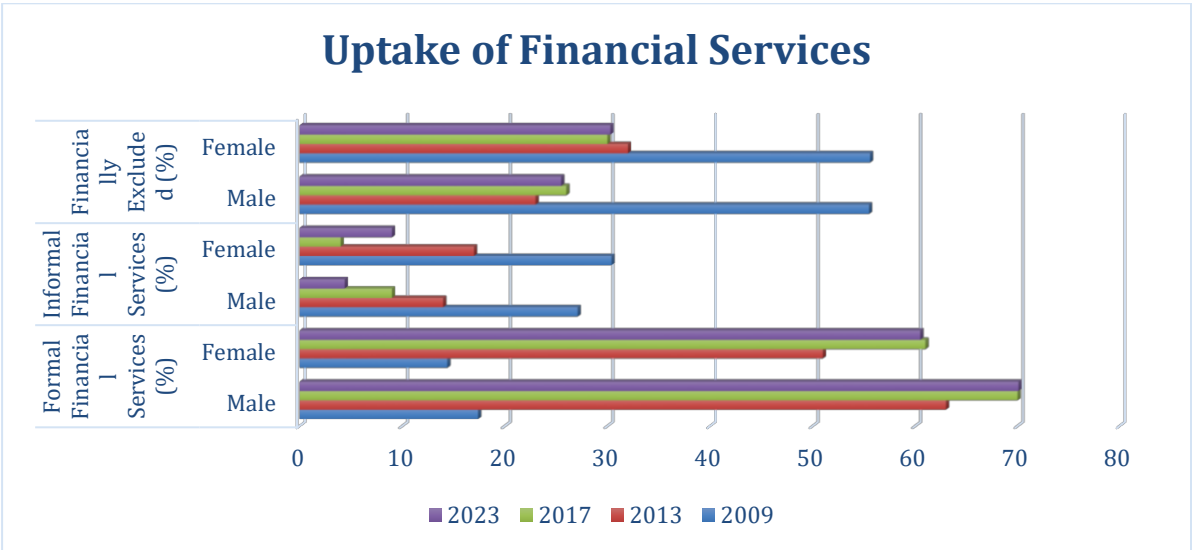


Figure 2: Uptake of Financial Services by gender

4. Analytical Results

The Kruskal-Wallis test was conducted to assess gender differences in the usage of financial services and financial exclusion, and whenever the test indicated significant differences a Dunn's post-hoc test was performed for significant variables to determine which specific groups (male or female) differed significantly within those parameters, Dunn, (1964).

Table 2 below presents the Kruskal-Wallis test which shows significant gender differences in formal financial services usage with p-values 0.01. These findings suggest that gender plays a crucial role in determining access to and usage of formal financial services in Tanzania. This finding aligns with Antonijević *et al;* (2022) who found a significant gender gap in access and usage of financial services across the globe using the Global Findex database 2017. Furthermore, the Kruskal-Wallis test also shows a significant gender difference in usage of non-financial services with p-value 0.03. Some studies are consistent with the findings presented in this paper, for instance, Pahlevan Sharif *et al;* (2013) who analysed the gender gap in financial inclusion in low-income economies found significant differences with men using the services at a higher rate. Similarly, Aziz *et al;* (2022) found that women are less likely to use financial services, especially in countries with religious restrictions Finally,

the test shows a significant gender difference in financial exclusion with p-value 0.04. While Table 2 provides only the presence of significant gender differences in all three variables-formal financial services, informal financial services and financially excluded, the nature of these differences are analyzed using Dunn's test. The results indicate that women are relatively less likely to access formal financial services compared to men. These results were obtained without controlling for a variety of factors such as education, income, marital status and employment. However, the impact of education on the likelihood of accessing financial services is notable suggesting that the relative significance of education in the utilization of traditional formal financial services. Furthermore, factors such as income, mobile phone ownership, and formal employment, in which women rank lower, significantly increase financial inclusion, and this ultimately places further constraints on their access to both formal and informal financial services

Table 2: Results of the Kruskal-Wallis test

Variable	Kruskal-Wallis Statistic	p-value	Hypothesis
Formal Financial Services	5.78	0.01	Accepted (H1)
Informal Financial Service	4.45	0.03	Accepted (H2)
Financially Excluded	3.21	0.04	Accepted (H3)

Kruskal-Wallis test only detects the presence of differences but does not specify which groups differ. In this case Dunn's test with Bonferroni correction was applied to adjust for multiple comparisons (Dinno, 2015). Table 3 below explores the specific nature of gender differences. The test confirmed significant gender differences in usage of formal financial services, with men being significantly more likely to own use formal financial services than women ($Z = -2.44$, $p = 0.01$). Similarly, women were found to have significantly higher rates of using informal financial services compared to their counterpart men ($Z = -2.25$, $p = 0.02$). Regarding financial exclusion the test shows that women are excluded from financial services significantly more than men ($Z = -1.99$, $p = 0.04$). This test provides further clarity, confirming significant gender differences in the services identified as significant in the Kruskal-Wallis test, with men consistently exhibiting higher usage rates, aligning with previous studies on the gender gap in financial inclusion (Antonijević et al., 2022; Demirgüç-Kunt et al., 2013; Mani, 2016; Kuroda et al., 2019; Aziz *et al.,* 2022; Demirgüç-Kunt et al., 2022; Roy & Patro, 2022).

Fungáčová & Weill (2015) found that lack of income and education are associated with less use of formal accounts and savings. Additional barriers, such as distance, procedural requirements, and cultural norms, exacerbate exclusion, particularly for women, aligning with the findings of Anyangwe et al. (2022), Demirgüç-Kunt et al. (2013), Allen et al. (2016), and Saluja et al. (2023). For instance, Anyangwe et al. (2022) highlight that cultural factors like power distance and masculinity hinder financial inclusion, while individualism and long-term orientation promote formal account usage. Mani (2018) finds that a significant gender gap persists in South Asian countries, with women in Afghanistan and Pakistan facing greater exclusion due to socio-cultural barriers and limited financial literacy. Similarly, Demirgüç- Kunt et al. (2013) find that legal restrictions, discriminatory norms, and socio-cultural factors significantly limit women's access to financial services.

Table 3: Results of Dunn's Post-Hoc test

Variable	Comparison	Z-Score	Adjusted P-value
Formal Financial Services	Male-Female	-2.44	0.01
Informal Financial Service	Male-Female	2.25	0.02
Financially Excluded	Male-Female	1.99	0.04

5. Influence of Government Interventions on Gender Gap Reduction

Results from this study show a consistent improvement of women engagement in financial inclusion significantly from 2017 in Tanzania. This may not be a surprise due to intentional efforts put forth by the Government towards

women empowerments and categorically focusing on gender-based interventions. Such efforts are earmarked below;

5.1 Setting women's financial inclusion as an explicit policy objective with quantitative targets

Tanzania's 2013-2016 Financial Inclusion Framework gave priority to poor rural households and their enterprises, including low-income women and youth, without specifying gender targets. Following the high-level conference on women's financial inclusion held in Yamoussoukro in August 2015 and the 7th AFI Global Policy Forum (GPF) held in Maputo in September 2015, the Bank of Tanzania decided to introduce gender targets and indicators in the revised measurement framework, with the possibility of integrating gender issues into the Financial Inclusion National Framework itself, and the implementation of the proposal started in 2016. This effort saw an immediate increase in women's formal financial service usage by 10% in 2017 (from 51% in 2013 to 61% in 2017) although the usage rate slightly dropped to 60.5% in 2023.

5.2 Disaggregating financial inclusion data by gender

One of the key gender-based intervention in (2013-2016) Financial Inclusion Framework is intentionally aiming at narrowing the gender gap in access to financial services. Perhaps most notably, Tanzania's internationally recognized mobile money framework and the establishment of interoperability have provided a major impetus to women's financial inclusion. The impact of implantation of this framework has been seen in 2017 where the migration from using informal financial services formal financial services was noted, as usage of informal financial services dropped from 17% in 2013 to 5% in 2017 and slightly dropped to 4.6% in 2023, while usage of formal financial services improved from 51% in 2013 to 61% in 2017 and slightly dropped to 60.5% in 2023. As mobile money receives growing attention for bringing women into the formal financial system, Tanzania's conducive policy environment for mobile money stands out as a success. The explanation for slight droppage of usage of formal financial services between 2018 and 2023 is the introduction of mobile money taxation which generally discouraged the usage of mobile money transactions.

5.3 Financial education and financial literacy programs

A financial capability survey was conducted in Tanzania in 2014, with results presented in a 2015 report. The framework informed that women are left behind in financial education, and hence in 2016 the education program was developed to serve as a special program for women, and largely rolled out to women entrepreneurs/women at home and rural poor/"survivalists" as targets for financial education interventions. It is believed that the financial education intervention rolled out in 2016 contributed significantly to the improvement of financial inclusion for women between 2013 to 2017 as previously analysed

6. A Concluding Remark and Policy Implication

This study examined gender disparities in financial services utilization in Tanzania using FinScope database. The findings reveal significant gender differences in formal financial services usage, informal financial services usage and complete financial exclusion. The results show that women are left behind by men in usage of formal financial services throughout the period examined, while rate of women using informal financial services is reported to be higher than that of their men counterparts as compared to their men counterparts. It was further found that a greater percentage of women are completely financially excluded as compared to men. These results underscore the need for targeted policies to promote financial inclusion and reduce gender-based financial inequalities in Tanzania. The study proposes policymakers to prioritize targeted interventions to address gender disparities in financial service usage. Initiatives such as gender-responsive financial products, financial literacy programs and streamlined account- opening processes can help bridge the gap. Efforts should also aim to reduce cultural and procedural barriers that disproportionately affect women, ensuring equitable access to financial services.

Since the access to financial services is overwhelmed by the use of digital technologies, and as the country continues to embrace digital transformation, it is crucial to put in place policies, measures, and strategies that are

inclusive and gender-sensitive, so that digitally constrained population groups including women can effectively participate and benefit fully. Thus, the promotion of equal access to and usability of digital financial facilities, including mobile phones and smartphones is critical not only for enhancing financial inclusion and closing the gender gap, but also for enhancing the resilience of households and businesses. Furthermore, there is a need for enhancing financial literacy, especially among women. Policies to promote financial inclusion should also be cognizant of gender differences in preferences. For instance, policies and initiatives to increase financial inclusion and the use of formal financial services by women should be geared towards promoting saving groups to reach out to more women, as bank-based products and initiatives largely benefit men. The provision of safety nets for extremely needy cases should be considered.

This study does not explore regional or urban- rural disparities, which may reveal even greater gender gaps in financial inclusion. Future research should focus on these dimensions to provide a more nuanced understanding of financial exclusion across Tanzania. Additionally, qualitative studies could investigate socio-cultural factors in greater depth, complementing quantitative findings.

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Impact of Working Capital Management on the Financial Performance of Select Listed Sectoral Indices: An Evidence from India

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Abstract
This paper is an attempt to investigate whether working capital management influences the financial performance of the sample companies or not. In order to achieve this objective, the researchers have taken into consideration seven sectorial indices and each sectorial index is represented by ten companies. The research is based on a reference period of fifteen years ranging from 2006 to 2020. The researchers have taken Return on Capital Employed (ROCE) and Return on Net Worth (RONW) as proxy to financial performance. After the thorough analysis, the overall findings put forth by the study confirm that working capital management has statistically significant impact on the financial performance of the sample companies. The findings presented by the study affirm that Average Receivable Period (ARP) and Average Payable Period (APP) positively impact the financial performance of the sample firms statistically in a significant manner. However, on the other hand, the results also affirm that Inventory Conversion Period (ICP) and Cash Conversion Cycle (CCC) negatively impact the financial performance of the sample firms statistically in a significant manner. These findings collaborate with the results of many major studies which are discussed in the empirical review of literature.

Keywords: Working Capital, Financial Performance, Sectoral Indices, ROCE, RONW, ARP

1. Introduction

The success of a firm in the present cut throat competitive corporate world depends upon how well management ensures efficiency and effectiveness in each and every area of business operation. In this regard, management of working capital has assumed a pivotal role which in part determines the success of a business firm, besides, it has been seen that inadequacy or mismanagement of working capital is the leading cause of business failures in the long run. Proper working capital management ensures adequate liquidity, solvency, profitability, besides, aids in the attainment of shareholders wealth maximisation objectives. According to (Bierman and Smidt, 1988; Paulo, 1992) Working capital management is closely connected to a business's success as it is significantly associated with every form of inventory, moreover, the goal of working capital management is to guarantee the effective and efficient employment of resources. As per (Brigham and Houston, 2007) the goal of Working capital management is to ensure that the firm is able to continue its operations and it has sufficient cash flow to satisfy both maturing short-term debt and upcoming operational expenses. Numaira et al. (2020) every business entity not only strives

for the continuity of existing customers but also makes efforts to attract potential customers which demands availability of optimal inventory so that orders can be met as and when received. Thus, in the existing competitive environment, better inventory management has become key to the success of every business entity throughout the globe. Therefore, significance of inventory management cannot be overlooked as it is the key to the operational efficiency of every firm.

There are various factors like nature of business, production policy, credit policy, inventory policy, market conditions, conditions of supply, business cycle, size of the firm, age of the firm, taxation policy, dividend policy, operating efficiency, price level changes, depreciation policy and availability of raw material that affect working capital requirements. Hence, firms are to be quite proactive while taking decisions regarding working capital requirements as it has a major effect on a company's balance sheet. It entails striking the appropriate combination between accounts receivables, accounts payables and inventories. (Nazir and Afza, 2007) Working capital management happens to be significant for firms and its essentiality is more seen in case of manufacturing concerns due to its direct influence on their performance. As per Deloof (2003), Working capital management is an effective way of handling current assets and current liabilities that assures optimal shareholder wealth and it demands adequate amount of liquidity to guarantee that short-term maturing commitments are met as and when they mature. Firms with an effective working capital management strategy experience optimal levels of liquidity which results into adequate profits in the long run. There are various theories to the management of working capital which include the agency/stakeholder theory, risk and return theory, the operation and cash conversion theory and the operating cycle theory. In order to get profitability and attain liquidity at maximum, it is compulsory to track the silent goals of working capital management. For a long time, there has been a debate on which theory should be followed to efficiently manage working capital. Some academicians advocated for prescriptive (normative) approaches while as others advocated positive (descriptive) approaches to working capital management. It is the proper application of these theories which ensures how well the firm can achieve its primary goals. Therefore, firms should take each and every factor into consideration which directly or indirectly influences the working capital requirements while framing an effective working capital management strategy.

2. Relationship between Working Capital Efficiency and Financial Performance

Working capital management do have a significant impact on both profitability and liquidity of firms (Shin and Soenen, 1998). Regarding liquidity, working capital management seeks to ensure that the investment in working capital components should be neither too little nor too much. The former could give rise to illiquidity, stock outs, and lost sales, whereas, the latter amounts to underutilization of financial resources and higher costs, Therefore, management of working capital requires careful planning so that both the excess and the scarcity of working capital in relation to the operational requirement of an undertaking can be avoided. Better practices related to Working capital management improve money flows in the firm, thereby, makes the firm less reliant on external funds resulting in reduced possibility of default. A major element in working capital management efficiency is cash conversion cycle. If there is larger time period of conversion cycle, there will be higher amount invested in working capital, therefore, higher amount of funds will be required which will result in higher Interest expenses, higher default risk and reduced profitability. Efficient working capital management allows firms to redeploy underutilized corporate resources to higher-valued use, such as the funding of cash acquisitions. Firms that converge to the optimal level, either by increasing or decreasing their investment in working capital, improve their stock and operating performance over the subsequent period. The conclusion of this discussion puts forth that working capital efficiency and financial performance are closely related to each other.

3. Empirical Review of Literature

A comprehensive review of empirical literature has been undertaken so as to develop a better understanding of the working capital management and its impact on the financial performance of firms. As Turner et al., (2012) rightly said that review of literature is the foundation for useful research. Thus, in this paper, the researchers have reviewed various studies that have helped in illuminating the various aspects of Working Capital Management i.e. inventory, receivables, payables and cash. These research pieces would not only help in grasping the idea as to what extend the knowledge of the subject is being implemented globally but would also help us to bring up the different areas

of Working capital management and analyze various concepts. Allwood (2012) rightly asserted that an extensive examination of the literature enables researchers to develop appropriate research questions and strategies. Hence, a detailed review is undertaken on working capital, its components, financial performance, measures of financial performance and the allied areas so as to develop a proper understanding of the subject area.

3.1. Inventory Management

The management of inventory has a significant bearing on the performance of every firm. There should neither be excess or short inventory as both are having negative impact on the financial performance of the firm. Kilonzo et al. (2016), undertook a study on inventory management and financial performance and the results confirmed that there is a positive and significant relationship between inventory management and financial performance of firms funded by government venture capital in Kenya. Roumaintsev and Netessine (2005) studied in their paper the relationship between inventory management policies and financial performance of a firm and they could not find any significant evidence that could confirm statistically significant association between the variables under study. Onikoyi et al. (2017) undertook an investigation, regarding cement sector and the results affirmed that there is a positive relationship between inventory management and organizational growth and profitability. That is, profitability of cement firms increases when effective inventory management is carried out, as inventory consists of major current assets of the cement sector. Agus and Noor (2006) examined the relationship between inventory management practices and financial performance. The study measured manager's perceptions of inventory and supply chain management practices and the level of performance in the industry. The findings suggest that inventory management practices have significant correlations with profitability and return on sales. Koumanakos (2008) studied the effect of inventory management on firm performance. The researcher took 135 manufacturing firms operating in three industrial sectors (food, textiles and chemicals) in Greece with a reference period from 2000 – 2002. The findings suggest that the higher the level of inventories preserved by a firm, the lower the rate of return. Vipulesh Shardeo (2015) investigated the effect of inventory management on the financial performance and the findings put forth by the study affirmed that there exists a positive relationship between inventory management and financial performance of the sample companies. Khurshid and Numaira (2022) undertook a study to assess the impact of inventory management on the financial performance of sample companies and the findings affirmed that Inventory Turnover Ratio does not have any statistically significant impact on the operating profits of the sample companies, thereby, accepting the null hypothesis which states that there exists statistically no significant impact of inventory management on the financial performance of sample companies.

3.2. Cash Management

Cash Management is one of the most important components of working capital management. It was Gitman (1974) who introduced the concept of Cash Cycle and later Richards and Laughlin (1980) developed the Cash Conversion Cycle into a comprehensive model. A dynamic measure of working capital is Cash Conversion Cycle which establishes the time to convert a dollar of cash outflow back into a dollar of cash inflow. The Cash Conversion Cycle shows the relationships among Working Capital Management, Working Capital Policy, and firm profitability. Odo and Udodi (2022) investigated the Influence of Cash Management on Financial Performance of select firms and the analyses showed that there is a strong negative influence of cash and cash equivalent on return on assets. Soet et al. (2018) examined the effect of operating cash flow management on financial performance of mutual funds in Kenya. The study found out that operating cash flow management has had a significant and positive effect on return on assets and insignificant and positive effect on return on equity. Thevaruban (2016) in his study confirmed that Cash ratio and financial performance do have statistically significant negative relationships with each other. Thus, management needs to ensure an adequate cash management control. Dhruba (2019) examined the impact of cash management on financial performance and the Study found that Cash management has an insignificant but positive effect on profitability. It clarifies that conversion cycle, cash flow and inventory management positively effect the profitability but the effect is nominal. Nuzulia et al. (2021) investigated the impact of cash management practices towards financial performance and the analysis shows a significant relationship between cash management practices and return on assets but a non-significant relationship between cash management practices and Gross Profit Margin. Thangjam Ravichandra (2015) undertook a research to examine the link between free cash flow and profitability of firms. The findings of the research demonstrated

that earnings and free cash flows are positively related. The analysis indicates, however, that the gains do not ensure unfettered cash flow to companies. Hafiza Faiza Muhammad (2015) made a study to assess the effects of the capital structure on a corporation's profitability. The research focuses on the automotive sector and includes five businesses. The researchers used the examination of numerous ratios to fulfil the aims of the study and the results of the research show that the capital structure has statistically significant consequences on the profitability of companies.

3.3. Receivable Management

One of the significant components of working capital is account receivable which is a direct result of credit sales. If the receivables are managed effectively, monitored efficiently, planned properly and reviewed periodically by the management, it can not only enable the firm to better its financial performance but it can also enhance its inventory turnover. Deloof, M. (2003) made a study and found a significant negative relation between gross operating income and the number of days accounts receivables, inventories and accounts payables of sample firms. The findings of the study suggested that managers can create value for their shareholders by reducing the number of days of accounts receivables and inventories to a reasonable minimum. Francis and Charles (2018) studied the impact of Receivable management and the study concluded that there is a strong positive and statistically significant correlation between cash conversion period and financial performance of sample firms. George et.al. (2021) examined the effect of receivable management on the financial performance of sample entity and the findings puts forth affirmed that the accounts receivable management had an inverse correlation with the financial performance. This negative correlation meant that an increase in the Average Collection Period of chartered public universities in Kenya resulted in a decline in the financial performance of these institutions. Munene and Tibbs (2018) investigated whether receivable management effects financial performance or not. The study found that the average collection period and current ratio have a significant positive effect on equities, indicating that a positive change in the debtor's payment period resulted in the company's improved financial performance. Adam and Caroline (2018) studied the relationship between accounts receivable management and financial performance of Small Medium Enterprises in Mogadishu, Somalia. The study revealed an underlying positive effect of accounts receivable on SMEs' financial performance in Mogadishu.

3.4. Payable Management

The amount of money that a recipient of goods promises to pay to the supplier is referred to as accounts payable. It is one of the major sources of unsecured short-term external finance for a firm, therefore, researchers all over the world have undertaken numerous studies to investigate the impact of accounts payable on financial performance of firms. Duru and Okpe (2016) examined the impact of accounts payable management on financial performance and the results arising after analysis confirmed that the relationship between accounts payable ratio and profitability is statistically positive and significant. The study also revealed that both Debt ratio and Sales growth rate had positive and significant effect on profitability of the Companies under study. Rotich and Achode (2016) studied the relationship between accounts payable and financial performance of sample firms. After the thorough analysis, the results showed positive relationship between accounts payable and financial performance of sample firms. Hence, recommended that firms should established a long-term relationship with suppliers in order to access trade credit in a more easy and fast way which will reflect in their financial performance. Nwakaego and Ikechukwu (2016) undertook a study to find out the effect of management of accounts payable on the financial performance of industrial and domestic manufacturing companies in Nigeria. The results put forth by the study confirmed a positive and significant effect of proper accounts payable management on profitability ratio. Mutai and Kimani (2019), investigated accounts payable management policies and its effect on liquidity. The findings revealed statistically significant positive relationship between Accounts Payables Management practices and liquidity. Moodley et al. (2014) undertook a study on accounts payable and their impact of return to investors. The findings clearly indicate that firms with low levels of accounts payable underperform. It is possible that this could be a result of companies taking advantage of settlement discounts and reducing payable days with the resulting negative impact on long-term return as a consequence of lower cash resources to otherwise invest. Elias and Nwankwo (2018) examined the impact of average payment period on the return on assets and the results indicated that average payments period has a significant negative impact on profitability. Based on the findings, the study

recommends that Nigerian insurance companies should endeavour to reduce their number of days accounts payables optimally and concentrate on reducing the high variability in the average payables period to enhance their corporate profits.

3.5. Working Capital Management and Firm Performance

As per the research finding, there exists statistically significant correlation between working capital management and firm performance. (Nyamao, et al., 2012) observed in their study that the financial performance is positively related to efficiency of cash management, receivables management, inventory management and Payable management. The study further puts forth that working capital management practices have an influence on the financial performance of Small-Scale Enterprises. Konak and Guner (2016) confirmed in their study that effective management of working capital, such as decrease in short term debt turnover days positively affect the performance of firms. Le, et al. (2018) undertook a study and affirmed that Working Capital Management positively impacts the financial performance of firms. The cash conversion cycle has a significant positive relationship with firm performance as cash conversion cycle had statistically significant relationships with two out of three firm performance measurements. Niresh (2012) working capital management is a crucial element in determining the financial performance of a firm, particularly, manufacturing firms. Therefore, such firms should manage their working capital efficiently to achieve optimal profitability which can be achieved by improving the inventory control process, collecting receivables in line with the agreed credit terms and by delaying payments to suppliers. All these will lead to shorten the cash conversion cycle resulting to an increase in profitability. Charitou, et al. (2010) undertook an empirical investigation that shows the effect of working capital management on firm's financial performance in an emerging market. The results indicate that the cash conversion cycle and all its major components; namely, days in inventory, days sales outstanding and creditors' payment period are associated with the firm's profitability. Waithaka (2010) in order to revamp the companies and to improve profitability the focus on the area of efficient working capital management is impeccable. The efficiency in working capital management practices as measured by efficiency in cash management, efficiency in receivables management and efficiency in inventory management has an influence on the growth rate of business sales, market share, profits and total assets and consequently plays a huge role in the financial performance of a company.

4. Objectives

The study's broader objective is to investigate the impact of working capital efficiency on the financial performance of the sample industries in Indian context. More specifically, the study aims at achieving the following set of objectives:

1. To assess the impact of Average Revenue Period (ARP) on the financial Performance of the sample Industries.
2. To assess the impact of Average Payable Period (APP) on the financial Performance of the sample Industries.
3. To assess the impact of Inventory Conversion Period (ICP) on the financial Performance of the sample Industries.

5. Hypotheses

The following set of hypotheses has been developed to meet the specified goals of the study. provide the investigation a correct direction:

H1: Account Receivable does not have statistically any significant impact on the financial performance of sample industries.

H2: Accounts Payable does not have statistically any significant impact on the financial performance of sample industries.

H3: Inventory Conversion period does not have statistically any significant impact on the financial performance of sample industries.

H4: Cash Conversion cycle does not have statistically any significant impact on the financial performance of sample industries.

6. Data base and Research Methodology

In order to achieve the objectives of the study, the researchers have drawn the sample of the study from seven sectoral indices, namely, Automobile, Pharmaceutical, Fast Moving Consumer Goods, Consumer Durables, Metal, Oil and Gas and Real Estate. Each sample industry is represented by 10 companies and the weightage of these ten companies in each sectorial index is around 80 percent to 85 percent which stands as a fair representative of each sectorial index.

The study has used panel data set of 70 Indian listed companies which represent seven different sectors. The researchers have taken a reference period of 15 years ranging from 2006 to 2020 which is reasonable enough to provide dependable results. The data has been collected through Capitaline Electronic database, which is a digital database for giving financial information of listed as well as other companies.

7. Variable specifications

The first group of variables undertaken in the study are concerned with the efficiency of working capital which is represented by cash conversion cycle (CCC), accounts receivable period (ARP), accounts payable period (APP) and inventory conversion period (ICP) to quantify working capital efficiency.

The Profitability variables make up the second set of variables. Several measures of profitability have been employed in previous empirical research on working capital management; for example, Vishnani and Shah (2007), Bhunia and Das (2015), joshi Lalit Kumar (2017) took Return on Capital Employed (ROCE) as a proxy for assessing firms' financial performance, while Niresh (2012) used Return on Equity (ROE) as a representative variable for measuring firms' financial performance. Riyaz Ahmad (2012) has used RONW as a variable to study profitability. In this study, the researchers have employed Return on Capital Employed (ROCE) and Return on Net Worth (RONW) to determine the financial performance of sample firms.

8. Baseline Specifications and Estimation Approach

8.1. Baseline Specifications

It must be noted that all the specifications used in this study have been largely borrowed from some previous studies, namely, Altaf and Shah (2017), Banos et al. (2012), Bhatia and Srivastava (2016), Singhania et al. (2014) among others. These studies helped in the identification of appropriate controls to be used along with the main variables.

8.2. Baseline Specifications for investigating the impact of working capital efficiency on financial performance

The following are the baseline specifications for testing the relationship between working capital efficiency and financial performance:

Variable ARP:

$$ROCE_{i,t} = \beta_O + \beta_1 ARP_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Size_{i,t} + \beta_4 CR_{i,t} + \beta_5 CF_{i,t} + \beta_6 LEV_{i,t} + \beta_7 AGE_{i,t} + \epsilon_{i,t} \quad (1)$$

$$RONW_{i,t} = \beta_O + \beta_1 ARP_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Size_{i,t} + \beta_4 CR_{i,t} + \beta_5 CF_{i,t} + \beta_6 LEV_{i,t} + \beta_7 AGE_{i,t} + \epsilon_{i,t} \quad (2)$$

Variable APP:

$$ROCE_{i,t} = \beta_O + \beta_1 APP_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Size_{i,t} + \beta_4 CR_{i,t} + \beta_5 CF_{i,t} + \beta_6 LEV_{i,t} + \beta_7 AGE_{i,t} + \epsilon_{i,t} \quad (3)$$

$$RONW_{i,t} = \beta_O + \beta_1 APP_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Size_{i,t} + \beta_4 CR_{i,t} + \beta_5 CF_{i,t} + \beta_6 LEV_{i,t} + \beta_7 AGE_{i,t} + \epsilon_{i,t} \quad (4)$$

Variable ICP:

$$ROCE_{i,t} = \beta_O + \beta_1 ICP_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Size_{i,t} + \beta_4 CR_{i,t} + \beta_5 CF_{i,t} + \beta_6 LEV_{i,t} + \beta_7 AGE_{i,t} + \epsilon_{i,t} \quad (5)$$

$$RONW_{i,t} = \beta_O + \beta_1 ICP_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Size_{i,t} + \beta_4 CR_{i,t} + \beta_5 CF_{i,t} + \beta_6 LEV_{i,t} + \beta_7 AGE_{i,t} + \epsilon_{i,t} \quad (6)$$

Variable CCC:

$$ROCE_{i,t} = \beta_O + \beta_1 CCC_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Size_{i,t} + \beta_4 CR_{i,t} + \beta_5 CF_{i,t} + \beta_6 LEV_{i,t} + \beta_7 AGE_{i,t} + \epsilon_{i,t} \quad (7)$$

$$RONW_{i,t} = \beta_O + \beta_1 CCC_{i,t} + \beta_2 Growth_{i,t} + \beta_3 Size_{i,t} + \beta_4 CR_{i,t} + \beta_5 CF_{i,t} + \beta_6 LEV_{i,t} + \beta_7 AGE_{i,t} + \epsilon_{i,t} \quad (8)$$

8.3. Estimation approach

The econometric panel data methodology has been employed to estimate the relationships defined by the models presented above. The following are the specifics of such an estimate:

8.4. Efficiency of panel data

Because of the benefits it provides, panel data approach was used to estimate the models mentioned above. First, panel data is based on the assumption that individuals are heterogeneous, which aids in controlling for unobservable heterogeneity (Hsiao, 2003; Klevmarken, 1989; Moulton, 1986,1987). Time-series and cross-section studies, in particular, do not account for individual variation and hence run the danger of producing skewed results (Moulton, 1986,1987). Second, panel data gives more information, increases variability, improves efficiency, and minimises collinearity between variables (Hsiao, 2003). Third, panel data can be used to investigate the dynamics of adjustment. According to Baltagi (2008) cross-sectional distributions appear steady but conceal a great number of shifts. Finally, it makes it easier to model technological efficiency by allowing complex models to be built (Koop and Steel, 2001).

9. Account Receivable efficiency and financial performance

The table 1.1 presents the results of the relationship between Accounts Receivable management and firm profitability on full-sample.

Table 1.1: Impact of ARP on Financial Performance

Variables	**Dependent Variable: ROCE**		**Dependent Variable: RONW**	
(1)	**(2)**	**(3)**	**(4)**	**(5)**
ARP	.02584*** (2.34)	1.15	.01213*** (2.52)	1.15
GROWTH	.13873** (2.22)	1.01	.127009*** (2.65)	1.01
SIZE	5.6796** (2.30)	1.25	6.0756** (2.00)	1.25
CR	-.80726*** (-2.85)	1.14	-.99163*** (-3.02)	1.14
CF	7.80685*** (4.68)	1.46	9.102*** (3.43)	1.46
LEV	-6.4077* (-1.92)	1.29	-8.0797** (-2.15)	1.29
AGE	-.69440** (-2.03)	1.12	-.17192* (-1.81)	1.12
IM Test	471.49***		581.76***	
Wooldridge test	11.394***		13.165***	
Adj R^2	0.51		0.52	

F-test	10.09*		10.08*	
Hausman	21.17*		27.04*	
B–P LM test	5171.10*		5213.74*	
Year FE	Yes		Yes	
Firm FE	Yes		Yes	
Cluster SE	Yes		Yes	

Notes: This table reports empirical results of Eqs. (1) and (2). Asterisks indicate significance at 1% (***) 5% (**) and 10% (*). T-Statistics are based on robust standard errors.

In the table 1.1Column (2) presents the results with Return on Capital Employed (ROCE) as dependent variable while as Columns (4) of the table takes Return on Net Worth (RONW) as the dependent variable. Further, in both Columns (2) and (4) the results presented include Average Revenue Period (ARP) as independent variable along with the other control variables. It must be noted that columns (3) and (5) of the table report the variance inflation factors (VIFs) of the models with ROCE and RONW as dependent variables respectively. The Adjusted R2 for both models is estimated to be around 50% based on the results reported in table. Furthermore, the F-test and Breusch-Pagan Lagrange Multiplier (B-P LM) test statistics in columns (2) and (4) of the table are significant, indicating that both the FE and RE models give superior estimates than the OLS model. We use the traditional Hausman test to determine the best fit model among FE and RE, knowing that alternative panel data models will yield better results than OLS. The test statistics of the Hausman test in both column (2) and (4) are significant, showing that the FE model is best suited to capture the results of the link between ARP and financial performance, as shown in table. Besides, both the IM and Wooldridge tests have significant test statistics at the 1% level of significance, demonstrating presence of heteroscedasticity and autocorrelation in both columns. In addition, the VIFs in the table are not greater than 10, indicating that multicollinearity is not an issue. The model's primary flaw is the occurrence of heteroscedasticity and autocorrelation, both of which have been addressed by producing cluster-robust standard errors, as recommended by Petersen (2009).

Thus, the findings of the table 1.1 puts forth that the coefficient on ARP is positive and statistically significant at 1% level of significance With both metrics of business profitability (ROCE and RONW). Therefore, alternative hypothesis is supported by these findings. These findings suggest that if companies increase their daily receivables or give their consumers more time to pay, their profitability may improve. Several researchers have found a similar link between ARP and corporate profitability (Altaf and Shah, 2018; Bhunia and Das, 2015; Chaklader and Shrivastava, 2013).

These findings are consistent with the developing market economic phenomena, which is characterised by a strong knowledge asymmetry between buyer and seller, as well as limited financial development leaving enterprises reliant on trade credit from their suppliers. Furthermore, the observed link supports the concept that extending trade credit to customers minimises information asymmetry between the buyer and seller because the extended receivable period allows customers to assess the product's quality before paying. This viewpoint is consistent with the quality guarantee theory and trade-credit financing theory, which state that suppliers who offer trade credit have more control over their clients since they can cut off supplies if they do not pay on time. This increased control over clients minimises the amount of bad debt and so boosts the company's profitability. Furthermore, granting trade credit can be utilised as a promotional technique, avoiding price competition. This viewpoint is consistent with the product differentiation theory, which states that investing in receivables tends to develop a group of loyal customers who provide future advantages in the form of increased profitability due to guaranteed future sales. Moreover, according to market power theory, trade credit can be used as a push marketing tactic because it encourages customers to work toward the promotion of the product. This, in turn, tends to improve sales while simultaneously lowering promotional costs and increasing company profitability.

Table 1.2: Impact of APP on Financial Performance

Variables	Dependent Variable: ROCE		Dependent Variable: RONW	
(1)	(2)	(3)	(4)	(5)
APP	.01454** (2.21)	1.06	.02179*** (3.00)	1.06
GROWTH	.13753* (1.81)	1.01	.07085*** (2.56)	1.01
SIZE	5.394** (2.18)	1.24	6.1837** (2.03)	1.24
CR	-.89635*** (-3.15)	1.11	-1.115*** (-3.39)	1.11
CF	7.8848*** (4.67)	1.44	9.043*** (3.34)	1.44
LEV	-6.723** (-2.00)	1.28	-7.112* (-1.87)	1.28
AGE	-.61584* (-1.79)	1.13	-.2497* (-1.72)	1.13
IM Test	462.43***		577.57***	
Wooldridge test	11.491***		13.316***	
Adj R^2	0.48		0.47	
F-test	11.12*		12.18*	
Hausman	31.07*		32.93*	
B–P LM test	4211.09*		4231.47*	
Year FE	Yes		Yes	
Firm FE	Yes		Yes	
Cluster SE	Yes		Yes	

Notes: This table reports empirical results of Eqs. (3) and (4). Asterisks indicate significance at 1% (***) 5% (**) and 10% (*). T-Statistics are based on robust standard errors.

In the table 1.2 Columns (2) presents the results of Eq(3) that takes ROCE as dependent variable while as Columns (4) of the table presents results of Eq(4) that takes RONW as the dependent variable. Further, both Columns (2) and (4) include APP as independent variable along with the other control variables. It must be noted that columns (3) and (5) of the table report the variance inflation factors (VIFs) of the models with ROCE and RONW as dependent variables respectively.

The Adjusted R2 for both models is estimated to be around 48% based on the results reported in table. Moreover, the F-test and Breusch-Pagan Lagrange Multiplier (B-P LM) test statistics in columns (2) and (4) of the table are significant, indicating that both the FE and RE models give superior estimates than the OLS model. We use the traditional Hausman test to determine the best fit model among FE and RE, knowing that alternative panel data models will yield better results than OLS. The test statistics of the Hausman test in both column (2) and (4) are significant, showing that the FE model is best suited to capture the results of the link between APP and firm profitability. The results confirm that there exists a positive relationship between APP and firm performance which implies that deferring payments to suppliers increases the financial performance of sample firms as it aids a firm in lowering transaction costs, overcoming financial limits and enhances financial performance.

Table 1.3: Impact of ICP on Financial Performance

Variables	Dependent Variable: ROCE		Dependent Variable: RONW	
(1)	(2)	(3)	(4)	(5)

ITR	-.422*** (-9.44)	1.04	-.3309*** (-6.41)	1.04
GROWTH	0.137** (1.99)	1.01	0.055** (1.95)	1.01
SIZE	3.414*** (2.48)	1.23	1.945*** (2.67)	1.23
CR	-0.762*** (-2.87)	1.10	-1.079*** (-3.43)	1.10
CF	6.917*** (2.56)	1.42	8.255*** (3.47)	1.42
LEV	-4.851* (-1.75)	1.28	-1.133*** (-3.09)	1.28
AGE	-1.001*** (-3.11)	1.14	-0.2985** (-2.16)	1.14
IM Test	532.49***		601.25***	
Wooldridge test	17.013***		21.190***	
Adj R^2	0.52		0.49	
F-test	11.09*		11.17*	
Hausman	30.13*		30.90*	
B–P LM test	4643.67*		4686.57*	
Year FE	Yes		Yes	
Firm FE	Yes		Yes	
Cluster SE	Yes		Yes	

Notes: This table reports empirical results of Eqs. (5) and (6). Asterisks indicate significance at 1% (***) 5% (**) and 10% (*). T-Statistics are based on robust standard errors.

The result of Eq (5) and (6) are presented in table 1.3 where Columns (2) present the results of equation with ROCE as dependent variable while as Columns (4) of the table present the results of equation RONW as the dependent variable. Further, in both Columns (2) and (4) the results presented include ICP as independent variable along with the other control variables. It must be noted that columns (3) and (5) of the table report the variance inflation factors (VIFs) of the models with ROCE and RONW as dependent variables respectively.

The Adjusted R2 for both models is estimated to be around 50% based on the results reported in table. besides, the F-test and Breusch-Pagan Lagrange Multiplier (B-P LM) test statistics in columns (2) and (4) of the table are significant, indicating that both the FE and RE models give superior estimates than the OLS model. We use the traditional Hausman test to determine the best fit model among FE and RE, knowing that alternative panel data models will yield better results than OLS.

The test statistics of the Hausman test in both column (2) and (4) are significant, showing that the FE model is best suited to capture the results of the link between ICP and financial performance, as shown in table. In addition, both the IM and Wooldridge tests have significant test statistics at the 1% level of significance, demonstrating heteroscedasticity and autocorrelation in both columns. Furthermore, the VIFs in the table are not greater than 10, indicating that multicollinearity is not an issue. The model's primary flaw is the occurrence of heteroscedasticity and autocorrelation, both of which have been addressed by producing cluster-robust standard errors, as recommended by Petersen (2009).

The findings in the table 1.3 confirm that there is a negative association between ICP and financial performance, thereby, supporting the idea that due to imperfect market circumstances and the lack of a precise way to forecast demand, it is necessary for Indian enterprises to keep some inventory. The negative association between ICP and business profitability also suggests that the companies in the sample have more inventory than they require.

Because of the transitive, preventive, and speculative incentives, these companies may be retaining higher inventories. However, the tested enterprises benefit lesser than the cost of maintaining inventories which is in alignment with Bullwhip effect. Hence, the findings affirm the acceptance of alternative hypothesis.

Table 1.4: Impact of CCC on Financial Performance

Variables	**Dependent Variable: ROCE**		**Dependent Variable: RONW**	
(1)	**(2)**	**(3)**	**(4)**	**(5)**
CCC	-.01031*** (-2.77)	1.06	-.01319** (-2.03)	1.06
GROWTH	.15195*** (2.33)	1.01	.0904585*** (2.71)	1.01
SIZE	5.455772*** (2.20)	1.22	5.914103* (1.94)	1.22
CR	-.8736135*** (-3.06)	1.10	-1.096541*** (-3.33)	1.10
CF	8.0435*** (4.81)	1.40	9.47666*** (3.62)	1.40
LEV	-6.7037** (-2.00)	1.28	-7.9349** (-2.01)	1.28
AGE	-.64613* (-1.88)	1.17	-.21422* (-1.68)	1.17
IM Test	464.05***		568.03***	
Wooldridge test	11.573***		13.414***	
Adj R^2	0.54		0.53	
F-test	13.41*		13.37*	
Hausman	30.01*		30.09*	
B–P LM test	4257.12*		4231.24*	
Year FE	Yes		Yes	
Firm FE	Yes		Yes	
Cluster SE	Yes		Yes	

Notes: This table reports empirical results of Eqs. (7) and (8). Asterisks indicate significance at 1% (***) 5% (**) and 10% (*). T-Statistics are based on robust standard errors.

Lastly, the results of Eq (7) and (8) have been presented in table 1.4, specifically Columns (2) of the table present results of equation with ROCE as dependent variable while as Columns (4) of the table results of equation with RONW as the dependent variable. Further, in both Columns (2) and (4) the results presented include Cash Conversion Cycle (CCC)independent variable along with the other control variables. It must be noted that columns (3) and (5) of the table report the variance inflation factors (VIFs) of the models with ROCE and RONW as dependent variables respectively.

The Adjusted R2 for both models is estimated to be around 53% based on the results reported in table. besides, the F-test and Breusch-Pagan Lagrange Multiplier (B-P LM) test statistics in columns (2) and (4) of the table are significant, indicating that both the FE and RE models give superior estimates than the OLS model. We use the traditional Hausman test to determine the best fit model among FE and RE, knowing that alternative panel data models will yield better results than OLS.

The test statistics of the Hausman test in both column (2) and (4) are significant, showing that the FE model is best suited to capture the results of the link between CCC and financial performance, as shown in table. Furthermore, both the IM and Wooldridge tests have significant test statistics at the 1% level of significance, demonstrating heteroscedasticity and autocorrelation in both columns. In addition, the VIFs in the table are not greater than 10, indicating that multicollinearity is not an issue. The model's primary flaw is the occurrence of heteroscedasticity

and autocorrelation, both of which have been addressed by producing cluster-robust standard errors, as recommended by Petersen (2009).

The findings in table 1.4 affirms a negative relation between CCC and financial performance of the sample firms. This phenomenon can be attributed to a variety of probable causes. For example, as previously stated, Indian companies underutilize short-term loans as a source of working capital financing. The CCC is lengthened by relying significantly on long-term funds, resulting in a lot of funds being blocked and inactive. Besides, raising interest costs, carrying costs and lowering profitability. When a company uses short-term credit to finance working capital, the duration of the CCC is reduced, financial costs are reduced and the company has more financial flexibility. Furthermore, lowering the CCC frees up cash flow which can be used to fund a company's day-to-day operations, lowering finance costs even more. In addition, the liberated cash can be used to make early payments to suppliers, allowing a company to benefit from discounts for timely payments. This event would result in further lower costs and higher profits for the company. Furthermore, the funds released can be used to fund buffer inventories, which will help to maintain consistent sales and boost financial performance.

10. Summary of findings and conclusions

This study contributes to the existing literature on working capital by investigating the impact of working capital management on the financial performance of the sample firms, which are from Automobile sector, Pharmaceutical, FMCG, Consumer Durables, Metal, Oil and Gas, and Real Estate. In order to achieve the objectives of the study, the researchers have taken Cash Conversion Cycle and its components such as ARP, APP and ICP as independent variable. The researchers used RONW and ROCE as proxy for financial performance, besides, the study also used Growth, Firm size, Firm age, cash flow, Current Ratio, Leverage and Cash flow.

The overall findings put forth by the study indicate that working capital management has a significant impact on the financial performance of the sample firms in terms of ARP, APP, ICP, and CCC. The findings presented by the study confirm that Average Receivable Period (ARP) and Average Payable Period (APP) positively impact the financial performance of the sample firms statistically in a significant manner. However, on the other hand, the results also affirm that Inventory Conversion Period (ICP) and Cash Conversion Cycle (CCC) negatively impact the financial performance of the sample firms statistically in a significant manner.

Thus, it can be concluded on the basis of above results that the independent variables of the study do influence the dependent variables such as Return on Capital Employed (ROCE) and Return on net worth (RONW). These findings explicitly confirm the relationship between the variables, therefore, management must make sure to manage the various aspects of working capital, thereby, enhancing the profitability of the firms.

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Determinants of Sectoral Labor Migration and Their Contribution to Enhancing Labor Productivity: A Case Study from Indonesia

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Abstract
This study aims to analyze the determining factors influencing the migration of agricultural labor in Indonesia. In examining the dynamics of the agarian labor share in Indonesia, the study uses several variables divided into three groups: demographic factors, structural factors, and economic factors. This study will also examine the contribution of agricultural labor migration to the Non-agricultural sector toward productivity growth in the economy. Using secondary data from various institutions, including the World Bank, Food and Agriculture Organization (FAO), and UNCTAD. The data collected consists of time series from the period 1980 to 2020; this study finds that agricultural labor migration in Indonesia heavily depends on developments in the Non-agricultural sectors, including both industry and services, education levels, and agricultural mechanization. However, foreign direct investment (FDI) does not appear to reduce the share of agricultural labor in Indonesia. This is because FDI tends to flow into sectors that rely on technology and automation. Agricultural workers may lack the skills required by these industries. FDI often seeks workers with high technical or managerial skills that do not align with the skill sets of Indonesian agricultural workers, most of whom have an education level below junior high school.

Keywords: Labor, Agriculture, Non-Agriculture, Industry, Services

1. Introduction

Economic development has transformed Indonesia from a relatively poor country in the 1960s into a developing country with an upper-middle-income level. Economic growth has changed Indonesia's financial structure, shifting from being dominated by the agricultural sector to becoming an industrial and service-oriented country. This is evident from the declining contribution of the agricultural sector's output, which decreased from 26.9% in 1980 to 13.3% in 2020. At the same time, the contribution of the non-agricultural sector's output, both industrial and service sectors, increased from 73.1% to 86.7% (BPS, 2020). This change in sectoral production contribution was accompanied by a shift in the labor force from agriculture to nonagriculture. The share of agricultural workforce decreased in 1980 by 64% and in 2020 dropped significantly to 30%. The market share of the labor force in the non-agricultural sector increased by 36% to 70%.

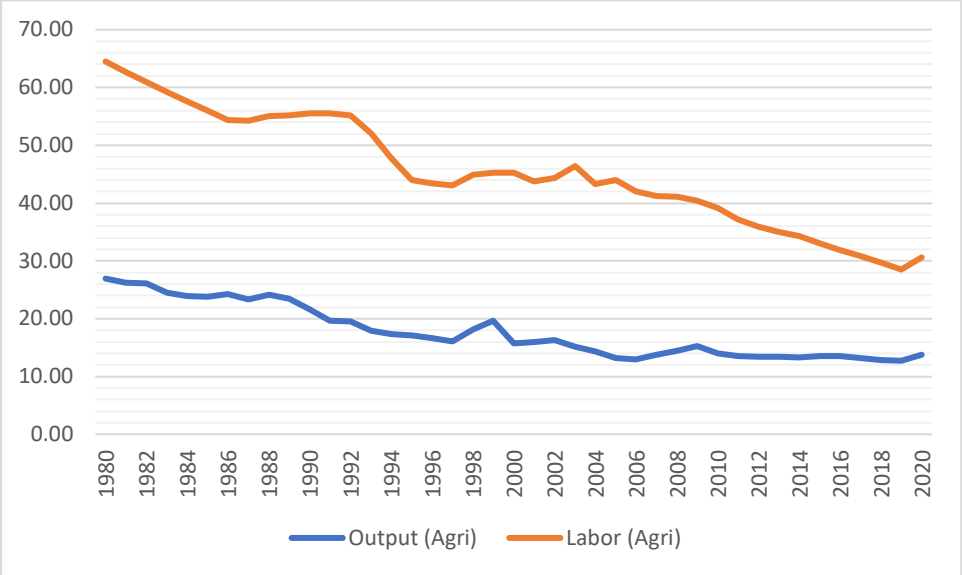

Figure 1: Comparison Of The Amount Of Output With Labor In Agriculture

The issue is that the rate of decline in the agricultural sector's output contribution has been faster than the reduction in its labor share. This has resulted in a substantial surplus of agrarian labor, leading to low productivity among farmers (Hubbansyah, Hakim, Hartoyo, & Widyastutik, 2023). The slow rate of labor transition imposes a burden on the agricultural sector by decreasing productivity and causing income inequality between agricultural and Non-agricultural sector workers (Kariyasa, 2006). This factor contributes to the relatively high level of rural poverty in Indonesia, which is even twice as high as urban poverty (Rammohan & Tohari, 2023). Consequently, rural areas have become pockets of poverty in Indonesia (Hasibuan & Hasibuan, 2022).

Therefore, the primary goal of economic development is to transfer labor from the low-productivity agricultural sector to the high-productivity non-agricultural sector (Hubbansyah, Hakim, Hartoyo, & Widyastutik, 2023). The seminal study by Lewis (1954) emphasizes the importance of the growth of the non-agricultural sector in driving the migration of agricultural labor. Additionally, individual factors such as age, education, and health, as well as non-individual factors such as socio-demographic, economic, political, and institutional factors, can influence the migration of labor from the agricultural to the non-agricultural sector (Patyka, Gryschenko, Kucher, Heldak, & Raszka, 2021). Furthermore, other studies highlight the role of foreign direct investment (FDI), credit-to-GDP ratio, per capita income, and labor productivity as determinants of the agricultural labor share (Felipe, Bayudan-Dacuycuy, & Lanzafame, 2016).

This study aims to analyze the determining factors influencing the migration of agricultural labor in Indonesia. In examining the dynamics of the agrarian labor share in Indonesia, the study uses several variables divided into three groups: demographic factors, structural factors, and economic factors. Unlike previous studies conducted in Indonesia, such as those by Raiyan & Putri (2021), Purwantoro, Rahayu, Rahman, & Hidayat (2022), and Hubbansyah, Hakim, Hartoyo, & Widyastutik (2023), this study will also examine the contribution of agricultural labor migration to the non-agricultural sector towards productivity growth in the economy. In this context, productivity growth will be decomposed into two main components: within-sector productivity and structural productivity.

Thus, the study will identify the contribution to productivity growth stemming from within the sector itself (such as increased education levels) and from labor migration between sectors (from the low-productivity agricultural sector to the more productive non-agricultural sector). In the productivity growth decomposition analysis, this study adopts the method developed by Aggarwal (2021). This study is expected to provide a more comprehensive understanding of the structural transformation process in Indonesia, focusing on two primary outcomes: the

determinants of the agricultural labor share and the contribution of labor migration to economic productivity growth in Indonesia.

2. Literature Review

The study conducted by Felipe, Bayudan-Dacuycuy, and Lanzafame (2016) aims to model and identify the factors affecting the reduction of the agricultural labor share in China. Using a long observation period from 1962 to 2013 and the Autoregressive Distributed Lag (ARDL) Model, Felipe et al. sought to identify both short-term and long-term effects of various variables, including changes in GDP per capita, Industrial Gross Value Added, the share of FDI in GDP, and the share of credit to the private sector on the agricultural labor share in China.

The results reveal that FDI has a long-term impact, indicating that open economic intensification policies will assist China in transforming its economic structure. Additionally, domestic credit, proxied by the share of credit to the private sector in GDP, also contributes to reducing the labor share in agriculture. Meanwhile, compared to the previous two variables, industry value added and income per capita has the most significant long-term impact on decreasing the agricultural labor share in China. Based on the significant variables identified, Felipe et al. conclude that the structural transformation process occurring in China follows a normal developmental trajectory.

Using the estimated determinants model, Felipe et al. projected the long-term labor conditions in China's agricultural sector. They found that it would take 80 to 87 years (from 1962) for China to achieve an agricultural labor share comparable to that of currently advanced countries, which is around 5 percent. Compared to other advanced nations, this projected timeline for China to reach such a reduction in agricultural labor is relatively swift. According to Felipe et al., this situation is attributable to China's rapid economic growth over recent decades. However, based on their findings, Felipe et al. further conclude that China has not yet surpassed the Lewis Turning Point, meaning that surplus agricultural labor has not fully transitioned to more productive sectors (manufacturing/services).

Sen (2016) describes two sets of independent factors: labor demand from high-productivity sectors and labor supply from low-productivity sectors, as determinants of the rate of labor market structural change. Government failures and market failures negatively impact labor demand in high-productivity sectors and restrict labor mobility from low-productivity sectors. Government failures, such as labor regulations and product market regulations, can adversely affect labor demand in high-productivity sectors like manufacturing. Meanwhile, land policies, such as ineffective land reforms or migration barriers, can hinder the movement of labor from low-productivity sectors (agriculture). Market failures, such as lack of coordination in investment and imperfections in credit markets, can negatively affect labor demand in high-productivity sectors (industry and services). Additionally, market failures in human capital can limit the supply of skilled labor from low-productivity sectors (agriculture) to high-productivity sectors (non-agriculture).

Raiyan and Putri (2021), who studied the shift of labor from agriculture to non-agriculture in Indonesia using a two-stage least squares (2SLS) approach, found a simultaneous relationship between economic growth and labor migration. An increase in economic growth by 1 percent in Indonesia leads to a 0.22 percent decrease in agricultural labor. This indicates that as economic growth rises, the labor force is more likely to leave the agricultural sector and seek employment in non-agricultural sectors. Furthermore, Raiyan and Putri (2021) also found that investment, proxied by domestic investment in the agricultural sector, negatively impacts agricultural labor. Specifically, a 1 percent increase in investment results in a 0.01 percent decrease in agricultural labor. According to Raiyan and Putri (2021), this suggests that investment in the agricultural sector has not been able to attract the labor force to work in agriculture, due to the perception of the sector as "dirty, dangerous, and difficult" (Wang, 2014). Susilowati (2016) also notes that most workers are disinterested in working in agriculture because the sector is perceived as unable to provide adequate rewards due to the limited availability of agricultural land.

In contrast to findings in Korea and Thailand, which indicate that structural changes positively impact income distribution (Kim, 2014; Bowothumrongchai, 2019), the structural changes in Indonesia have instead led to increased inequality (Dartanto, Yuan, and Sofiyandi, 2017). Using L Theil decomposition and econometric estimation to explore the relationship between structural transformation and inequality in Indonesia, the study by

Dartanto, Yuan, and Sofiyandi (2017) finds that: (i) the root causes of increasing inequality in Indonesia remain "mysterious," as the unexplained effect dominates the explanation for the rise in inequality; (ii) migration from agriculture to industry or services, from rural to urban areas, and from informal to formal employment are the second most significant contributors to the increase in inequality between 1996 and 2014; (iii) improvements in educational attainment contribute to reducing inequality. The econometric estimation results show that structural transformation leads to increased inequality in Indonesia. Furthermore, the rising share of the service sector in the economy creates inequality because the service sector is capital-intensive and requires high-skilled labor. As a result, fewer people benefit from growth in this sector compared to growth in agriculture or industry.

Labor migration from agriculture to non-agriculture in 31 countries implementing centrally planned economic policies from 1990 to 2019 by Herzfeld and Akhmadiyeva in 2021. The study focuses on the role of land ownership and land transfer rights in transition. Using a panel data random effect model, this study analyzes factors such as land transfer liberalization, income differences, agricultural sector size and relative price changes that affect labor reallocation. The results of this study show that land transfer liberalization significantly accelerates labor migration in agriculture. In addition, a higher income ratio between non-agricultural and agricultural workers where the agricultural sector is shrinking and price shifts is positively associated with labor migration from agriculture. This study also concludes that institutional reforms, especially in land policy, play an important role in helping structural transformation in transitioning economies.

Study by Bustos, Caprettini, and Poticeli (2016) looked at how agricultural productivity growth affected structural transformation by shifting labor from agriculture to non-agriculture in Brazil. The study analyzed how the use of genetically modified soybean technology increased agricultural productivity and affected labor reallocation. Using the difference in difference (DID) method, the study exploited variations in soil suitability for new technologies across regions to identify causal effects. The study found that higher agricultural productivity led to a decline in agricultural employment and an increase in industrialization, as excess labor moved to non-agricultural sectors. Regions with greater productivity gains experienced higher investment in manufacturing and services, supporting the idea that agricultural progress can drive broader economic transformation.

Research conducted by Gollin in 2021 explores the relationship between agricultural productivity and structural transformation in African countries. The study looks at how historical evidence from industrialized countries suggests that increasing agricultural productivity is critical for labor reallocation and economic diversification. Using comparative analysis of cross-country data and empirical studies, the same pattern holds across Africa. The results show that agricultural productivity growth can stimulate industrialization and urbanization, the extent of transformation depends on factors such as market integration, infrastructure and institutional quality. The study concludes that addressing constraints is critical to ensuring that agricultural progress contributes effectively to broader economic development.

3. Methodology

In relation to the analysis of determining factors, this study uses six variables that have been empirically proven to play important roles in the agricultural labor share conditions in various countries, including India (Behera & Tiwari, 2014), China (Felipe, Bayudan-Dacuycuy, & Lanzafame, 2016), Ukraine (Patyka, Gryschenko, Kucher, Heldak, & Raszka, 2021), and several other Asian countries such as Thailand, Cambodia, and Myanmar (Bai, Zeng, Fu, & Zhang, 2024). These six variables, suspected to be determinants of the agricultural labor share, are grouped into three factors: (1) demographic factors, including rural population growth rate and the share of rural population with secondary education; (2) structural factors, including the share of industrial and service output; and (3) economic factors, including capital intensity per hectare of land and foreign direct investment. A detailed description of these six variables can be seen in the table below:

Table 1: Data Source

Variabel	Notasi	Definisi	Sumber Data	Periode
Agricultural Labor Share	agriemp	Portion of labor in the agricultural sector (%)	World Bank	1980-2020

Rural Population Growth	ruralagr	Rural Population Growth Rate (%)	World Bank	1980-2020
Secondary Education Enrollment	secondary	Gross secondary enrollment (%)	World Bank	1980-2020
Industrial Output Share	Qind	Share of industrial output to total output (%)	World Bank	1980-2020
Service Output Share	Qser	Share of service output to total output (%)	World Bank	1980-2020
Capital per Hectare of Land (Mechanization)	K/H	Agricultural capital per hectare of agricultural land	FAOSTAT	1980-2020
Foreign Direct Investment	FDI	FDI/GDP (%)	World Bank	1980-2020

The empirical model for analyzing the determining factors of the agricultural sector labor share in Indonesia is as follows:

$$agriemp_t = \alpha_0 + \alpha_1 ruralagr_t + \alpha_2 secondary_t + \alpha_3 Qind_t + +\alpha_4 Qser_t + \alpha_5 K/H_t + +\alpha_6 FDI_t + \varepsilon_t \quad (1)$$

Equation (1) will be estimated using time series analysis. Time series data are recorded or collected based on specific time periods (Juanda & Junaidi, 2012). Essentially, time series data capture economic behavior over time, allowing us to observe how economic agents make adjustments, improvements, and refinements to their past performance.

Since this study adopts a time series analysis approach, the estimation of equation (1), which shows a long-term relationship, is justified only if the combination of variables in equation (1) is cointegrated. Therefore, to avoid the problem of spurious regression, it is necessary to test the cointegration condition of equation (1). If the combination of variables in equation (1) is found to be stationary, it can be concluded that equation (1) has a long-term relationship. To demonstrate this, equation (1) can be rewritten in the following form:

$$\varepsilon_t = agriemp_t - \alpha_0 - \alpha_1 ruralagr_t - \alpha_2 secondary_t - \alpha_3 Qind_t - \alpha_4 Qser_t - \alpha_5 \frac{K}{H_t} - \alpha_6 FDI_t \quad (2)$$

If the linear combination is stationary, then ruralagr, secondary, Qind, Qser, K/H, and FDI are cointegrated, and the regression between the agricultural labor share and these six variables is referred to as a cointegrated regression (Juanda & Junaidi, 2012). Therefore, the estimation results of equation (1) are valid and free from the issue of spurious regression. Furthermore, this study also decomposes aggregate productivity growth into two main components: (i) within effect, which captures the contribution of productivity growth within sectors to overall economic productivity, and (ii) between effect, which reflects the impact of labor reallocation from less productive sectors to more productive sectors. The decomposition of aggregate economic productivity growth into within effect and between effect uses the following approach (Alam et al., 2008; Aggarwal, 2021):

$$P_m = \frac{Y_m}{L_m} = \sum_{j=1}^{n} \frac{Y_j}{L_j} * \frac{L_j}{L_m} = \sum_{j=1}^{n} P_j * S_j \quad (3)$$

Mathematically, aggregate labor productivity (Pm) is the total productivity level of each sector weighted by the sectoral labor share. Y is the output, L refers to the number of workers in each sector (j=1,2,3,…,n), and m denotes the total economy, while S represents the sectoral labor share.

The first term on the right-hand side of equation (3) represents the within-sector contribution to productivity growth, while the second term shows the contribution of sectoral shifts. Aggregate labor productivity will be positive if sectors with high productivity growth increase their share in employment. Conversely, productivity will be negative if growing sectors have low productivity or if the labor share of high-productivity sectors declines.

To further verify the contribution of structural changes to productivity changes in equation (3), this study also empirically tests the impact of sectoral labor transitions on labor productivity using the method developed by Dastidar (2008), Kahya (2012), and Sen (2017) as follows:

$$L_{AGR} + L_{IND} + L_{SER} = 100 \quad (4)$$

From identity equation (4) above, it is clear that the total proportion of labor in the agricultural and non-agricultural sectors (industry and services) adds up to 100 percent. By expressing productivity as a function of the sectoral labor proportions, the function can be written as follows:

$$Labor\ Productivity = f(L_{AGR}, L_{IND}, L_{SER}) \quad (5)$$

To model labor productivity with three sectors—agriculture (LAGR), industry (LIND), and services (LSER)—and to examine how productivity depends on sectoral labor transitions, we can modify equations (4) and (5) as follows:

$$Labor\ Productivity = f(L_{AGR}, L_{IND}, (100 - L_{AGR} - L_{IND}) \quad (6)$$

Given the assumption that Lind (labor in the industrial sector) is constant, any 1 percent change in Lagri (labor in the agricultural sector) corresponds to a 1 percent change in Lser (labor in the service sector), thus satisfying the identity condition in equation (4). Therefore, the empirical model to test the impact of sectoral labor transitions on labor productivity in this study is as follows:

Transition of Labor from Agriculture to Services:

$$Labprod = \alpha_0 + \alpha_1 L_A + \alpha_2 L_I + \alpha_3 School + \alpha_4 L_A * School + \varepsilon \quad (7)$$

Transition of Labor from Agriculture to Industry:

$$Labprod = \alpha_0 + \alpha_1 L_A + \alpha_2 L_S + \alpha_3 School + \alpha_4 L_A * School + \varepsilon \quad (8)$$

Given that Labprod is the output per labor unit, which measures productivity, and considering the shares of labor in agriculture (LA), industry (LI), and services (LS) as well as the gross secondary school enrollment rate (school), the interaction variable between LA and school captures the contribution of semi-skilled labor moving from agriculture to non-agriculture sectors on changes in labor productivity within the economy. Equation (7) demonstrates the impact of labor transitions from agriculture to services, while Equation (8) shows the impact of labor transitions from agriculture to industry on changes in labor productivity. Similar to Equation (1), testing Equations (7) and (8) also considers the stationarity and cointegration of variables to avoid the problem of spurious regression.

4. Results and Discussion

Data shows that the share of agricultural labor in Indonesia has consistently declined from 65% in 1980 to 30% in 2020. In analyzing the dynamics of the agricultural labor share, this study utilizes several variables categorized as follows: (1) demographic factors, including rural population growth rate (ruralgr) and the share of population with secondary education (secondary enrollment); (2) structural factors, including the share of non-agricultural output, specifically industry and services; and (3) economic factors, including capital intensity per hectare of land (KA/HA) and foreign direct investment (FDI). The estimation results can be seen in the table below:

Table 2: Estimation Results

Variable	Model (1)	Model (2)	Model (3)	Model (4)
Demographic Factors:				
Ruralgr	14.11***	4.76***	-0.37^{n}	-2.72^{n}
	(1.29)	(0.94)	(1.76)	(1.91)
Secondary		-0.38***	-0.26***	-0.12***
		(0.03)	(0.05)	(0.05)
Structural Factors:				
Q_{IND}			-1.147***	-0.84**
			(0.346)	(0.42)
Q_{SER}			-1.290***	-1.05****
			(0.395)	(0.48)
Economic Factors:				
K_A/H_A				-0.008***
				(0.002)
FDI				0.26^{n}
				(0.33)
Konstanta	44.18	67.38	160.69	146.68
F-Stat	119.16	380.57	238.21	232.34
R-Square	0.753	0.952	0.963	0.976

The estimation results of model (1) show that rural population growth (ruralgr) has a positive impact on the share of agricultural labor in Indonesia. Specifically, a 1% increase in rural population growth raises the share of agricultural labor by about 14%. However, this effect diminishes when controlled for educational factors, as seen in model (2). In this case, participation in secondary education reduces the rural population working in the agricultural sector by about 4.7% for every 1% increase in rural population growth. In other words, participation in secondary education decreases the share of agricultural labor in Indonesia by 0.38%. This is because workers with higher educational qualifications have greater opportunities to work outside the agricultural sector. These findings are consistent with Drean et al. (2021), who found that education levels negatively affect agricultural labor absorption. Highly educated workers generally tend to avoid agricultural work, preferring sectors with higher wages (Gollin & Waugh, 2014; Herrendorf & Schoellman, 2018). Factually, labor data from Indonesia's agricultural sector shows that the majority of agricultural workers have an elementary school education or lower, accounting for approximately 66% of the total agricultural workforce in 2020.

Table 3: Proportion of Indonesian Agricultural Labor by Education Level

Year	Never Attended School	Didnt complete SD	SD	SLTP	SLTA	Diploma	Undergraduate
1985	8,827	12,450	12,164	1,620	453	17.6	8.8
(%)	(24.84)	(35.03)	(34.23)	(4.56)	(1.27)	(0.05)	(0.02)
1990	7,913	12,712	15,782	2,786	1,036	38.1	16.5
(%)	(19.64)	(31.56)	(39.18)	(6.92)	(2.57)	(0.09)	(0.04)
1995	5,629	9,957	15,848	3,196	1,514	48.9	43.8
(%)	(15.53)	(27.48)	(43.73)	(8.82)	(4.18)	(0.13)	(0.12)
2000	5,034	9,584	18,873	4,767	2,300	57.7	58.1
(%)	(12.38)	(23.56)	(46.40)	(11.72)	(5.65)	(0.14)	(0.14)
2005	4,276	8,176	19,592	6,908	2,693	65.1	100.8
(%)	(10.23)	(19.55)	(46.86)	(16.52)	(6.44)	(0.16)	(0.24)

2010	4,355	10,790	15,865	7,346	4,230	99.2	137.2
(%)	(10.17)	(25.20)	(37.05)	(17.15)	(9.88)	(0.23)	(0.32)
2015	3,522	10,397	14,488	6,494	4,707	168.6	282.9
(%)	(8.79)	(25.95)	(36.17)	(16.21)	(11.75)	(0.42)	(0.71)
2020	2,454	8,858	14,955	6,501	5,492	211.5	482.7
(%)	(6.30)	(22.74)	(38.39)	(16.69)	(14.10)	(0.54)	(1.24)

Regarding structural factors, this study finds that the development of non-agricultural sectors, both industry and services, contributes to the decline in the share of agricultural labor in Indonesia, as seen in model (3). Specifically, a 1% increase in industrial output can reduce the share of agricultural labor by 1.15%, while a 1% increase in service output can decrease the share by 1.29%. Interestingly, after considering the role of these structural factors in model (3), the impact of rural population growth on the share of agricultural labor becomes insignificant. This indicates that rural residents tend to seek employment in non-agricultural sectors, which are perceived to offer better wages (Wang, 2016). Most of the labor force is not interested in agricultural work due to the difficulty in earning sufficient wages caused by limited land ownership (Susilawati, 2016).

Furthermore, the estimation results of model (3) show that while still significant, the impact of education on the share of agricultural labor tends to decrease after controlling for structural factors. Previously, a 1% increase in secondary education participation reduced the share of agricultural labor by 0.38%, but now the impact is reduced to 0.26%. This suggests that although non-agricultural sectors are a priority for rural labor, limited job opportunities in these sectors make it difficult for job seekers to find employment. Additionally, there is an issue of skill mismatch between the curriculum taught in schools and the demands of businesses and industries, creating structural challenges for agricultural labor.

The problem is further complicated by changes in the economic environment, both external and internal, which have led to a decline in industrial performance in Indonesia, entering a phase known as premature deindustrialization. Priyarsono (2011) concluded that the deindustrialization process occurring in Indonesia is not a natural phenomenon, as seen in developed countries, but is premature. This situation arises due to shocks to the national economy, such as declining investment levels, foreign trade performance, raw material imports, and the influx of imported consumer goods. Hubbansyah (2018) similarly noted that industrial growth in Indonesia slowed from 10.3% in the pre-1998 crisis period to only 3% in the post-crisis period.

The impact of the slowdown in the non-agricultural sector's performance is that those who previously transitioned from agriculture find it more challenging to secure jobs in the industrial and service sectors. This is reflected in the number of agricultural workers in 2020, which still reached 38 million people, about 3 million higher than in 1995, a period when Indonesia was approaching its turning point. In other words, the transition of labor to higher productivity sectors (non-agricultural sectors) faced significant obstacles during the post-Asian financial crisis period. This situation contrasts with the rapid decline in agricultural output's contribution to the economy, from around 17% to 13% during the same period. Although not an outlier, Indonesia is also not among the few East Asian countries that managed to quickly transition agricultural workers in the past two decades (Briones and Felipe, 2013).

The estimation results of model (4) found that agricultural mechanization, indicated by the capital per hectare of agricultural land (KA/HA), negatively impacts the share of agricultural labor. In this context, the more intensive the adoption of technology in agriculture, the lower the share of agricultural labor. This finding aligns with Hubbansyah et al. (2023), who showed a trend of labor-saving in agriculture alongside technological advancements. Farmers choose technology due to greater economic incentives, such as lower production costs, increased productivity, and reduced losses. Macroeconomically, agricultural mechanization has significantly contributed to the national economy in Indonesia (Sulaiman et al. 2018). These contributions mainly come from achieving efficiency, increasing production, and raising farm income through the use of agricultural machinery.

On the other hand, education continues to play an important role in reducing the share of agricultural labor in Indonesia. Even when controlled for both structural and economic factors, participation in secondary education

significantly reduces the share of agricultural labor. However, the resulting decline in impact is diminishing. This indicates that while agricultural mechanization negatively affects agricultural labor absorption, it also requires skilled labor to enable the agricultural sector to implement technology to support its performance (Ananto & Alihamsyah, 2010; Silaban & Sugiharto, 2016).

The estimation results show that foreign direct investment (FDI) does not significantly reduce the share of agricultural labor in Indonesia. This occurs because FDI tends to flow into sectors that rely on technology and automation. Agricultural workers may not have the skills that these industries require. FDI often seeks workers with specific technical or managerial skills, which do not align with the skills of workers in Indonesia's agricultural sector, most of whom have only a middle school education or lower. Therefore, the job opportunities created by FDI in Indonesia tend to be biased towards high-skilled labor (Ningrum, 2008).

Table 4: Productivity Growth Decomposition

Tahun	Productivity Growth (%)	Contributed From	
		Within (%)	*Structural (%)*
1980 – 1990	3.7	2.0	1.7
1991 – 2000	2.3	0.9	1.4
2001 – 2010	3.8	2.9	0.9
2011 – 2020	3.3	2.4	0.9

The decomposition results highlight the significant contribution of structural changes to labor productivity growth in Indonesia, ranging from 0.9% to 1.7% during the period 1980–2020. Therefore, the shift of labor from agriculture to non-agriculture sectors has led to a substantial increase in aggregate productivity growth. This finding is reinforced by the empirical tests of equations (8) and (9), which show a significant impact of sectoral labor transition on productivity growth. However, the increase in productivity varies between the transition from agriculture to industry and from agriculture to services.

Table 5: Structural Transition and Productivity Changes

Variable	Coeff	Std Error	P > |t|	Robust Std Error	P > |t|
L_{AGR}	-109.08	17.25	0.000	13.19	0.000
L_{SER}	-78.31	23.45	0.002	16.42	-
L_{IND}	-	-	-	-	-
School	425.04	53.93	0.000	50.27	0.000
L_{AGR}*School	-5.80	1.75	0.002	1.47	0.000
Konstanta	11781.35	1684.64	0.000	1255.8	0.000
F-stat	538.89				
	(0.000)				
Variable	Coeff	Std Error	P > |t|	Robust Std Error	P > |t|
L_{AGR}	-30.75	16.82	0.076	12.31	0.017
L_{SER}	-	-	-	-	-
L_{IND}	78.34	23.46	0.002	16.43	0.000
School	425.07	53.93	0.000	50.28	0.000
L_{AGR}*School	-5.80	1.75	0.002	1.47	0.000
Konstanta	3948.56	1137.89	0.001	801.33	0.000
F-stat	538.87				
	(0.000)				

The productivity increase resulting from the transition of labor from agriculture to industry is significantly higher than the transition from agriculture to services. Specifically, for every 1% shift of agricultural labor to industry, productivity increases by USD 109. This figure can rise even higher to USD 114 if the agricultural labor moving to the industry has at least a high school education or is semi-skilled. Meanwhile, the transition of agricultural labor to services increases productivity by USD 30–35. This is because the industrial sector is seen as more capable

of creating a larger number of formal jobs, thus having a greater leverage effect on productivity improvement compared to the services sector (Rodrik, 2016).
However, this study also found that the contribution of structural changes to productivity growth began to slow down since the 1990s, and this trend continued into the mid-2000s. This can be observed from the declining contribution of structural changes from 1.7% in 1980–1990 to 0.9% in 2011–2020. This slowdown is due to several factors, including the decline in industrial performance, particularly in the manufacturing sector, and the development of capital-intensive service sectors such as financial services and telecommunications, which resulted in fewer job opportunities in non-agricultural sectors and the emergence of structural unemployment issues (Tarsidin, 2009).

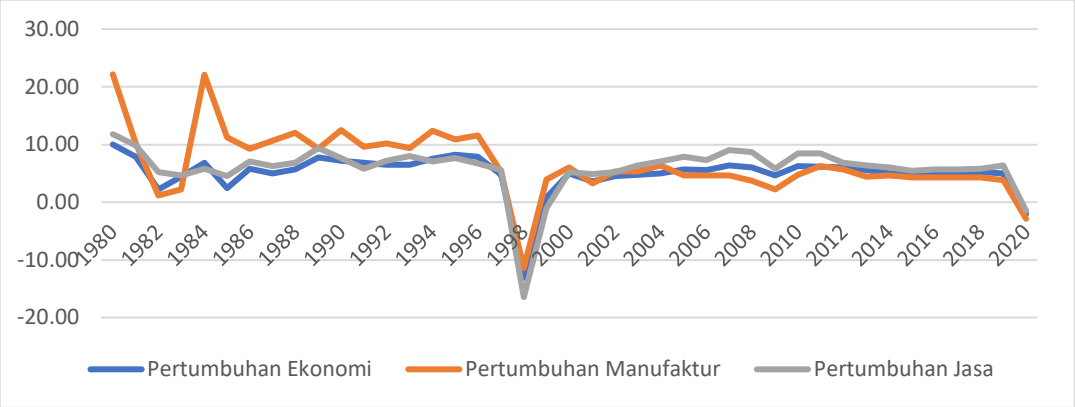

Figure 2: Comparison of Economic Growth with Manufacturing Growth and Service Sector Growth

However, the decline in the contribution of structural changes to productivity growth since the 2000s is attributed to the slowdown in manufacturing performance. Before the 1998 Asian financial crisis, the manufacturing sector's growth rate was generally higher than overall economic growth. Thus, it was the growth in manufacturing, particularly in labor-intensive sectors such as electronics and textiles, that drove economic growth. Because the skill requirements for these sectors were not too high, barriers to transitioning labor from agriculture to industry, especially manufacturing, were relatively low (Yustika, 2010).

However, following the 1998 Asian financial crisis, the manufacturing sector began to experience a premature slowdown. The crisis severely impacted most manufacturing sectors, except for transportation and equipment. The most affected subsectors were export-oriented ones such as textiles, apparel, footwear, and furniture products. These subsectors experienced a growth recession, and their contribution to GDP growth dropped drastically. Low domestic demand and worsening business conditions in the years following the Asian financial crisis were major factors in this slowdown. At the same time, rising commodity prices led to a shift in Indonesia’s exports from manufacturing to resource-based commodities. This shift resulted in a different economic transformation after the Asian financial crisis, with resource-based sectors growing and labor-intensive sectors such as textiles, leather and footwear, and wood products declining.

The manufacturing sector became increasingly uncompetitive from 2001 onward, marked by a continuous decrease in the manufacturing share of total exports. Additionally, the share of manufacturing in output and labor absorption also slowed down. In developed countries, the contribution of the manufacturing sector to employment is roughly proportional to its contribution to total output. In contrast, in Indonesia, even at the peak of industrialization, the contribution of manufacturing to employment (around 13.5%) was much lower than its contribution to output (29%). In other words, Indonesia's deindustrialization process tends to be more premature and negative. Indonesia follows the pattern of premature deindustrialization observed in developing countries that reached the peak of industrialization at income levels far lower than those experienced by developed countries. Premature deindustrialization has become a characteristic of the deindustrialization process in low- and middle-income countries over the past 2-3 decades (Rodrik, 2016).

The slowdown in the manufacturing sector's growth is detrimental to Indonesia for several reasons. First, the manufacturing sector provides significant opportunities for capital accumulation. Second, it creates a substantial number of formal job opportunities. Third, it offers specific chances to achieve economies of scale. Fourth, technological advancements typically occur in the manufacturing sector, making it a primary source of technology-based productivity growth. Fifth, the linkages and spillover effects are stronger in the manufacturing sector compared to other economic sectors. Sixth, as a producer of physical and durable goods, manufacturing has a higher marketability than agriculture and services. Indeed, one of the key aspects of manufacturing compared to services and agriculture is the marketability of its output, as manufactured products remain more freely tradable than products from other sectors.

After the Asian financial crisis, the weakened growth of the manufacturing sector was unable to absorb the surplus labor from the agricultural sector as it had in the previous period. The elasticity of labor absorption to output (the percentage change in labor absorption due to a one percent change in output) in the manufacturing sector decreased from 0.67 during the period 1988-1996 to just 0.2 during 2000-2008. The manufacturing sector became increasingly unable to absorb labor.

As a result, after the 1998 Asian financial crisis, the service sector began to replace manufacturing as the engine of economic growth. This can be seen from the service sector's growth being higher than the overall economic growth. The average growth rate of the service sector from 2000 to 2020 was 6.24 percent, higher than the average economic growth rate of only 4.91 percent. Although its growth is impressive, the service sector has not been able to provide as many jobs as the manufacturing sector, and job growth varies significantly among sub-sectors. Among the main industries in each sector, finance, electricity, and construction stand out in job creation, while manufacturing, transportation, and communication are the opposite. The issue is that when early deindustrialization occurs (as in Indonesia), the service activities replacing the role of manufacturing are often low-skilled and non-tradable, with lower productivity levels (Tregenna, 2015). This is evident from the increasing share of informal labor in the non-agricultural sector across all education levels. The rise in informal workers outside the agricultural sector explains the decreasing share of structural changes in productivity growth following the 1998 Asian financial crisis.

The service subsectors that developed in Indonesia between 2000 and 2020 include financial services, telecommunications, healthcare, education, and wholesale trade. These sectors are relatively capital-intensive and require educated labor. Changes in demand and supply in the labor market due to structural economic shifts have led to structural unemployment, given the mismatch between the skills of available workers and the needs of employers. As a result, many workers remain unemployed. Meanwhile, for workers, it takes time to develop the necessary skills, as seen in formal service sectors.

Table 6: Share of Informal Labor by Education Level

Education Level	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
< SD	67.69	65.99	66.69	66.35	65.61	69.18	70.26
SMP	52.95	52.89	52.64	53.68	53.49	59.25	59.82
SMA	34.15	36.09	36.99	37.68	38.26	45.15	44.76
SMK	26.85	30.38	29.10	31.17	30.45	34.70	35.24
Diploma	14.82	18.34	17.67	18.83	19.26	23.71	23.71
University	8.19	9.99	10.48	11.48	11.63	16.16	14.57

The growth of the informal sector in non-agricultural areas is a response to the limitations of the formal sector in absorbing labor. This occurs because the formal labor market is unable to create a sufficient number of job opportunities. The formal sector tends to employ educated workers with specific skill requirements, yet not all available workers meet these requirements. As a result, labor that is not absorbed by the formal sector will seek alternative, easier opportunities, such as those in the informal sector.

While the informal sector has advantages like ease of entry and often acts as a buffer for absorbing labor, the increasing share of informal employment also indicates a deteriorating labor market climate in Indonesia. This is related to the characteristics of the informal sector, which include not paying taxes, being persistent (Gibson & Flaherty, 2016), having low education and skills (Ramdan, 2012; Armansyah & Taufik, 2018), and being impoverished (Chen & Vanek, 2013). The informal sector becomes a popular survival strategy for job seekers who cannot adapt to globalization, fail to enter the formal job market, face competition, or are laid off (Canclini, 2019). According to the ILO (2020), informal workers have limited access to social and employment security.

5. Conclusion

This study aims to analyze the determinants affecting the migration of agricultural labor to the non-agricultural sector and its impact on productivity within the economy. Using Indonesia as a case study, the research finds that demographic, structural, and economic factors significantly influence changes in the share of agricultural labor.

Agricultural labor migration in Indonesia heavily depends on developments in the non-agricultural sectors, including both industry and services, education levels, and agricultural mechanization. However, foreign direct investment (FDI) does not appear to reduce the share of agricultural labor in Indonesia. This is because FDI tends to flow into sectors that rely on technology and automation. Agricultural workers may lack the skills required by these industries. FDI often seeks workers with high technical or managerial skills that do not align with the skill sets of Indonesian agricultural workers, most of whom have an education level below junior high school.

Estimation results show that rural population growth positively impacts the increase in the share of agricultural labor in Indonesia. However, this effect diminishes when controlled for education factors. In this regard, higher participation in secondary education can reduce the rural population working in agriculture. This is because workers with higher educational qualifications have greater opportunities to work outside the agricultural sector. These findings are consistent with research by Drean et al. (2021), which found that education levels negatively affect the absorption of agricultural labor. Highly educated workers generally tend to avoid agricultural work, opting instead for sectors with higher wages (Gollin & Waugh, 2014; Herrendorf & Schoellman, 2018).

Regarding structural factors, this study finds that developments in the non-agricultural sector, including both industry and services, contribute to reducing the share of agricultural labor in Indonesia, as observed in model (3). Specifically, a 1% increase in industrial output can reduce the share of agricultural labor by 1.15%. Meanwhile, a 1% increase in service output can reduce the share of agricultural labor by 1.29%. Estimation results from model (4) indicate that agricultural mechanization, as measured by capital per hectare of agricultural land (KA/HA), negatively impacts the share of agricultural labor. In this context, greater adoption of technology in agriculture leads to a further decrease in the share of agricultural labor. This is consistent with findings from Hubbansyah et al. (2023), which show a tendency for input savings in agricultural labor with technological advancements. Farmers choose technology because of greater economic incentives, such as lower production costs and increased productivity.

Estimation results show that foreign direct investment (FDI) does not appear to reduce the share of agricultural labor in Indonesia. This occurs because FDI tends to flow into sectors that rely on technology and automation. Agricultural workers may lack the skills required by these industries. FDI often seeks workers with specific technical or managerial skills. Therefore, job opportunities created by FDI in Indonesia tend to be biased towards high-skilled labor (Ningrum, 2008).

Decomposition results highlight the importance of structural change in contributing to labor productivity growth in Indonesia, ranging from 0.9% to 1.7% during the period 1980-2020. Thus, the shift of labor from agriculture to non-agriculture has significantly increased overall productivity. The productivity increase resulting from the transition of labor from agriculture to industry is much greater than from agriculture to services. Specifically, for every 1% shift of agricultural labor to industry, productivity increases by USD 109. This figure can rise further to USD 114 if the agricultural labor moving to industry has at least a high school education or is semi-skilled. In contrast, the transition of agricultural labor to services increases productivity by USD 30-35. This is because the

industrial sector is seen as more capable of creating a larger number of formal job opportunities, thus having a higher leverage effect on productivity growth compared to the service sector (Rodrik, 2016).

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A Qualitative Perspective on The Implementation of Indonesian Dividend Tax Exemption: Hopes and Challenges

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Abstract
The Indonesian government has implemented a tax exemption policy on dividends under certain conditions to stimulate investment, which is expected to drive economic growth. This study seeks to examine how the Indonesian government's expectations can be realized and what challenges arise in its implementation. Using a qualitative approach through in-depth interviews, this research explores insights from various stakeholders, including regulators, professional associations, taxpayers, and academics. The novelty of this study lies in its focus on examining the policy within the Indonesian context and its use of a qualitative approach through in-depth interviews, which differs from previous studies that were mostly conducted in developed countries and predominantly employed a quantitative approach. The interview findings, analyzed using NVivo software, indicate that the dividend tax exemption is not the primary factor influencing corporate dividend distribution decisions. At the individual level, however, the exemption incentivizes investment, as reinvestment is a prerequisite for obtaining the tax relief. In terms of implementation, the challenges faced include several key aspects, such as administrative burdens and the need for monitoring to ensure compliance with the established requirements. In this regard, data integration and coordination among stakeholders are critical concerns.

Keywords: Dividend, Tax Exemption, Payout, Tax Incentive, Investment

1. Introduction

Tax policy is one of the tools employed by governments to enhance investment. However, not all tax policies yield positive effects on investment. A country's tax regime can positively and negatively impact investment. Poorly designed tax policies can adversely affect investment (OECD, 2006). Therefore, policymakers are encouraged to create policies that impose an acceptable tax burden and ensure low compliance costs.

One of the tools used by various countries to encourage investment is to change the policy regarding taxes on dividends. The change in tax policy on dividends in Sweden was motivated by the need to encourage entrepreneurship and investment in general (Alstadsæter et al., 2017). Meanwhile in China, tax policy changes in 2012 were aimed at encouraging long-term investment and curbing short-term speculative activity of individual investors (Li et al., 2017). In the context of dividend tax reform in the United States, the President of the United

States stated that this dividend tax cut would provide short-term support for investment, capital to build factories and buy equipment, and employ more people (Yagan, 2015).

The Indonesian government has implemented several tax policies aimed at increasing investment. In 2016, the government introduced the Tax Amnesty policy, which included provisions for lower tax rates if undisclosed assets were declared and subsequently invested within a specified period. Furthermore, in 2019, the Indonesian government issued tax incentives to promote investment through Government Regulation No. 45 of 2019. Under this regulation, taxpayers undertaking new capital investments in designated pioneer industries could receive exemptions or reductions in corporate income tax. A more recent example of a tax policy designed to encourage investment is Law No. 7 of 2021 on the Harmonization of Tax Regulations (UU HPP), which exempts dividend income from income tax, provided that the dividends are reinvested in specified investment instruments.

In every tax incentive given by the government, some consequences must be borne by the Government, namely the loss of potential tax revenue. Of course, in every decision to provide this incentive, the government hopes that its policies will run well and will provide greater economic benefits than the value of the loss of potential tax revenue. Beyond the revenue loss, Zee et al. (2002), highlight three additional costs associated with investment tax incentives: distortions between incentivized and non-incentivized investments, administrative costs required to manage these policies, and the social cost arising from potential misuse or abuse of the incentives.

Studies to see how this policy change affects the ultimate goal, influencing investment, have been conducted by many previous researchers. Empirical studies on the impact of dividend tax rate changes on investment have reached inconclusive results. Studies in the United States concluded that a reduction in dividend tax rates does not affect corporate investment (Chay et al., 2023; Yagan, 2015). While study in Switzerland reported that companies affected by the policy increased their dividend payments by 30% (Isakov et al., 2021). However, the reduction in dividend taxes did not stimulate investment. In contrast, study in South Korea found that a reduction in dividend tax rates increases corporate investment (Lee & Park, 2023).

To measure the impact on investment, researchers typically categorize their analyses into two perspectives, commonly referred to as the *Old View* and the *New View*. The traditional perspective, known as the Old View, assumes that corporate investment financing is conducted through the acquisition of new capital. Therefore, the ability to obtain new capital is closely linked to what is termed the cost of capital. Under the *Old View*, an increase in dividend taxes raises the cost of capital, and conversely, a reduction in dividend taxes lowers the cost of capital. As such, a decrease in dividend tax rates is expected to boost corporate investment, as companies can acquire capital at a lower cost of capital. However, an opposing perspective to the *Old View* has also gained traction in various studies. This perspective, known as the *New View* (Jacob, 2022), considers the availability of internal corporate funds as a determinant of a company's ability to finance its investments. From this viewpoint, dividend taxes do not affect corporate investment.

The design of the dividend tax exemption policy in Indonesia differs from that of other countries, as indicated by previous studies. Furthermore, the dividend tax exemption policy in Indonesia includes administrative requirements for taxpayers seeking to benefit from this facility. Therefore, the author considers it necessary to conduct a study to examine how the implementation of this policy aligns with its intended objectives. This research aims to address how policy expectations and challenges are responded to, as well as the challenges in policy implementation.

Previous studies predominantly employed quantitative approaches to examine the impact of tax exemption policies on dividends, utilizing data derived from financial reports. Similar qualitative studies have previously been conducted using survey data from executives of public companies in Indonesia (Baker & Powell, 2012) and also in the United States (Brav et al., 2008). The novelty of this study lies in its focus on the policy context in Indonesia and its use of interviews with various relevant informants to conclude.

2. Method

The quantitative approach is a popular choice in financial research (Dewasiri & Weerakoon, 2016). However, the quantitative approach, which typically relies on proxies as tools to study the behavior of financial decision-makers, may not fully capture their actual decision-making processes (Dewasiri et al., 2018). Therefore, a qualitative approach is also necessary to complement research in finance (Burton, 2007). This study employs a qualitative approach to explore in depth the impact of income tax exemption policies on investment. This approach is chosen with the expectation of providing a more comprehensive understanding of stakeholders' perspectives on the policy. The primary method used is in-depth interviews, aiming to uncover the views, experiences, and challenges faced by various groups of informants in the context of tax policy and investment (Patton, 2002).

This research uses a qualitative approach that utilizes data obtained through in-depth interviews involving various stakeholders. Informants were selected purposively based on their expertise and involvement in taxation and dividend policy (Bryman, 2012). In-depth interviews in this study were also conducted with the consent of the informants. Informants were given sufficient explanation regarding the purpose of their research and their role in this study. Thus, each informant has the freedom to decide whether to be willing to be interviewed or refuse to participate in the in-depth interview. Thus, it can be said that this in-depth interview was conducted voluntarily and with the consent of each informant and respects ethical principles.

These interviews are conducted with respondents categorized into four groups. The first group consists of regulators, represented by the Ministry of Finance, which introduced the policy of income tax exemption on dividends. Specifically, the regulators in this study include the Directorate General of Taxes (DGT), covering the Directorate of Tax Regulations, the Directorate of Tax Data and Information, and the Directorate of Audit and Collection. Additionally, the Fiscal Policy Agency (Badan Kebijakan Fiskal or BKF), as a policy advisory partner, also represents the regulatory perspective. The second group consists of professional associations, including the Indonesian Public Listed Companies Association (Asosiasi Emiten Indonesia) and the Tax Consultants Association (Ikatan Konsultan Pajak Indonesia or IKPI). Professional and business associations often serve as intermediaries between their members and regulators, making their perspectives particularly important to examine. The third group represents taxpayers directly impacted by the policy are represented by listed company finance that act as direct taxpayers. From these taxpayers, insights can be gained into the factors they consider when determining dividend policy and their perspectives on the implementation of the dividend tax exemption policy. The fourth group comprises academics and tax policy observers. This group includes tax experts who contributed to drafting academic papers and participated in discussions on legislative proposals, expert witnesses in domestic and international tax trials, university lecturers, tax commentators in mass media, and tax policy researchers.

Qualitative research often presents challenges, including the intensive and time-consuming nature of qualitative data collection, sampling and analysis biases, and interpretation biases (Priyatni et al., 2020). The use of NVivo software application is recommended to address this issue. NVivo assists researchers in managing qualitative data by organizing and classifying it systematically according to the characteristics of qualitative research. The software helps streamline and facilitate the organization process, ensuring data is neatly categorized and easily analyzed.

3. Results

3.1. In-Depth Interview

In this study, in-depth interviews were conducted with several respondents or informants. The informants were categorized into four groups to facilitate the coding process: Regulators, Associations, Operators, and Academics.

The interviews covered various topics, including the background of the dividend tax incentive policy implementation, which is expected to support macroeconomic development, particularly investment, as emphasized by regulators. Another key issue discussed was the allocation of investment instruments, as there is

no specific prioritization among the 12 available investment instruments. Additionally, the interviews addressed the effectiveness of policy implementation, policy evaluation concerning information technology aspects highlighted by several informants, as well as data integration and inter-agency coordination. Another crucial aspect discussed was the need for implementing regulations, such as technical guidelines and specific regulations, to support the execution of the dividend tax exemption policy.

In terms of the impact of the policy on increasing dividend distribution to shareholders, informants revealed that taxes on dividends are not the main determining factor. The factor that has a greater influence on dividend distribution is the Company's financial condition. These results strengthen the qualitative research by Brav et al. (2008) and Baker & Powell (2012) which shows that the role of tax policy is not too dominant in dividend payment.

In the Association category, informants agreed on the impact of the dividend tax exemption in stimulating investment by individual dividend recipients. However, the encouragement for increased investment by individuals receiving dividend income is not necessarily in line with increased investment by corporations. This result strengthens other empirical findings which show that the exemption of income tax on dividends does not necessarily encourage corporate investment (Chay et al., 2023; Yagan, 2015). This result doesn't support the finding conclude that the dividend tax policy affect corporate investment such as the results of a study by Lee & Park (2023) in South Korea which showed an increase in corporate investment. This is also in line with the statement of the informant who stated that dividend payments are influenced by the financial conditions and needs of the company.

Other insights provided by informants from the Regulator, Operator, Association, and Academic categories will be further explored through coding analysis.

3.2. Coding Analysis

In this study, a Node system was developed based on the coding hierarchy to examine several aspects, including the impact of the dividend tax exemption policy on corporate dividend payments, its effect on corporate investment, and the analysis of its implementation in Indonesia. To achieve these objectives, a Node system named "Implementation" was established, with two sub-Nodes: "Impact" and "Others." The "Impact" sub-Node refers to the effects of the dividend tax exemption policy, particularly on investment. Meanwhile, the "Others" sub-Node maps Nodes that fall outside the context of the policy's impact. In aggregate, at least 20 Nodes were identified at the highest hierarchical level.

Conceptually, several excerpts indicate that the 10% final dividend tax incentive influences investment decisions by dividend-receiving taxpayers, including in the real sector and financial market deepening. Another dominant Node is "Data Integration," which refers to inter-agency collaboration in supporting the Directorate General of Taxes (DGT) in implementing the tax incentive policy.

These Nodes further suggest that inter-ministerial and inter-agency coordination can affect the quality of data and information necessary to support policy implementation. Building on this, the "Digitalization > Administration" Node highlights operational efficiency, including data availability, which impacts administrative costs for both taxpayers and tax authorities. Additionally, another dominant Node underscores the importance of stakeholder synergy, particularly concerning data integration quality and information exchange.

Furthermore, several Nodes were mentioned by 33% of informants, including "Supplementary Guideline," "Stakeholders Complexity," "Compliance Rate Problem," "Priority Program > Effectiveness," "Conditional Release," and "Government Revenue." These Nodes reflect key issues:

The need for technical regulations or derivative rules, such as technical guidelines and specific regulations;
The challenges of achieving synergy at the operational level;
The low compliance rate with the implemented policy;

The impact of the dividend tax exemption policy in directing investment allocation toward national priority programs, affecting its overall effectiveness;
Concerns over the policy's restrictive terms and conditions; and
The expectation that tax expenditure could accelerate investment and, ultimately, contribute to government revenue.

The following section presents a hierarchical mapping of the "Impact" sub-Node, which categorizes key aspects related to the effects of the dividend tax exemption policy. Based on figure 1, the impact on investment is most often mentioned compared to other Nodes. Furthermore, the Nodes "Tax Exemption > Investment" have a reference count of 8 or have a contribution value of 67%.

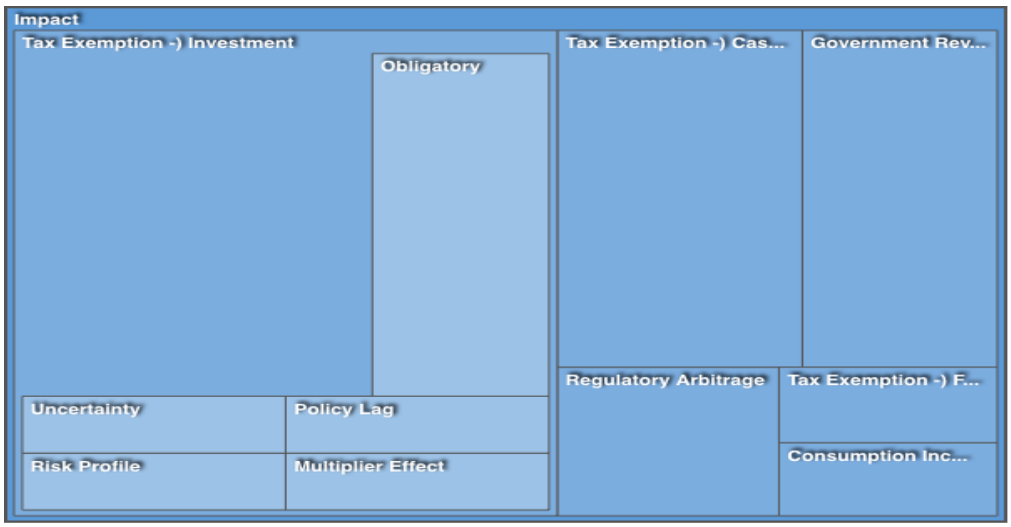

Figure 1: The Hierarchy of Sub Nodes "Impact"

Furthermore, the Nodes "Tax Exemption > Investment" have several sub-Nodes in them which are hierarchical in form, the following is an image that shows what is meant:

Figure 2: The Hierarchy of Sub Nodes "Tax Exemption"

Based on figure 2, several sub-Nodes have been mapped. "Obligatory" is the most frequently mentioned Node across all informants. This Node highlights the investment allocation resulting from the dividend tax exemption, which contains an obligatory element through the imposition of a 10% final tax. Other mapped Nodes under the "Impact" sub-Node include "Uncertainty," "Risk Profile," "Policy Lag," and "Multiplier Effect." Each of these Nodes has a reference count of one, contributing 8.3% to the overall discussion. Data analysis indicates that "Tax Investment" is the Node with the highest number of references, totaling eight, with a contribution of 67%. This suggests that approximately 67% of informants mentioned the impact of the dividend tax exemption on the level

of investment made by dividend recipients. Additionally, 42% of informants discussed its impact on corporate cash flow, while 33% addressed its effect on government revenue. Furthermore, the "Obligatory" and "Regulatory Arbitrage" Nodes were mentioned by 25% and 17% of informants, respectively. The "Obligatory" Node also contains a child Node, "Criminal Act," which refers to potential violations related to taxpayer non-compliance in allocating tax-exempt dividend proceeds. The following figure describes the project map of Nodes "Impact".

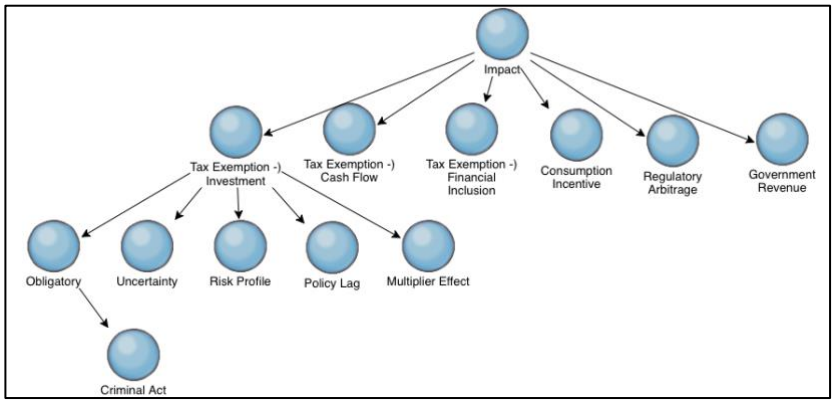

Figure 3: Project Map Sub-Nodes "Impact"

Furthermore, the 'Others' sub-Nodes will be analyzed. These sub-nodes map out what if the things mentioned are related to the context of dividend tax exemption policy implementation, except for the impacts caused. Figure 4 show us that, 'Data Integration' has the largest number of references compared to other Nodes. The contents of these Nodes refer to the need for inter-agency cooperation in creating good quality data integration, especially for tax authorities, in supporting tax implementation. In addition, 'Digitalisation > Administration' is also the Node that has the largest number of references and at the same time the most mentioned by all informants. The contents of these Nodes refer to the importance of the role of digitalization that can have an impact on the level of operational efficiency, both in terms of taxpayers and tax authorities.

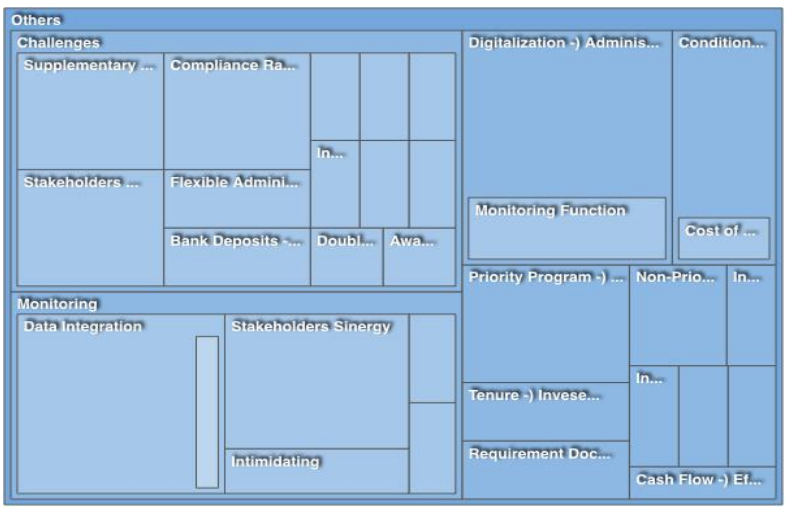

Figure 4: The Hierarchy of Sub Nodes "Others"

Meanwhile, several other Nodes such as: "Conditional Release", "Priority Program > Effectiveness Rate", "Compliance Rate Problem", "Stakeholders Complexity", and "Supplementary Guideline" are Nodes that are also dominantly mentioned after the digitalization aspect. Here are some of the notes: (i). Complaints about the dividend policy that is still bound by certain terms and conditions; (ii). Tax expenditure that is expected to have an impact on accelerating investment which ultimately leads to government revenue; (iii). The results of the low level of compliance with the implemented policies; (iv). Synergy that is considered difficult to do at the implementing level; and (v). The need for technical or derivative regulations such as Technical Instructions, Regulations, and so on. Furthermore, several issues are also mapped that can be categorized as

obstacles/challenges in the implementation of the dividend tax-free policy, the following is a hierarchy that shows the dominance of each mapped Node, as follows:

Figure 5: The Hierarchy of Sub Nodes “Challenges”

Based on Figure 5, in the context of obstacles, "Compliance Rate Problem", "Stakeholder Complexity", and "Supplementary Guideline". The "Compliance Rate Problem" refers to the low policy output (compliance) as a result of the implementation of the dividend tax-free policy. The Nodes "Bank Deposits > Effectiveness Rate", and "Flexible Administration" refer to the response of taxpayers who invest in bank deposits which some informants consider to have no impact on investment. Meanwhile, "Flexible Administration" refers to tax administration which is still considered difficult for taxpayers. Furthermore, related to the supervision carried out, several child Nodes are also mapped in it, such as: "Data Integration", "Stakeholders Sinergy", "Intimidating", "Grace Period" and "Priority Pre-Audit Identification". The following is an image that shows what is meant:

Figure 6: The Hierarchy of Sub Nodes “Monitoring”

In terms of the “Others” sub-Nodes the data processing shows us that “Data Integration” is the Node with the highest number of references, namely 8 with a total contribution of 67%. This concludes that around 67% of informants mentioned the importance of data integration between institutions in supporting the implementation of the dividend tax-free policy. Meanwhile, 59% of informants in this study mentioned the impact of technology use on tax administration. The importance of synergy between stakeholders, one of which is related to the exchange of information/data integration, was mentioned by 50% of informants. Furthermore, 33% of informants in this study mentioned the Nodes “Compliance Rate Problem”, “Stakeholder Complexity”, and “Supplementary Guideline”. The following figure describes the project map of Nodes “Others”.

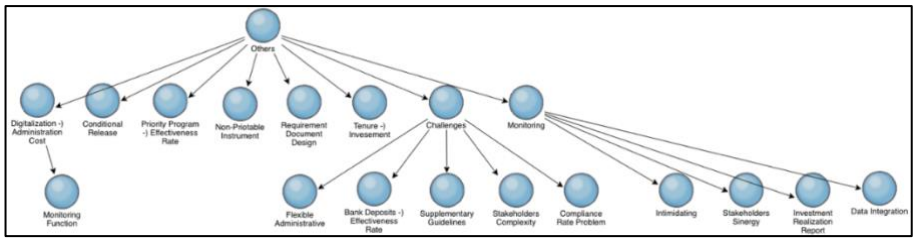

Figure 7: Project Map Sub-Nodes “Others”

The next stage is the comparative diagram analysis. This step known as second cycle coding is the second phase in the coding analysis. The nodes or coding that has been created previously at the first cycle coding serve as the foundation for the second cycle coding. The results of the analysis describe the similarities of things mentioned by each informant. At the Second Cycle Coding stage, causal coding that has been built in the previous stage that has the highest reference is also grouped. Futhermore, to draw a comprehensive pattern, a concept mapping was created based on the first and second coding analysis. The following is a picture that shows what is meant:

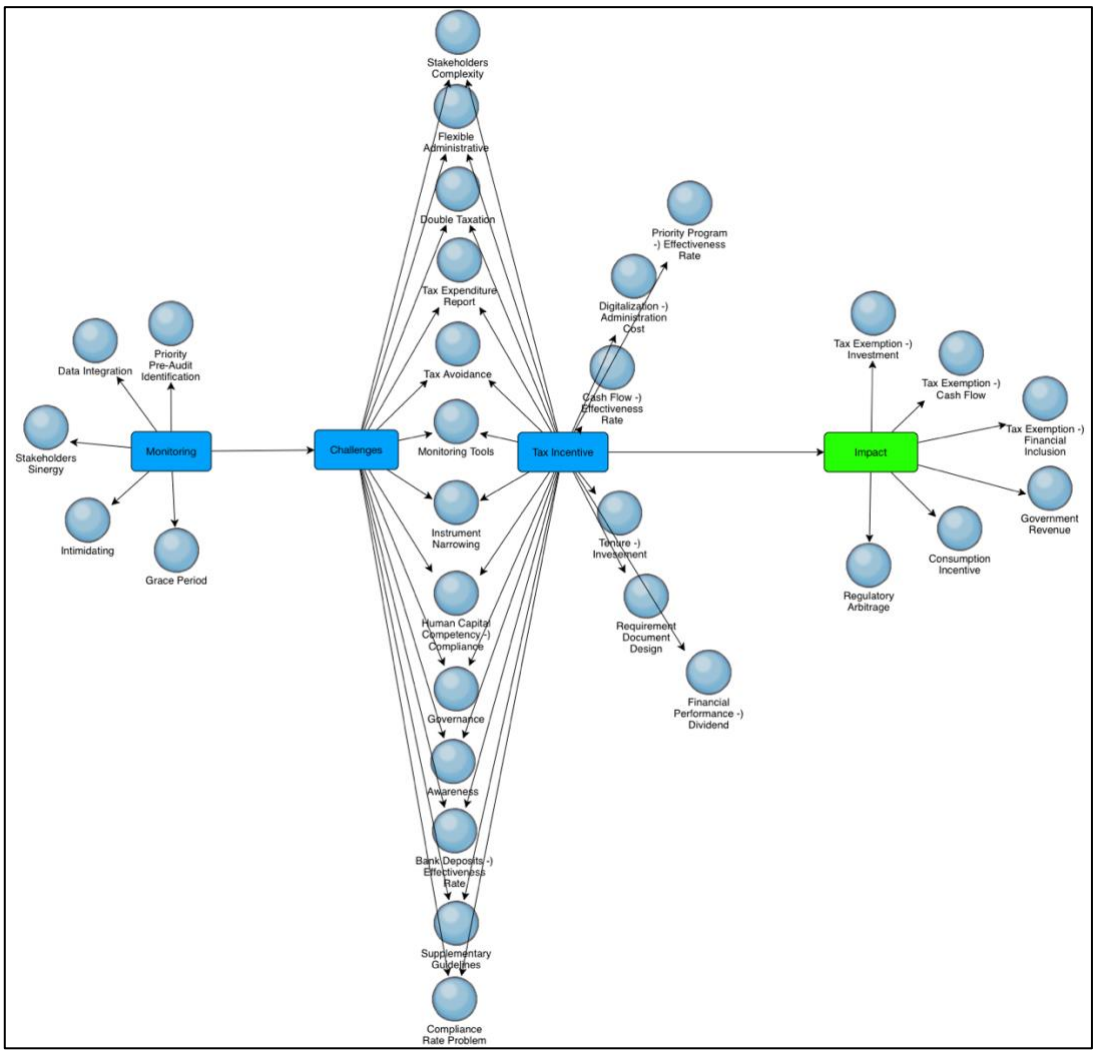

Figure 8: Concept Mapping

Based on Figure 8, in the process of implementing the dividend tax exemption policy, several obstacles are still found which are also strategies that can be used to support the implementation of the policy. The nodes "Stakeholders Complexity", and "Flexible Administrative" indicate that administrative complexity is a key

consideration in the implementation of this policy. This is understandable, as the policy does not automatically grant a tax exemption on dividends but instead imposes administrative requirements for its utilization, such as periodic investment reporting. Administrative burdens, in turn, may weaken both domestic and foreign investment. Therefore, if referring to the policy framework for investment by the OECD (2015), a systematic program review is needed to ensure that regulations are cost-effective, consistent, and produce the desired policy impact.

Another concern raised pertains to how the implementation of this policy can be effectively monitored to achieve its intended objectives. This can be seen from the emergence of "Tax Avoidance" and "Compliance Rate Problem" nodes. In the context of Indonesian policy, individual taxpayers who benefit from this incentive are required to invest their dividend income in various investment instruments. Theoretically, the funds invested by these individuals can be utilized by corporations to finance their real investments. Therefore, it is crucial to monitor the extent to which individuals receive dividend income and how much of it is invested in Indonesia.

This concern over monitoring appears to have led to the emergence of related nodes from the informants. Nodes such as "Data Integration" and "Stakeholders Synergy" indicate concerns regarding this issue. These nodes suggest that Indonesia's tax authorities must collaborate with other stakeholders to obtain the necessary data for policy monitoring. The tax exemption policy on dividends has the consequence of eliminating the withholding tax system on dividend income. As a result, tax authorities must work with other stakeholders to collect data on who receives dividend income, the amount received, and other income data. This data can then be utilized for pre-filling PIT returns and audit purposes (OECD, 2024). Consequently, information from various sources will help tax authorities identify tax avoidance opportunities, thereby increasing compliance, which can lead to higher state revenues (Jacobs, 2017).

4. Discussion

The coding analysis of the dividend tax exemption policy, especially for corporations, shows that it is not the main factor influencing the company's decision to distribute dividends. This is indicated by the existence of the Nodes "Financial Performance > Dividend". The nodes refer to one of the statements of the informant "Operator" which states that the decision to distribute dividends is more influenced by the condition of its financial performance, especially on cash flow. Furthermore, the informant also stated that tax is not the main and only factor for companies in determining dividend distribution. This opinion confirms previous qualitative research conducted by Brav et al. (2008) and Baker & Powell (2012) that tax policy on dividends is not the main factor driving dividend distribution by companies. Dividend distribution by the company can be influenced by the company's condition where most companies need additional capital or support operational activities through cash flow and company profits. The impact of the tax-free policy may have more impact on Individual Taxpayers.

The coding analysis shows us that the dividend tax exemption policy will conceptually have an impact on investment allocation at the individual level/Individual Taxpayers receiving dividends. This is indicated by the existence of the Nodes "Tax Exemption > Investment" which has the highest number of references, namely 8 (67%) compared to other Nodes.

However, in its implementation, several obstacles were still found. The coding analysis gives us information that the implementation of this policy still has several challenges, mainly related to the administrative burden and aspects of policy supervision related to compliance with the policy. Challenges regarding policy supervision require cooperation so that this policy can be implemented properly.

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Who Gains from Higher Education? District-Level Development and Labor Market Inactivity Among Indonesian Young Adults

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Abstract
Despite rapid expansion in higher education access, Indonesia continues to face persistently high rates of labor market inactivity among young adults. This study investigates the relationship between tertiary education, household economic status, and NEET (Not in Employment, Education, or Training) outcomes among individuals aged 25–34, while examining how these effects are shaped by regional development contexts. Using nationally representative SUSENAS data from 2019 to 2024, the analysis applies a multilevel mixed-effects logistic regression model to assess both individual- and district-level influences, including interactions between education and contextual indicators such as the Human Development Index (HDI) and poverty rates. The results confirm that both tertiary education and household income (log per capita expenditure) significantly reduce the likelihood of being NEET. However, their protective effects are not uniform across regions. In high-HDI and high-poverty districts, the employment benefits of tertiary education are notably weaker—suggesting that credential expansion alone cannot overcome structural labor market constraints. Margins analysis further reveals that while NEET probabilities decline with rising income and education, these gains taper off in more developed and more deprived areas. These findings challenge assumptions of uniform returns to education and underscore the importance of aligning human capital investments with local labor market conditions. Targeted employment policies and spatially responsive education-to-work strategies are essential to ensure that higher education translates into real opportunities for Indonesia's youth.

Keywords: Indonesia, Labor Market Inactivity, Multilevel Mixed-Effects Logistic Model, Young Adults

1. Introduction

1.1 The Paradox of Higher Education: Inactivity Among Indonesia's Young Adults

Over the past two decades, Indonesia has substantially expanded access to tertiary education. By 2024, the country's gross enrollment rate (GER) in higher education had reached 39.4%, reflecting a steady upward trend. This figure, however, still lags behind neighboring countries such as Singapore (91.1%), Thailand (49.3%), and Malaysia (43.0%) (Brodjonegoro, 2024). As of 2022, Indonesia was home to 4,481 higher education institutions—

including universities, Islamic colleges, service academies, and the Open University—many of which are privately managed (Moeliodihardjo, 2024). The rapid growth in institutional capacity has been accompanied by a rising social demand for higher education, mirroring global patterns in which tertiary education is seen as a pathway to human capital accumulation, upward mobility, and improved labor market outcomes (Lim et al., 2023; Psacharopoulos & Patrinos, 2018).

Despite these gains, a growing paradox has emerged. While more young Indonesians attain tertiary education than ever, a sizable share remains disengaged from the labor market—classified as Not in Employment, Education, or Training (NEET). This disconnect challenges conventional human capital assumptions that link higher education directly to improved employment outcomes (Becker, 1993; Brown et al., 2011). In low- and middle-income countries especially, the promise of education as a shield against exclusion is increasingly contested (Ilie & Rose, 2018; UNESCO, 2020).

In the Indonesian policy discourse, the focus on youth inactivity has often centered on those aged 15–24 (Jessica & Arcana, 2024; Naraswati & Jatmiko, 2022; Pattinasarany, 2024), consistent with Sustainable Development Goal indicators. However, this age group often includes students who have not yet completed their education, making it a less precise lens for studying labor market entry. By contrast, the 25–34 age group better captures individuals who are more likely to have exited education and face employment decisions directly (Aina et al., 2021; Dinku, 2024).

Drawing on nationally representative SUSENAS data from 2019 to 2024, Figure 1 illustrates labor market inactivity trends among Indonesians aged 25–34, disaggregated by educational attainment. Inactivity rates have remained persistently high—ranging from 26.8% to 27.8%—suggesting deep structural frictions. Tertiary-educated individuals consistently show lower inactivity (17.1% to 21.7%), but the protection is partial and uneven. Notably, inactivity among this group peaked at nearly 22% in 2022 following COVID-19 disruptions before declining to 19.5% in 2024. This volatility indicates that higher education alone is not a reliable guarantee of labor market integration.

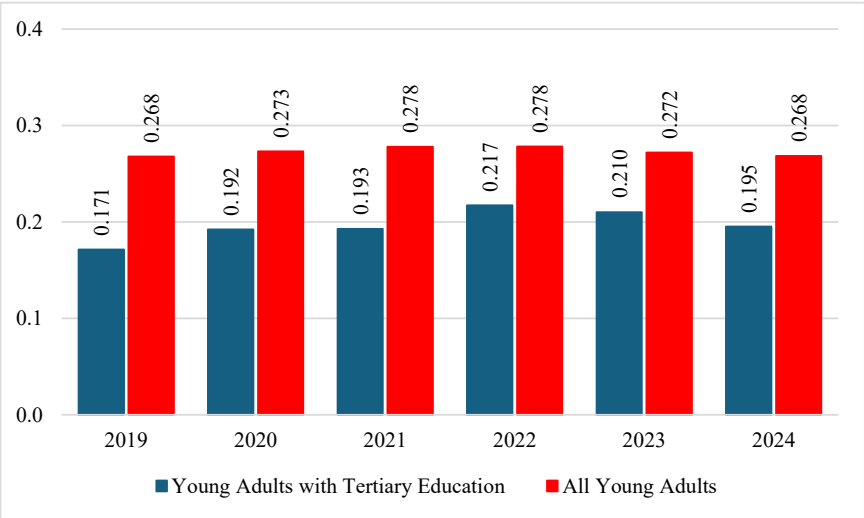


Figure 1: Labor Market Inactivity Among Young Adults Aged 25–34, by Educational Attainment, 2019–2024

Source: Author's calculation

Similar trends have been observed in other middle-income countries, where the expansion of tertiary education has outpaced the capacity of labor markets to absorb graduates, resulting in widespread mismatches and underemployment (Battu & Bender, 2020; Neycheva, 2021). These patterns underscore the need to move beyond aggregate enrollment figures and examine the structural, institutional, and regional constraints that limit the ability of even well-educated young adults to transition successfully into meaningful employment

1.2 Purpose of the Study and Research Questions

This study investigates the determinants of labor market inactivity among young adults aged 25–34 in Indonesia, specifically focusing on how regional socioeconomic contexts shape the effectiveness of higher education in preventing NEET (Not in Employment, Education, or Training) outcomes. Using nationally representative SUSENAS data from 2019 to 2024, the analysis examines how individual educational attainment and household economic status interact with district-level structural factors—namely the Human Development Index (HDI) and poverty rates—to influence labor market participation.

Grounded in human capital theory and contextualized by economic development literature, the study explores whether the protective effect of tertiary education is uniform across regions or contingent upon broader development conditions. By incorporating cross-level interactions between individual- and district-level variables, the research design aims to capture the multidimensional dynamics that shape labor market outcomes in a middle-income country context. A multilevel mixed-effects logistic regression model is employed to account for clustering at the district level and to model heterogeneity in regional economic environments.

The research addresses the following research questions (RQs):

- **RQ1:** To what extent is tertiary education associated with a reduced likelihood of labor market inactivity among young adults in Indonesia?
- **RQ2:** How does household economic status, as measured by log per capita expenditure (LogPCE), relate to the probability of being NEET?
- **RQ3:** Do regional contextual factors—specifically HDI and poverty rates—independently affect the likelihood of labor market inactivity?
- **RQ4:** Do HDI and poverty rates moderate the relationship between tertiary education and NEET status?
- **RQ5:** Does the effect of household economic status on labor market inactivity vary across districts with differing levels of HDI and poverty?

1.3 Importance and Contribution of the Study

This study contributes to the literature on labor market integration by focusing on an underexamined demographic group: young adults aged 25–34 in Indonesia. Unlike the more commonly studied 15–24 age group, which includes many individuals still in formal education, this older cohort has largely completed their schooling, making them a more appropriate population for analyzing post-education labor market transitions and the realized economic value of tertiary education. In doing so, the study addresses a critical gap in the evidence base on education-to-employment outcomes in emerging economies.

The study offers three key contributions. First, it introduces a multilevel framework grounded in human capital theory, linking individual-level factors—tertiary education and household economic status—with district-level structural conditions, namely the HDI and poverty rates. This framework allows for a more comprehensive understanding of how macro-contexts shape the micro-level effects of education. Second, by incorporating cross-level interaction terms, the analysis tests whether the benefits of higher education and household resources vary by the level of regional development, thereby highlighting spatial conditionality in educational returns. Third, the study uses nationally representative, multi-year data (2019–2024) and applies multilevel mixed-effects logistic regression to capture the hierarchical structure of the data and regional clustering, enhancing the robustness and policy relevance of the findings.

The findings have practical implications for regional development policy, education system accountability, and labor market planning. By identifying where and for whom tertiary education fails to translate into employment, the study provides actionable insights for targeting interventions—such as skills matching, employment services, or investments in lagging districts. Conceptually, it contributes to ongoing debates on uneven returns to education, structural barriers to inclusion, and contextual inequality in labor market outcomes in middle-income countries.

2. Materials and Methods

2.1 Conceptual Framework

This study draws on human capital theory, which posits that educational investments increase an individual's productivity and employability, leading to better labor market outcomes (Becker, 1993). From this perspective, tertiary education should protect against labor market exclusion, as it endows individuals with skills in demand in a modern economy. Becker conceptualizes schooling as a capital investment, yielding returns through enhanced earnings and labor force participation. In the context of Indonesian young adults, this framework suggests that individuals with tertiary education should be less likely to be inactive in the labor market as their advanced skills and credentials increase their competitiveness.

However, the extent to which educational attainment leads to employment is uneven and highly dependent on structural and contextual factors. Regional disparities in development often mediate this relationship, either enabling or obstructing the translation of education into labor market opportunities. In many low- and middle-income countries, including Indonesia, challenges such as underdeveloped labor markets, high levels of informality, and spatial inequalities significantly limit these returns (Filmer & Fox, 2014). In South Africa, for example, young adults with higher education continue to face exclusion from the labor market due to job shortages, skills mismatches, and institutional barriers (Yu, 2013). Similarly, Yeung and Yang (2020) emphasize that globally, even tertiary-educated youth often confront precarious or informal employment, with labor market outcomes shaped by broader inequalities linked to socioeconomic status, gender, and ethnicity.

This study incorporates two key district-level indicators to capture these contextual dynamics: the Human Development Index (HDI) and poverty rates. HDI reflects overall regional capabilities, combining health, education, and income indicators, while poverty rates measure the prevalence of deprivation and economic vulnerability. Both serve as proxies for the local opportunity structure in which young adults attempt to convert educational attainment into labor market participation. Empirical evidence from Western African countries shows that individuals in regions with low development levels often face greater barriers to employment, regardless of their education level (Dimova et al., 2010). These findings support the view that the effect of education is not absolute but contingent upon the structural and institutional characteristics of the region.

This study adopts a multilevel analytical approach to examine how individual-level attributes—tertiary education and household economic status—interact with regional development conditions. It explores whether the benefits of education and household resources vary systematically across districts with differing levels of HDI and poverty. Specifically, the analysis considers whether the protective effect of tertiary education against labor market inactivity is stronger in districts with higher HDI and lower poverty, where institutional support and job opportunities may be more robust. It also assesses whether the influence of household economic status, proxied by log per capita expenditure (LogPCE), is shaped or constrained by broader regional development and deprivation contexts.

By integrating individual and contextual determinants, the conceptual framework offers a more comprehensive understanding of labor market inactivity among young adults in Indonesia. It contributes to broader discussions on the spatial conditionality of educational returns in developing and emerging economies.

2.2 Methodology

This study employs a multilevel mixed-effects logistic regression model to examine the determinants of labor market inactivity among young adults in Indonesia, guided by five research questions. The model incorporates explanatory variables at two levels: individual and household characteristics (Level 1) and district-level contextual factors (Level 2), with tertiary education attainment as the key independent variable.

The multilevel approach is appropriate given the hierarchical structure of the data, with individuals nested within districts, and the binary nature of the dependent variable (inactivity status). Random intercepts at the district level

account for unobserved contextual heterogeneity and adjust for clustering effects. This framework allows for the simultaneous estimation of fixed effects while capturing variation in baseline inactivity risks. By integrating cross-level interactions, the model tests how education and household economic status are shaped by broader regional development conditions, such as HDI and poverty (Rabe-Hesketh & Skrondal, 2022).

Formally, the *Baseline Model* is specified within a latent response framework, serving to establish the baseline relationships between individual- and district-level predictors and labor market inactivity. Let y_{ij}^{*} denote the unobserved propensity for individual i in district j to be NEET. This latent variable is modelled as:

$$y_{ij}^{*} = x1_{ij}\beta 1 + x2_{j}\beta 2 + z_{ij}u_{j} + \epsilon_{ij}$$

where $x1_{ij}$ represents individual- and household-level covariates; $x2_{j}$ denotes district-level contextual variables; z_{ij} is a covariate vector associated with the random effects (in this case, a scalar of 1); u_{j} is the district-specific random intercept; and ϵ_{ij} is the individual-level error term, assumed to follow a logistic distribution with mean 0 and variance $\pi^{2}/3$, independent of u_{j}.

The observed binary outcome y_{ij} is linked to the latent variable y_{ij}^{*} through the measurement equation:

$$y_{ij} = \begin{cases} 0 \; if \; y_{ij}^{*} > 0 \\ 1 \; if \; y_{ij}^{*} \leq 0 \end{cases}$$

Building on the Baseline Model, the *Interaction Model* introduces interaction terms between tertiary education attainment and two continuous district-level contextual variables—HDI and poverty rates. This specification tests whether the effect of tertiary education on labor market inactivity varies with regional development conditions. To complement this approach, the *Categorical Interaction Model* replaces the continuous indicators with binary categorical variables based on district-level rankings. Districts are classified into two groups for each indicator: low (low-HDI or low-poverty) and high (high-HDI or high-poverty), based on the bottom and top 50th percentiles, respectively. This grouping strategy enhances interpretability and facilitates direct policy-relevant comparisons across contrasting development contexts.

Unlike the continuous Interaction Model, which assumes linear moderation, the categorical model captures potential threshold effects and non-linearities in how regional development shapes the returns to tertiary education. To avoid multicollinearity, the continuous HDI and poverty variables are excluded, as the binary groupings are constructed from the same underlying distributions. Interaction terms between the binary HDI and poverty variables and tertiary education are included to assess whether the protective effect of higher education differs significantly across regional development tiers.

2.3 Data

This study uses data from the National Socioeconomic Survey (*Survei Sosial Ekonomi Nasional*, SUSENAS), an annual household survey conducted by Indonesia's Central Statistics Agency (Badan Pusat Statistik—BPS). SUSENAS is designed to be nationally and subnationally representative, covering all 514 districts (*kabupaten*/regencies and *kota*/municipalities). As one of Indonesia's most comprehensive sources of socioeconomic data, it enables rigorous analysis of population-level trends. The study draws on pooled data from six survey waves, spanning 2019 to 2024, and focuses on a subset of 977 453 individuals aged 25 to 34. Concentrating on this age group—typically beyond formal schooling—allows for a more accurate assessment of post-education labor market outcomes and structural inactivity.

SUSENAS adopts a stratified two-stage sampling design to ensure representativeness at multiple levels. In the first stage, census blocks are selected using probability proportional to size based on household counts. In the

second stage, a fixed number of households are randomly selected within each chosen block. Each year, SUSENAS surveys approximately 320 000 households, yielding data on about 1.2 million individuals, enabling robust estimates across provinces and districts.

For this study, NEET status is defined as young adults aged 25–34 who were not engaged in employment, education, or training during the reference week prior to the survey. This category includes individuals with unpaid domestic responsibilities (e.g., caregiving or household tasks), those involved in personal or social activities (e.g., religious participation or informal learning), or those reporting no specific activity. The definition excludes individuals who were temporarily not working but maintained formal employment or self-employment status. By adopting this refined classification, the study aims to capture the structural labor market inactivity phenomenon more accurately, distinguishing it from short-term absences or voluntary non-participation.

The descriptive statistics of the variables used in this study, including means and standard deviations disaggregated by year, are presented in Table 1.

Table 1: Mean and Standard Deviation of Data

Variable	2019		2020		2021		2022		2023		2024		All Obs	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
NEET Status	0.268	0.443	0.273	0.446	0.278	0.448	0.278	0.448	0.272	0.445	0.268	0.443	0.273	0.446
Female	0.511	0.500	0.515	0.500	0.510	0.500	0.513	0.500	0.517	0.500	0.520	0.500	0.514	0.500
Married	0.735	0.442	0.753	0.431	0.748	0.434	0.725	0.446	0.700	0.458	0.686	0.464	0.725	0.446
Age (years)	29.59	2.90	29.61	2.90	29.53	2.88	29.59	2.88	29.64	2.90	29.69	2.90	29.61	2.89
Tertiary Education	0.219	0.414	0.208	0.406	0.216	0.412	0.216	0.412	0.253	0.435	0.215	0.411	0.221	0.415
Urban	0.409	0.492	0.403	0.490	0.428	0.495	0.361	0.480	0.506	0.500	0.474	0.499	0.435	0.496
HH aged 0-4 (persons)	0.45	0.65	0.41	0.63	0.34	0.59	0.40	0.63	0.36	0.59	0.33	0.57	0.37	0.60
HH aged 60+ (persons)	0.35	0.63	0.38	0.65	0.40	0.67	0.32	0.61	0.34	0.63	0.37	0.65	0.36	0.64
Log(PCE)	13.80	0.64	13.74	0.62	13.79	0.63	13.86	0.63	13.99	0.64	14.01	0.62	13.86	0.64
HDI (point 0-100)	69.87	6.30	69.99	6.19	70.32	6.27	70.93	6.23	71.64	6.18	72.34	6.10	70.84	6.28
Poverty Rate (%)	11.60	7.32	11.60	7.01	11.92	7.03	11.37	6.86	11.16	6.76	10.79	6.65	11.41	6.95
Observations	165 842		168 829		179 135		165 791		153 480		144 376		977 453	

Notes: NEET status, Female, Married, Age, and Tertiary Education are calculated using individual-level weights. Urban residence, household members aged 0–4 and 60+, and Log(PCE) are calculated using household-level weights. HDI and Poverty rates are reported as unweighted district-level values.

Source: Author's calculation

3. Results and Discussions

The results of the multilevel mixed-effects logistic regression are presented across three model specifications, with all estimates reported as odds ratios for ease of interpretation. As outlined in the Methodology section, these include the Baseline Model (Column [1]), the Interaction Model (Column [2]), and the Categorical Interaction Model (Column [3]). The complete results are summarized in Table 2.

Table 2: Multilevel Logistic Regression of Labor Market Inactivity Among Young Adults

	Baseline		Interaction		Categorical Interaction	
	[1]		[2]		[3]	
Female	14.140	(0.096) ***	14.146	(0.096) ***	14.140	(0.096) ***
Married	0.854	(0.007) ***	0.854	(0.007) ***	0.853	(0.007) ***
Age 26	1.031	(0.012) **	1.031	(0.012) **	1.031	(0.012) **
Age 27	1.001	(0.012)	1.001	(0.012)	1.001	(0.012)
Age 28	0.928	(0.011) ***	0.927	(0.011) ***	0.928	(0.011) ***
Age 29	0.853	(0.010) ***	0.852	(0.010) ***	0.853	(0.010) ***
Age 30	0.819	(0.010) ***	0.818	(0.010) ***	0.819	(0.010) ***
Age 31	0.763	(0.009) ***	0.761	(0.009) ***	0.762	(0.009) ***
Age 32	0.716	(0.009) ***	0.715	(0.009) ***	0.716	(0.009) ***
Age 33	0.675	(0.008) ***	0.673	(0.008) ***	0.674	(0.008) ***
Age 34	0.641	(0.008) ***	0.640	(0.008) ***	0.641	(0.008) ***
Urban	1.056	(0.007) ***	1.058	(0.007) ***	1.060	(0.007) ***
#HHM aged 0-4	1.149	(0.005) ***	1.150	(0.005) ***	1.149	(0.005) ***
#HHM aged 60+	1.016	(0.005) ***	1.016	(0.005) ***	1.016	(0.005) ***
Log Percapita Expenditure	0.684	(0.004) ***	0.683	(0.004) ***	0.685	(0.004) ***
Tertiary Education	0.445	(0.003) ***	0.071	(0.008) ***	0.398	(0.006) ***
HDI	1.027	(0.005) ***	1.023	(0.005) ***		
HDI * Tertiary			1.022	(0.002) ***		
High-HDI					0.974	(0.024)
High-HDI * Tertiary					1.130	(0.017) ***
Poverty Rate	0.984	(0.003) ***	0.981	(0.003) ***		
Poverty Rate * Tertiary			1.023	(0.001) ***		
High-Poverty					0.928	(0.021) ***
High-Poverty * Tertiary					1.093	(0.017) ***
Year 2020	1.072	(0.010) ***	1.073	(0.010) ***	1.075	(0.010) ***
Year 2021	1.101	(0.010) ***	1.102	(0.010) ***	1.107	(0.010) ***
Year 2022	1.159	(0.012) ***	1.160	(0.012) ***	1.196	(0.011) ***
Year 2023	1.142	(0.013) ***	1.143	(0.013) ***	1.203	(0.011) ***
Year 2024	1.108	(0.015) ***	1.110	(0.015) ***	1.194	(0.011) ***
Constant	2.806	(0.965) ***	3.932	(1.355) ***	15.513	(1.224) ***
Variances: District (constant)	0.268	(0.017)	0.268	(0.017)	0.336	(0.022)
LR test (p-score)	0.000		0.000		0.000	
Intraclass Correlation (ICC)	0.075		0.075		0.093	
Observations	977 453		977 453		977 453	

Notes: Standard errors are in parentheses. *** statistically significant at the 1% level, ** 5%, * 10%

Source: Author's calculation

Prior to estimating the full models, a null model was specified to assess the degree of clustering in NEET outcomes across districts. This intercept-only model, which excludes explanatory variables but includes random intercepts at the district level, serves to quantify baseline contextual variation. The intra-class correlation coefficient (ICC) derived from the null model was 0.064, indicating that approximately 6.4% of the total variance in NEET status is attributable to differences between districts (Snijders & Bosker, 2011). In addition, a likelihood ratio (LR) test comparing the multilevel specification to a single-level logistic regression produced a chi-square statistic of 24 154.04 ($p < 0.001$), confirming that the multilevel model offers a significantly better fit. Although the results of the null model are not reported in Table 2, they provide critical justification for the use of a multilevel framework in the subsequent analysis.

Following the null model, a variance inflation factor (VIF) test was conducted to assess the presence of multicollinearity among the explanatory variables. Using an ordinary least squares regression that included the

same set of covariates specified in the full model, the test results show that all independent variables have VIF scores below 2. This confirms that multicollinearity is not a concern in the data and that the estimated coefficients in the subsequent multilevel logistic regression can be interpreted with confidence.

3.1 Education and Economic Status as Determinants of NEET Status (RQ1 & RQ2)

The estimation results from the Baseline Model (Column [1]) demonstrate that tertiary education has a significant protective effect against labor market inactivity among young adults in Indonesia. On average, individuals with tertiary education are 56% less likely to be NEET compared to those without (OR = 0.445), highlighting the role of higher education in reducing early adulthood exclusion from the labor market. This finding is consistent with international research showing that tertiary education improves employability by enhancing skills, expanding access to formal employment, and increasing resilience during economic shocks. For instance, Agranovich and Dreneva (2022) demonstrate that in Russia, individuals with advanced tertiary qualifications—particularly master's degrees—are more likely to remain economically active even during periods of crisis. These cross-national patterns underscore the transformative impact of tertiary education on employment outcomes. In the Indonesian context, the results provide robust support for RQ1 by confirming that tertiary education serves as a powerful protective factor against NEET status.

Household economic status, measured by log per capita expenditure (LogPCE), emerges as a key predictor of labor market outcomes. The regression results indicate that each unit increase in LogPCE is associated with a 32% reduction in the odds of being NEET (OR = 0.684), suggesting that greater household resources provide a protective buffer against labor market inactivity. Improved economic conditions may enable young adults to invest more in job search activities, overcome spatial or financial barriers to employment, and access social networks that facilitate job entry. This finding is consistent with prior evidence; for instance, Naraswati and Jatmiko (2022) show that lower household income significantly increases NEET risk in Indonesia, particularly in contexts where poverty limits access to education, transportation, and job networks. Together, these results affirm RQ2 by highlighting the protective role of economic resources in reducing NEET status.

Robustness checks were conducted by estimating alternative models that incorporated quadratic, cubic, and quartic forms of LogPCE to assess potential nonlinearities in the relationship. However, none of these higher-order terms improved model fit or substantially altered the interpretation of results. As a result, the linear specification was retained for clarity and parsimony. This approach is consistent with broader empirical evidence on youth labor market outcomes in low- and middle-income countries.

The analysis extends beyond odds ratios by incorporating predicted probabilities derived from the multilevel logistic regression model to better illustrate how education and household economic status shape NEET risk. While odds ratios convey the direction and statistical significance of associations, predicted probabilities offer a more intuitive understanding of how the likelihood of labor market inactivity changes across combinations of LogPCE and educational attainment. This approach clarifies the substantive magnitude of differences in NEET risk and facilitates visual comparison across relevant subgroups. Examining predicted probabilities over a continuous range of LogPCE values and disaggregating by tertiary education status allows for a more nuanced understanding of how economic and educational factors jointly influence the probability of youth disengagement from the labor market.

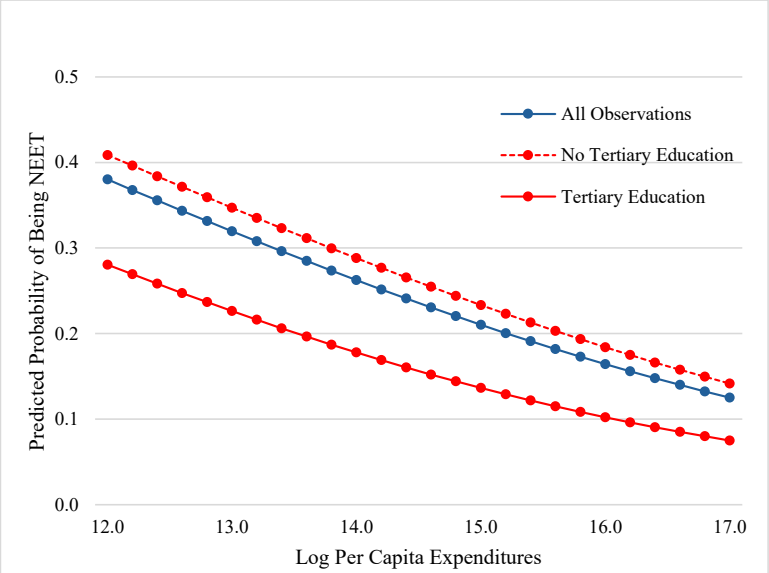


Figure 2: Predicted NEET Probability By Education And Economic Status

Source: Author's calculation

The predicted probabilities (Figure 2) reveal a pronounced inverse relationship between LogPCE and NEET status. As LogPCE rises from 12.0 to 17.0, the predicted probability of being NEET among the general population declines from 38.0% to 12.5%, reinforcing the central role of household economic resources. When disaggregated by educational attainment, tertiary education consistently lowers NEET probabilities across the entire income spectrum. The effect is most pronounced among lower-income individuals: at LogPCE 12.0, the NEET gap between those with and without tertiary education is 12.8 percentage points, narrowing to 6.7 points at LogPCE 17.0. These patterns indicate that while rising household wealth reduces the overall risk of inactivity, tertiary education adds a critical layer of protection—particularly for individuals from economically disadvantaged backgrounds. The findings offer direct evidence in support of both RQ1 and RQ2. Tertiary education substantially reduces the likelihood of labor market inactivity, and the effect of economic status on NEET risk is clearly moderated by educational attainment (Rahmani & Groot, 2023). The interaction observed—wherein the protective benefit of tertiary education is greatest at lower levels of LogPCE—underscores the compounded disadvantages faced by uneducated youth in poor households.

3.2 Regional Development and the Risk of Labor Market Inactivity (RQ3)

Based on estimates from the Baseline Model (Column [1]), the results indicate that the Human Development Index (HDI) is positively and significantly associated with the likelihood of labor market inactivity among young adults. Specifically, a one-point increase in HDI (on the 0–100 scale) corresponds to a 2.7% increase in the odds of being labor market inactive (OR = 1.027), after controlling for individual and household characteristics, including gender, marital status, age, education, urban residence, household composition, and log per capita expenditure. While this may seem counterintuitive—given that higher HDI is typically associated with stronger development outcomes and institutional capacity—it may reflect labor market dynamics in more developed districts. In such areas, employment systems may be more formalized and competitive, making it harder for individuals without strong credentials or social capital to secure work (Pylypenko et al., 2023). Alternatively, higher expectations around job quality may lead young adults to delay employment, increasing temporary inactivity (ILO, 2024). These patterns are consistent with prior findings that development can sometimes widen gaps in access to quality employment when institutional pathways do not keep pace with educational expansion.

In contrast, the poverty rate is negatively and significantly associated with labor market inactivity. A one-percentage-point increase in district-level poverty is associated with a 1.6% decrease in the odds of being NEET (OR = 0.984). Although this direction appears counterintuitive, it may reflect necessity-driven labor force participation. In economically disadvantaged areas, young adults may be compelled to take up any form of employment—regardless of job quality, pay, or formality—to meet household needs. As a result, fewer individuals

may fall into the NEET category, not because of stronger labor market integration but due to a lack of viable alternatives to participation. This survival-based dynamic has been observed in other developing contexts, where high poverty rates are correlated with higher informal sector absorption and lower rates of reported inactivity (Oviedo et al., 2009).

These findings directly address RQ3, confirming that regional contextual factors—HDI and poverty—independently influence the likelihood of labor market inactivity among young adults. However, the directions of the effects point to complex underlying mechanisms. Higher HDI may coincide with elevated barriers to entry or delayed employment choices, while higher poverty may suppress inactivity through necessity-based employment. These results underscore the need to interpret regional development indicators not as linear predictors of opportunity but as context-specific factors whose effects are shaped by local labor markets, social norms, and survival strategies.

3.3 Regional Moderation of Educational Effects on Labor Market Inactivity (RQ4)

The results provide strong evidence that the Human Development Index (HDI) and poverty rates significantly moderate the relationship between tertiary education and NEET status among young adults in Indonesia, based on estimates from the Interaction Model (Column [2]). The main effect of tertiary education is highly protective, with individuals who attained tertiary education having substantially lower odds of experiencing inactivity compared to those without such education (OR = 0.071). However, this protective effect is not uniform across districts. The interaction term between tertiary education and HDI is positive and statistically significant (OR = 1.022), indicating that in districts with higher HDI, the advantage conferred by tertiary education diminishes. Specifically, for each one-point increase in HDI, the odds of being NEET among tertiary-educated individuals increase by approximately 2.2% relative to their non-tertiary-educated peers. This suggests that labor market saturation or a mismatch between job expectations and available opportunities may erode the employment benefits typically associated with higher education in more developed districts. Similar trends have been observed in India, where structural barriers and education-employment mismatches have undermined the expected returns to tertiary education despite rising attainment rates (Chakraborty, 2024).

Likewise, poverty rates are also found to moderate the education–inactivity relationship significantly. While the main effect of district-level poverty is associated with lower odds of NEET status (OR = 0.981)—a counterintuitive finding—it becomes less protective when considering individuals with tertiary education. The positive and significant interaction term (OR = 1.023) implies that the benefits of higher education are constrained in poorer districts. This may reflect structural economic weaknesses, underdeveloped labor markets, or limited job-matching mechanisms in impoverished areas. The total effect calculations reinforce this interpretation: for tertiary-educated individuals, the combined effect of HDI yields an odds ratio of approximately 1.046, while the combined effect of poverty approaches 1.003, indicating a neutral to slightly adverse influence. These findings align with prior studies that emphasize the spatial heterogeneity in education-to-employment transitions and the role of contextual disadvantage in undermining the returns to education (Parsons, 2022).

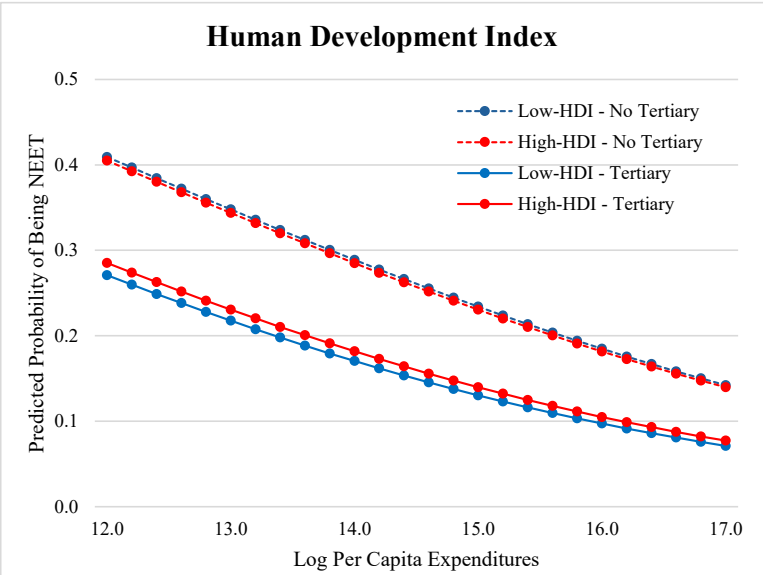
These interaction effects confirm that HDI and poverty levels moderate the relationship between tertiary education and NEET status, thereby affirmatively answering RQ4. The analysis indicates that regional disparities significantly influence how tertiary education protects young adults from labor market exclusion. This underscores the need for policy responses that are not only education-focused but also spatially targeted, considering the varying capacity of local labor markets to absorb educated youth. Without such attention to place-based inequality, national efforts to promote higher education as a pathway to economic participation may fail to deliver inclusive outcomes.

3.4 Moderating Role of Regional Development in the Economic Status–Inactivity Link (RQ5)

District-level HDI and poverty rates were each grouped into two categories to examine whether regional development and deprivation moderate the relationship between household economic status and NEET status. The first group comprises districts in the bottom 50th percentile of the national distribution—classified as low-HDI or low-poverty—while the second group includes those in the top 50th percentile, categorized as high-HDI or high-poverty. These classifications were constructed separately for each survey year to reflect shifts in the distribution of development indicators over time. This relative grouping approach allows for consistent year-on-year comparisons. It facilitates the analysis of whether the protective effect of tertiary education varies systematically across more and less developed contexts (hereafter referred to as low- vs. high-HDI and low- vs. high-poverty districts). The resulting binary variables were used in Interaction Models and margin analyses to assess moderation effects.

The regression results from the Categorical Interaction Model (Column [3]) indicate that tertiary education remains a strong protective factor. Individuals with some higher education are about 60% less likely to be NEET than those without (OR = 0.398). However, the main effects of regional context are more complex. Living in a high-HDI district does not significantly alter NEET risk (OR = 0.974, p = 0.289). In contrast, residence in high-poverty districts is associated with slightly lower odds of being NEET (OR = 0.928, p = 0.001)—a pattern that may reflect economic necessity driving participation in informal work. More notably, the interaction terms reveal that the protective effect of tertiary education is significantly weaker in both high-HDI (OR = 1.130, p < 0.001) and high-poverty districts (OR = 1.093, p < 0.001), suggesting a partial erosion of returns to education in more developed and more deprived regions. These patterns may be explained by credential inflation, job saturation, or structural barriers such as weak labor demand and poor institutional support (Brown et al., 2011; Thurow, 1975).

Figure 3 further illustrates these dynamics using predicted probabilities. In the top panel, NEET probabilities decline with rising LogPCE across low- and high-HDI districts. At LogPCE 12.0, the NEET rate among non-tertiary individuals in low-HDI areas is 0.409, compared to 0.271 among those with tertiary education (a 13.8-point gap). A similar gap exists in high-HDI districts (0.405 vs. 0.285), though the benefit of education is slightly smaller. This pattern persists across the income range, with the education gap narrowing modestly at higher income levels. At LogPCE 14.0, the gap is 11.9 points in low-HDI and 10.3 in high-HDI areas, indicating that the returns to education are marginally less pronounced in more developed districts.



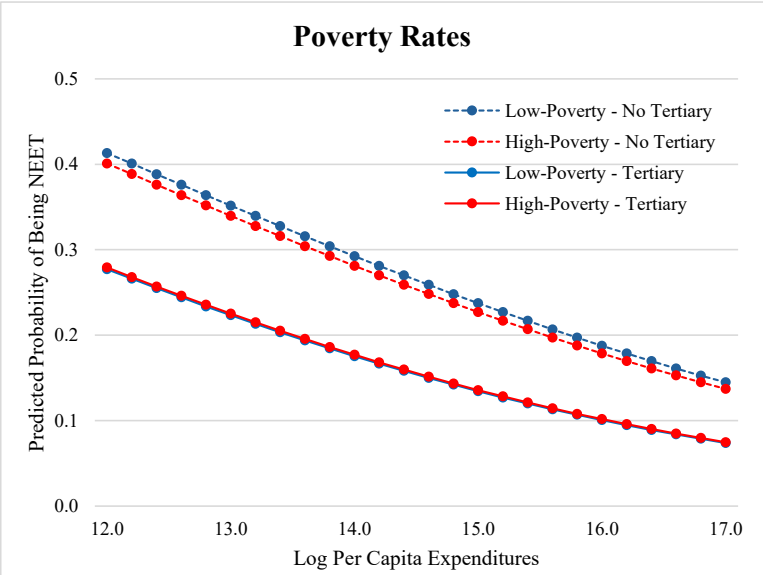


Figure 3: Predicted NEET Probability By Education, Economic Status, Human Development Index, and Poverty Rates

Source: Author's calculation

The bottom panel of Figure 3 presents predicted NEET probabilities by poverty status. Like the HDI patterns, NEET probabilities decline with income, and tertiary education remains protective. At LogPCE 12.0, non-tertiary individuals in low-poverty districts face a NEET probability of 0.413, compared to 0.277 among their tertiary-educated counterparts—a gap of 13.6 points. In high-poverty districts, the gap is slightly smaller (0.401 vs. 0.279). This difference persists at higher income levels, but the gap narrows: at LogPCE 14.0, the NEET rate is 0.293 for non-tertiary and 0.175 for tertiary-educated youth in low-poverty districts, compared to 0.281 and 0.177 in high-poverty areas. These results suggest that while the poverty context modestly influences the benefits of education, household income and individual education remain the primary determinants.

Together, these findings provide a clear response to RQ5, which asks whether the effect of household economic status on labor market inactivity varies across districts with differing levels of HDI and poverty. While income consistently reduces NEET risk, the degree to which this effect is enhanced by tertiary education varies by regional context. The interaction terms and predicted probabilities indicate that education's protective value is marginally weaker in high-HDI and high-poverty areas (ILO, 2020). This context-sensitive effect reflects local labor market saturation, institutional weaknesses, or mismatches between graduate skills and available jobs. Although education and income remain central to reducing NEET status, their effectiveness is shaped by the opportunity structures in which young adults are embedded.

Robustness checks were conducted to confirm the consistency of these results. One test used fixed groupings based on 2024 values of HDI and poverty rates, applied uniformly across all survey years. Another reclassified HDI and poverty into terciles—low, middle, and high—rather than binary categories. The interaction patterns and effect sizes in both cases remained consistent with those reported above. These findings confirm that the moderating influence of regional development and deprivation on the relationship between tertiary education and NEET status is robust to alternative classification strategies, reinforcing the credibility of the analysis.

3.5 Estimates for Additional Individual and Household Predictors

The Baseline Model (Column [1]) also estimates the effects of additional individual and household-level characteristics on NEET status among young adults. Gender shows the strongest effect: women are over 14 times more likely than men to be NEET (OR = 14.140), highlighting persistent gender inequalities in labor market access—often shaped by caregiving burdens and gender norms (Kang & Youn, 2024). Married individuals are about 15% less likely to be NEET (OR = 0.854), potentially reflecting greater financial responsibilities or higher employment stability among those who marry (Mehta & Awasthi, 2025). The association between age and NEET status declines steadily from age 26 onward, with odds ratios falling to 0.641 by age 34. This age gradient reflects life-course transitions into more stable employment (Pattinasarany, 2024).

Urban residence is associated with slightly higher NEET risk (OR = 1.056), suggesting urban labor market exclusion despite greater job density—likely due to heightened competition or segmentation (Lindblad et al., 2025). Household composition also matters. The presence of young children (aged 0–4) increases the odds of being NEET (OR = 1.149), as does having elderly members (aged 60+), though more modestly (OR = 1.016), likely due to caregiving constraints (Parida & Pattayat, 2024). The year-fixed effects likely reflect the impact of the COVID-19 pandemic on youth labor market outcomes. Compared to 2019, the odds of being NEET increased significantly in 2020 and peaked in 2022 (OR = 1.159) before declining slightly in 2023 and 2024. This pattern is consistent with broader evidence that the COVID-19 pandemic disrupted school-to-work transitions and reduced job opportunities for young adults (ILO, 2022), leading to a temporary but notable rise in inactivity.

4. Conclusions

4.1 Summary of Findings

This study investigated the determinants of labor market inactivity among young adults aged 25–34 in Indonesia, focusing on how regional socioeconomic contexts shape the effectiveness of tertiary education in reducing NEET (Not in Employment, Education, or Training) outcomes. Drawing on nationally representative SUSENAS data from 2019 to 2024, the analysis examined how educational attainment and household economic status interact with district-level development conditions—specifically the Human Development Index (HDI) and poverty rates—using multilevel mixed-effects logistic regression to account for contextual heterogeneity.

The results confirm that tertiary education and household economic status are strong, independent predictors of NEET status. Individuals with tertiary education are significantly less likely to be inactive, and higher household income—as measured by LogPCE—is consistently associated with lower NEET risk. Predicted probabilities further reveal that these effects are interdependent: while income reduces NEET risk across all education levels, the protective effect of tertiary education is especially pronounced among individuals from lower-income households.

Regional context plays a moderating role in these relationships. The protective effect of tertiary education is weaker in high-HDI and high-poverty districts, suggesting that structural constraints—such as labor market saturation or limited job creation—diminish the employment benefits of education in these areas. Although rising income and education generally reduce inactivity, their effectiveness depends on the absorptive capacity of local economies. These findings underscore the need for spatially targeted strategies that align education investments with regional labor market conditions to ensure meaningful employment outcomes for young adults.

4.2 Policy and Economic Implications

The evidence that the effect of tertiary education on labor market inactivity varies across districts with different levels of HDI and poverty—classified using year-specific median splits— holds significant implications for economic theory and policy. It challenges the assumption embedded in classical human capital theory (Becker, 1993) that higher education yields uniformly positive returns by increasing individual productivity. Instead, the

findings support a more context-dependent interpretation, in which regional labor market structures and institutional capacity shape the economic value of education.

In districts classified as high-HDI, where education infrastructure and access are relatively strong, the weakening of the protective effect of tertiary education suggests signs of labor market saturation and credential inflation. These outcomes are consistent with job competition theory (Thurow, 1975), which posits that education acts more as a screening device than a productivity enhancer in contexts of limited job creation. Similar dynamics have been observed in urban labor markets across Southeast Asia and Sub-Saharan Africa, where rising educational attainment has not been accompanied by a commensurate expansion of high-skilled employment opportunities. In the Indonesian context, a World Bank (2021) study highlights that while tertiary education does improve employability on average, challenges related to underemployment and informality—particularly among younger cohorts—persist, indicating a disconnect between educational expansion and labor market absorption.

In districts classified as high-poverty, the reduced effectiveness of tertiary education reflects demand-side constraints—a hallmark of dual labor market theory (Doeringer & Piore, 1985). These regions typically lack a diversified economic base, which limits the number of formal sector jobs available to absorb skilled labor. Even when education levels improve, structural weaknesses such as poor infrastructure, low private sector activity, and limited institutional support mean that individuals cannot capitalize on their qualifications. Recent studies reinforce this interpretation. Montenegro and Patrinos (2023) highlight that in many developing countries, the labor market returns to education are heavily moderated by local job conditions, with returns being systematically lower in economically lagging regions.

These patterns underscore three critical economic policy implications. First, better alignment between education and regional labor markets is essential. Policymakers must invest in graduate tracking systems and strengthen local labor observatories to inform curriculum reform and skill development programs tailored to district-level disparities. Second, the weakened returns to education in both high-HDI and high-poverty districts call for spatially targeted employment policies. In urban centers of Java and Sumatera, where skilled labor markets are saturated, more effective Active Labor Market Policies (ALMPs) are needed. Indonesia's ALMPs—delivered through vocational training centers (BLKs), SIAPKerja platforms (Setyawan et al., 2024), and apprenticeship schemes—remain fragmented and uneven. Strengthening their integration with education systems and tailoring them to local labor demand can ease school-to-work transitions. In poorer regions, particularly Eastern Indonesia, ALMPs should be paired with investments in infrastructure, local enterprise support, and digital access to create demand for skilled labor and reduce inactivity among educated youth. Third, the study points to the need for integrated public spending strategies beyond investing in education alone. Without coordinated improvements in local economic conditions, rising educational attainment risks producing a class of overqualified but underemployed youth. This undermines the efficiency of human capital investment and may fuel frustration and disengagement among young adults, especially in peripheral regions.

4.3 Study Limitations and Future Extension

While the study offers important insights into how education, household economic status, and regional development influence youth labor market inactivity, it is not without limitations. The analysis is based on repeated cross-sectional SUSENAS data, which hinders the assessment of long-term transitions into and out of NEET status. Future research using panel data is strongly recommended to gain a more comprehensive and dynamic understanding of young adult trajectories (Karma, 2024). Furthermore, the binary measure of tertiary education fails to consider variations in field of study, institutional quality, or completion status, all of which can significantly affect employment outcomes.

In addition, the use of HDI and poverty rates as proxies for regional development does not fully capture local labor market structures or institutional conditions. Including complementary indicators—such as job informality, industrial composition, or access to local employment programs—would provide a more complete picture of regional constraints (ILO, 2020). Finally, it is crucial to emphasize the need for future studies to adopt mixed-method approaches that integrate survey data with qualitative insights. This urgency in research direction will help

to uncover how young people experience barriers to employment across different regional contexts (Sánchez-Soto & León, 2020). Such extensions would enrich the findings and offer deeper policy relevance.

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Mapping the Dynamic Interplay of Parental Readiness and Food Security in Child Nutrition: Insights from Causal Loop Diagrams

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Abstract
Stunting in toddlers in Indonesia is still a major challenge that impacts the health, cognitive development, and productivity of future generations. This study aims to identify and analyze the dynamic relationship between parental readiness and food security on children's nutritional status, focusing on the results of Focus Group Discussions (FGD) in West Java using the (Causal Loop Diagram) CLD approach. The results of the FGD show that factors such as family dynamics, parental knowledge and education, attitudes and behaviors, and socio-economic conditions interact in a complex manner and form a feedback loop that affects children's nutritional status. There are also aspects of food security including affordability, utilization, accessibility, and availability of food - also play an important role in determining the quality and diversity of children's nutritional intake. The CLD analysis revealed that this involved important stakeholders in West Java, such as Pergizi (association of nutrition and food experts in Indonesia), the Indonesian Midwifery Association, the West Java Provincial Food and Animal Husbandry Security Service, and Academics from the Faculty of Medicine from Padjadjaran University, which showed the existence of a reinforcing loop and balancing loop that clarifies the relationship between factors and highlights the importance of cross-sector interaction in efforts to reduce stunting. The CLD from this FGD provides an in-depth understanding of the systemic mechanisms underlying the comprehensive problem of stunting and is expected to be a reference for formulating more effective and sustainable intervention strategies in the future.

Keywords: Stunting, Parental Readiness, Causal Loop Diagram, Focus Group Discussion

1. Introduction

Stunting in toddlers is a significant public health problem both in Indonesia and globally. According to UNICEF and WHO (2023) around 22% of children under the age of five in the world experience stunting, with the highest prevalence in low- and middle-income countries. In Indonesia, the prevalence of stunting decreased from 36.8% in 2007 to 21.6% in 2022, but is still far from the national target of 14% in 2024. Stunting has a broad impact on children's physical and cognitive development, reduces productivity in adulthood, and contributes to a continuous cycle of poverty (2,3)

The main factors influencing the incidence of stunting include parental readiness and family food security. Parental readiness includes knowledge, attitudes, parenting behavior, and socio-economic conditions that support optimal child growth. Meanwhile, food security is related to the availability, accessibility, and affordability of sufficient and nutritious food. The combination of these two factors greatly determines the nutritional status of children and is the main focus of efforts to prevent stunting (4).

Various studies have examined the relationship between food security and parenting practices with the incidence of stunting. Studies in Indonesia by Paramashanti & Paratmanitya (2016) and Musyayadah & Adiningsih (2019) showed a significant correlation between household food security and the risk of stunting. However, most of these studies are still partial and have not integrated parental readiness factors comprehensively. International studies also emphasize the importance of parental education and behavior in determining children's nutritional status (7,8), but the dynamic interaction between parental readiness and food security is still less explored systematically.

The dynamic systems approach offers an effective framework for understanding the complexity of the interaction of these factors. Methods such as CLD allow mapping of causal relationships and feedback between social and health variables in the context of stunting(9). Several previous studies have used this approach to model food security and access to health services but the role of parents as central actors in stunting prevention has not been analyzed in depth using this method.

This study proposes the main hypothesis that parental readiness - including knowledge, attitudes, parenting behaviors, and socio-economic conditions - plays a significant role in influencing children's nutritional status through complex interactions with food security factors. The secondary hypothesis states that these interaction patterns vary geographically and socio-economically, thus requiring a multisectoral and contextual approach. This hypothesis is based on dynamic systems theory which emphasizes the importance of understanding feedback mechanisms in social and health systems (Sterman, 2000).

To test these hypotheses, this study uses a mixed methods design with a primary focus on qualitative analysis through FGD with various stakeholders in West Java. Qualitative data were further analyzed using CLD modeling to map the dynamic relationship between parental readiness factors and food security aspects such as food availability, accessibility, and affordability. This approach allows for an in-depth and systemic understanding of the complexity of factors that influence toddler nutritional status.

The results of the study are expected to provide theoretical contributions by enriching the understanding of the systemic interaction between parental readiness and food security in the context of stunting. In practice, these findings are expected to be a strong empirical basis for designing more effective and sustainable multisectoral interventions in reducing the prevalence of stunting in Indonesia. The dynamic systems approach and mixed methods are also expected to be new methodological contributions in nutrition and public health research.

2. Method

This research method uses a qualitative approach with the main focus on FGD involving various stakeholders such as academics, health practitioners, and food security officials in the West Java region. A detailed explanation will be described below.

2.1 Research Design

This study used a descriptive qualitative study design combined with dynamic system modeling to gain a deeper understanding of the factors influencing stunting in children under five. The research strategy focused on exploring the experiences, perceptions, and interactions among key stakeholders through structured FGD. Qualitative data generated from the FGDs were then analyzed thematically and used as the basis for constructing a CLD, which maps the dynamic relationships and feedback patterns between key variables such as parental preparedness and food security. This design was chosen because it allows for the identification of complex systemic mechanisms

that are not accessible through conventional quantitative approaches. With the division of methods into clear subsections including participants, procedures, measurement and analysis, and research design readers can easily navigate each stage of the study, assess the appropriateness of the methods, and replicate the study in similar contexts. For very specific details of procedures or instruments, additional information can be provided in the appendix or supplementary online materials.

2.2 Participants

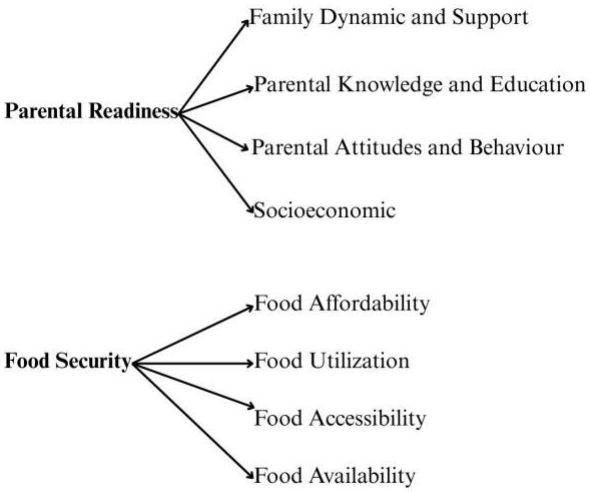
Participants in this study consisted of various stakeholders relevant to the issue of stunting in West Java, including academics from the Faculty of Medicine at Padjadjaran University, health practitioners such as midwives, officials from the Food and Agriculture Security Service (DKPP), and nutritionists from Pergizi West Java. Participants were selected purposively based on their roles and experiences in stunting prevention and food security programs in the region. Inclusion criteria included active involvement in related programs and in-depth knowledge of factors that influence the nutritional status of toddlers, while exclusion criteria were absence from FGD sessions and lack of direct involvement in stunting issues. The number of participants was adjusted to achieve rich and representative data in a qualitative context, taking into account the diversity of perspectives. The selection of West Java as the research location was based on the fact that this province is the most populous in Indonesia, with a population of more than 50 million people (10), and has a significant prevalence of stunting, which is around 20.2%, which reflects the general national condition (11). West Java represents a wide demographic and socio-economic diversity, ranging from urban to rural areas, so research results in this region can provide a comprehensive and relevant picture of the Indonesian context as a whole.

2.3 Participant (Subject) Characteristics

The research procedure began with a preparation stage that included identifying key stakeholders related to the stunting issue in West Java, such as midwifery academics from state universities, the Indonesian Midwives Association, officials from the Food and Agriculture Security Service (DKPP), and nutrition experts from Pergizi West Java. After determining the participants, the researchers prepared a FGD guideline containing key topics around parental readiness, food security, and agricultural factors relevant to stunting. The FGD was carried out face-to-face at an agreed location with an experienced facilitator who ensured that the discussion was systematic and that all participants could express their views. During the FGD, the discussion was audio-recorded with the consent of the participants and accompanied by a note-taker to record important points and the dynamics of group interactions. After the FGD was completed, the discussion data were collected in the form of transcripts and field notes for further analysis. There was no intervention or experimental manipulation carried out in this study, so the entire process focused on extracting qualitative data through professionally facilitated focus group discussions.

2.4 Analysis and Measurement

Data analysis in this study was conducted qualitatively with a thematic analysis approach to the results of FGDs that had been transcribed verbatim. The analysis process began by reading and reviewing the FGD transcripts thoroughly to identify key themes related to parental readiness, food security, and other factors that influence the nutritional status of toddlers. Each theme and subtheme that emerged was then systematically coded to ensure data consistency and traceability. Furthermore, these thematic findings were used as the basis for constructing a CLD, which maps dynamic relationships, feedback patterns (reinforcing and balancing loops), and interactions between key variables identified from the discussion. Data validity was maintained through source triangulation, namely by comparing FGD results from various stakeholders (academics, health practitioners, food security officials, and nutritionists), as well as conducting member checking with participants to ensure data interpretation was in accordance with their experiences. The reliability of the analysis was strengthened by the discussion of the research team in the coding and theme drawing process as follows:



by coding and theme drawing, the results obtained can be scientifically accounted for and replicated in similar studies. This approach allows for a deep understanding of the systemic mechanisms that influence stunting, although this study did not proceed to the CLD simulation stage, but stopped at the construction and interpretation of diagrams as a systemic analysis tool.

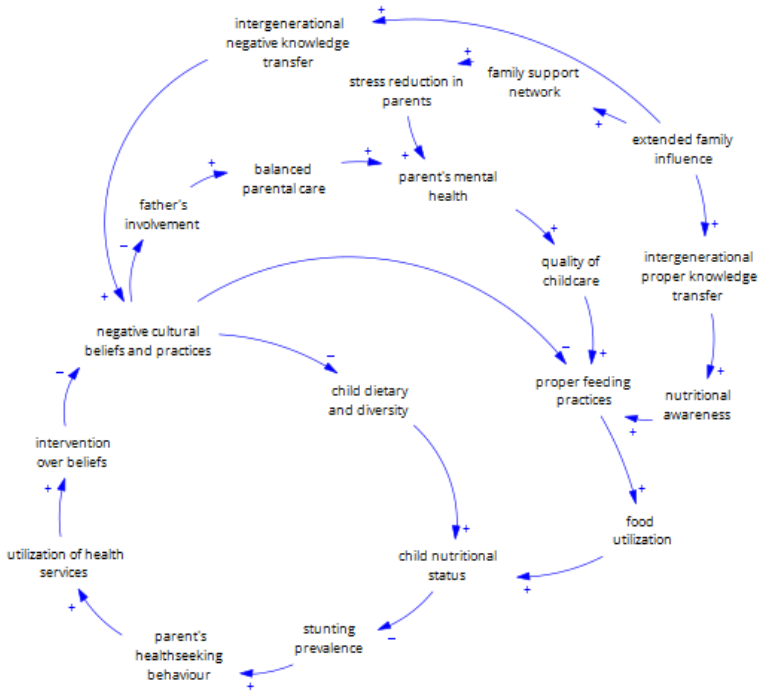
3. Results

This section presents the main findings of the study based on the analysis of FGD and the construction of CLDs. The results are organized according to the key pillars identified in the research, namely parental readiness and food security, with each pillar further detailed into its main components. The findings highlight the dynamic interactions and feedback mechanisms among the factors influencing child nutrition and stunting in West Java. Visualizations in the form of CLDs are provided to illustrate the complex relationships and systemic patterns that emerged from the qualitative data. All results are presented regularly to provide a comprehensive overview of the determinants and interconnections relevant to stunting reduction efforts.

3.1 Parental Readiness

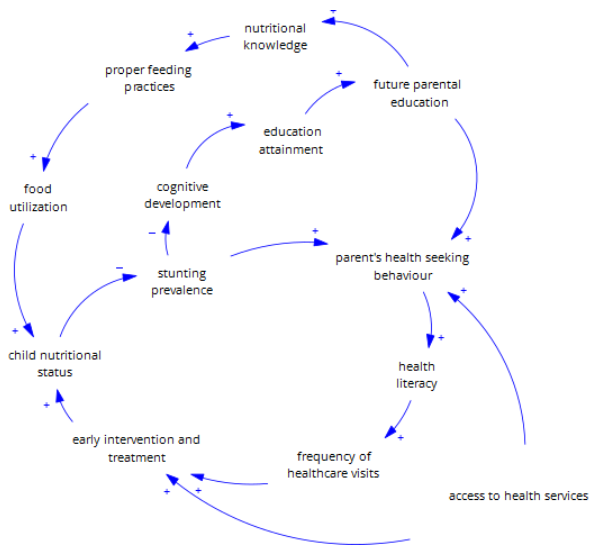
This section presents the main findings related to parental readiness as an important pillar in efforts to prevent stunting in toddlers. Based on the results of FGD and CLD analysis, parental readiness was identified as a very determining factor, including family dynamics and support, parental knowledge and education, attitudes and behaviors in parenting, and family socio-economic conditions. Each of these aspects interacts with each other and forms a complex feedback pattern, which directly or indirectly affects the nutritional status and risk of stunting in children. In the following section, the research results are presented systematically according to the parental readiness sub-pillars, complemented by CLD visualizations to illustrate the dynamic relationships between factors found in this study.

3.1.1 Family dynamic and support



This CLD shows the dynamic relationship between various factors that influence children's nutritional status and stunting prevalence. The diagram maps father involvement, family support, intergenerational knowledge transfer, and the influence of the extended family on parental mental health, parenting quality, and proper feeding practices. The diagram also illustrates the role of negative cultural beliefs, parental health-seeking behavior, and interventions on these beliefs in influencing health service utilization and children's nutritional status. Factors such as nutritional knowledge, nutritional awareness, food utilization, and children's dietary diversity are also connected in a feedback system that influences nutritional status and stunting prevalence. This diagram displays several reinforcing and balancing pathways between variables.

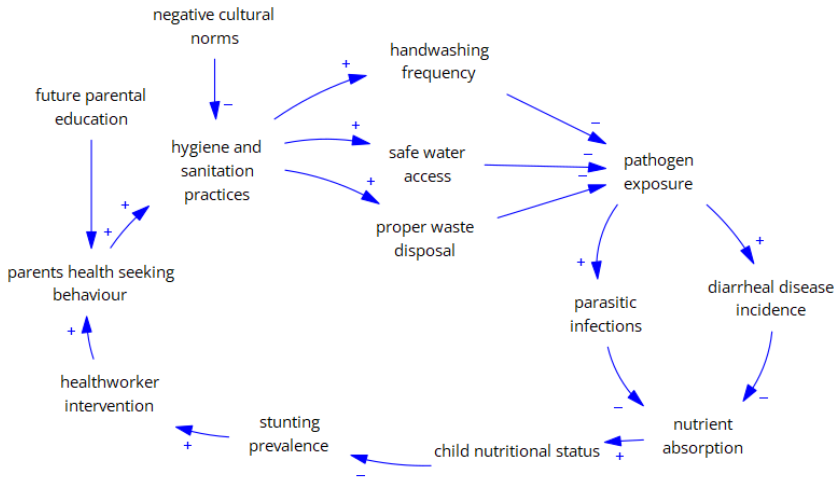
3.1.2 Parental Knowledge and Education



This CLD objectively shows the relationship between nutritional knowledge, future parental education, educational attainment, parental health-seeking behavior, health literacy, access to health services, frequency of visits to health facilities, early intervention and treatment, child nutritional status, food utilization, proper feeding practices, cognitive development, and stunting prevalence. Each variable is connected by an arrow indicating a positive or negative relationship between factors, forming a feedback loop that illustrates how changes in one

variable can affect other variables in the system. This diagram maps the sequence and interrelationships between factors without providing an interpretation or explanation of the meaning of these relationships.

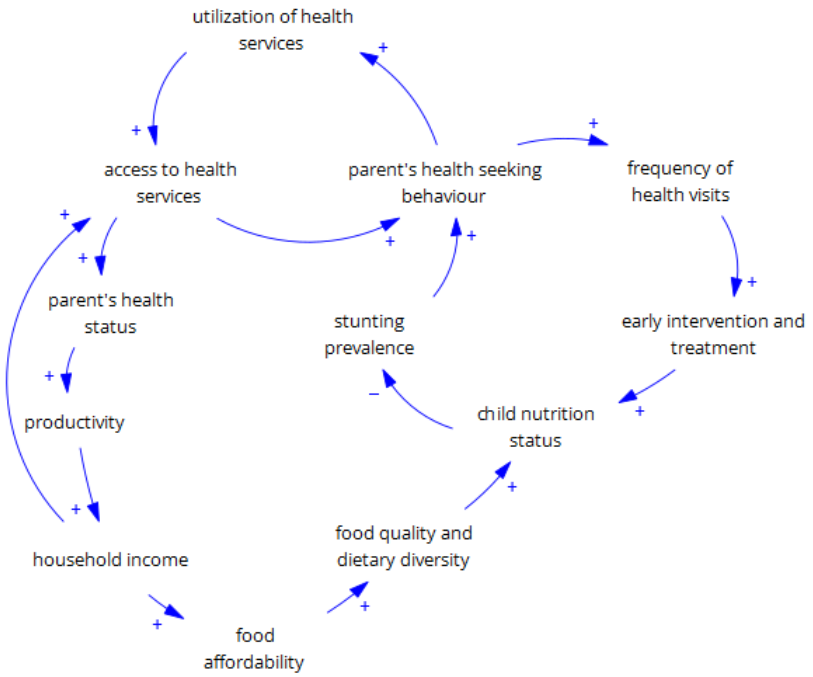
3.1.3 Parent's Attitude and behaviour



This CLD objectively maps the relationship between negative cultural norms, hygiene and sanitation practices, handwashing frequency, access to clean water, proper waste disposal, pathogen exposure, parasitic infections, diarrheal disease incidence, nutrient absorption, child nutritional status, and stunting prevalence. The diagram shows that negative cultural norms are related to hygiene and sanitation practices, which in turn affect handwashing frequency, access to clean water, and proper waste disposal. These factors are related to the level of pathogen exposure, which then affects the incidence of parasitic infections and diarrheal diseases. The incidence of diarrheal diseases impacts nutrient absorption, which is related to child nutritional status and stunting prevalence. The diagram also includes the relationship between future parental education, parental health-seeking behavior, and health worker interventions on stunting prevalence. All variables in the diagram are associated with positive or negative signs, indicating the direction of the relationship between factors in the system without providing further interpretation.

3.1.4 Sosioeconomic

This CLD objectively maps the relationship between food affordability, household income, productivity, parental health status, access to and utilization of health services, parental health-seeking behavior, frequency of visits to health facilities, early intervention and treatment, child nutritional status, food quality and diversity, and stunting prevalence.

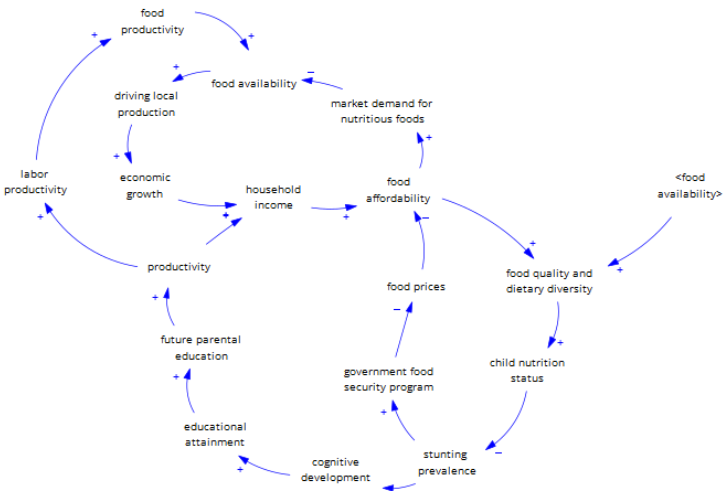


This diagram shows that increasing food affordability is associated with increasing household income, which in turn increases parental productivity and health status. Good parental health status is associated with better access to health services, which then increases health service utilization. Optimal health service utilization encourages parental health-seeking behavior, increases the frequency of visits to health facilities, and enables early intervention and treatment. This is associated with improving child nutritional status, increasing food quality and diversity, and decreasing stunting prevalence. All variables in this diagram are interconnected through positive or negative relationships, forming a feedback pattern in the system without further interpretation.

3.2 Food Security

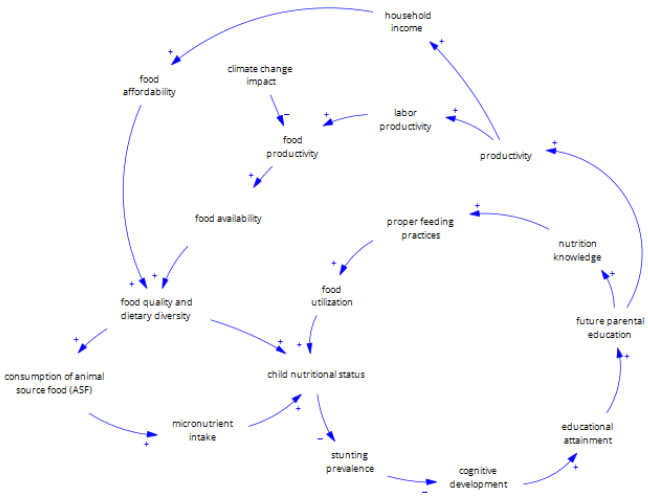
This CLD objectively maps the relationship between food affordability, household income, productivity, parental health status, access to and utilization of health services, parental health-seeking behavior, frequency of visits to health facilities, early intervention and treatment, child nutritional status, food quality and diversity, and stunting prevalence. This diagram shows that increasing food affordability is associated with increasing household income, which in turn increases parental productivity and health status. Good parental health status is associated with better access to health services, which then increases health service utilization. Optimal health service utilization encourages parental health-seeking behavior, increases the frequency of visits to health facilities, and enables early intervention and treatment. This is associated with improving child nutritional status, increasing food quality and diversity, and decreasing stunting prevalence. All variables in this diagram are interconnected through positive or negative relationships, forming a feedback pattern in the system without further interpretation.

3.2.1 Food Affordability



The CLD in this section objectively maps the relationship between food productivity, food availability, market demand for nutritious food, household income, food affordability, food prices, government food security programs, food quality and diversity, child nutritional status, cognitive development, educational attainment, labor productivity, and economic growth. This diagram shows that increasing food productivity can increase food availability, which in turn affects market demand for nutritious food and household income. Higher household income is associated with better food affordability, which is also affected by food prices and government food security program interventions. Good food affordability is associated with improved food quality and diversity, which has an impact on child nutritional status and a decrease in stunting prevalence. Good child nutritional status supports cognitive development and educational attainment, which then increases labor productivity and economic growth, so that this cycle again strengthens food productivity and food availability. All variables in the diagram are connected through positive or negative signs, forming a feedback pattern in the system without further interpretation.

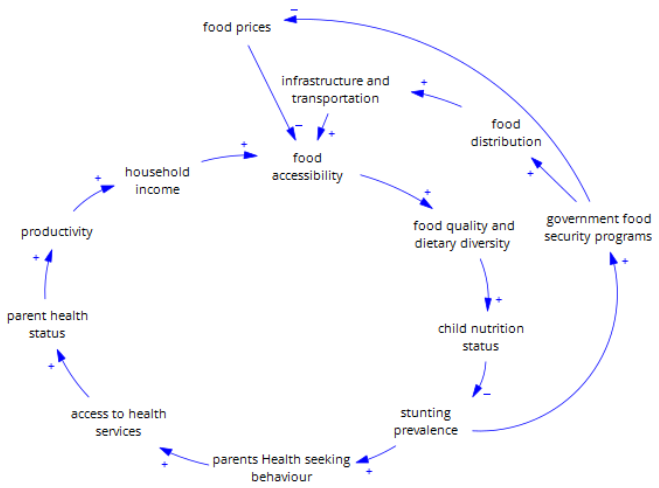
3.2.2 Food Utilization



The CLD in this section objectively maps the relationship between food productivity, food availability, market demand for nutritious food, household income, food affordability, food prices, government food security programs, food quality and diversity, child nutritional status, cognitive development, educational attainment, labor productivity, and economic growth. This diagram shows that increasing food productivity can increase food availability, which in turn affects market demand for nutritious food and household income. Higher household income is associated with better food affordability, which is also affected by food prices and government food security program interventions. Good food affordability is associated with improved food quality and diversity, which has an impact on child nutritional status and a decrease in stunting prevalence. Good child nutritional status

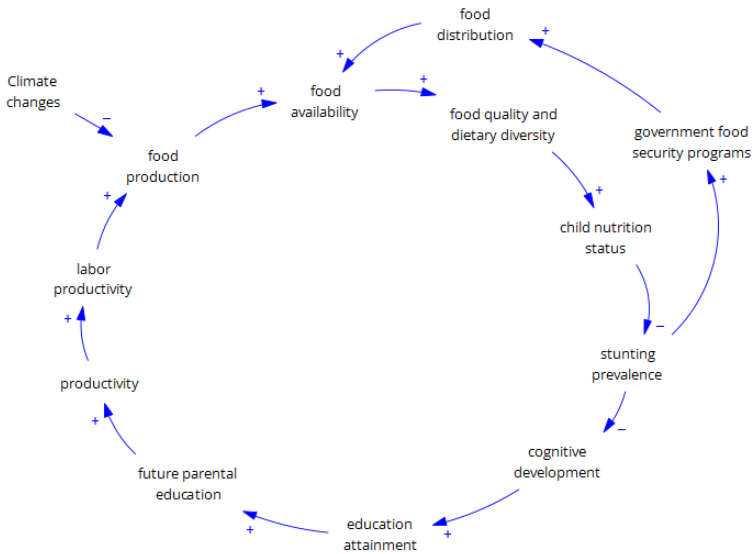
supports cognitive development and educational attainment, which then increases labor productivity and economic growth, so that this cycle again strengthens food productivity and food availability. All variables in the diagram are connected through positive or negative signs, forming a feedback pattern in the system without further interpretation.

3.2.3 Food Accessibility



This CLD objectively maps the relationship between food accessibility, food prices, infrastructure and transportation, food distribution, government food security programs, food quality and dietary diversity, child nutrition status, stunting prevalence, parents' health-seeking behavior, access to health services, parent health status, productivity, and household income. This diagram shows that food accessibility is influenced by food prices and infrastructure and transportation, which are also related to food distribution and government food security programs. Food accessibility is related to food quality and dietary diversity, which in turn affects child nutrition status and stunting prevalence. Stunting prevalence is related to parents' health-seeking behavior, which has an impact on access to health services, parent health status, and productivity. Productivity is related to household income, which in turn affects food accessibility. All variables in this diagram are interconnected through positive or negative relationships, forming a feedback pattern in the system without further interpretation.

3.2.4 Food Availability



This CLD objectively maps the relationships between climate change, food production, food availability, food distribution, food quality and diversity, government food security programs, child nutritional status, stunting

prevalence, cognitive development, educational attainment, future parental education, productivity, and labor productivity. The diagram shows that climate change affects food production, which impacts food availability. Increased food availability is associated with better food distribution, which can improve food quality and diversity. Government food security programs also play a role in improving food quality and diversity, which then affects child nutritional status and reduces stunting prevalence. Reduced stunting supports cognitive development and educational attainment, which contribute to future parental education, productivity, and labor productivity. Increased labor productivity will again strengthen food production, forming a feedback pattern in the system without further interpretation.

3.3 Master of Undernutrition CLD

This combined CLD objectively maps the dynamic relationships between factors that influence child nutritional status and stunting prevalence. The variables connected in this system include parental preparedness (such as cross-generational knowledge, family support, education, attitudes, behaviors, and socio-economic conditions), feeding practices, health literacy, access to and utilization of health services, hygiene and sanitation practices, access to clean water, waste disposal, exposure to pathogens, infections, and parental health-seeking behavior. In addition, food security factors such as food affordability, availability, accessibility, and utilization, food productivity, food prices, food distribution, and government food security programs are also mapped in this diagram. All of these variables are interconnected through positive or negative relationships that form feedback patterns (reinforcing and balancing loops), which illustrate how changes in one factor can affect other factors in the system, without providing interpretation or explanation of the meaning of these relationships.

4. Discussion

The results of this study confirm that stunting in toddlers in Indonesia is a multidimensional phenomenon influenced by complex interactions between parental readiness, food security, and environmental and socio-economic factors. CLD analysis identified patterns of reinforcing and balancing feedback involving cross-generational knowledge transfer, clean living behavior, nutritional literacy, access and utilization of health services, household income, and affordability, availability, accessibility, and utilization of food. Each of these factors does not stand alone, but is interrelated in a system that affects children's nutritional status and stunting prevalence, as also found in dynamic system studies on complex public health issues (Homer & Hirsch, 2006; Poelman et al., 2023).

This study strengthens the evidence that parental readiness—including knowledge, attitudes, behaviors, and family support—plays a central role in stunting prevention. Negative knowledge transfer across generations and inappropriate cultural beliefs reinforce incorrect feeding practices, lower children's nutritional status, and increase the risk of stunting (Bella et al., 2020; Abdulaziz et al., 2024). In contrast, father involvement, extended family support, and good nutritional literacy create a positive reinforcement cycle that reduces the prevalence of stunting. These findings are in line with a study in Yogyakarta that showed that poor parental feeding style doubled the risk of stunting compared to good parenting style (14). The developed CLD system also emphasizes the importance of family and community-based interventions, as described in the family empowerment and community-based intervention models (15–17).

Food security, including affordability, availability, accessibility, and utilization of food, has been shown to be a major determinant of children's nutritional status. Systematic studies have shown that household food insecurity is consistently associated with stunted cognitive and physical development in children, even after controlling for economic factors (18). The CLD in this study highlights that household income, food prices, and government food security programs form a reinforcing cycle that can improve dietary quality and diversity, reduce stunting prevalence, and increase family productivity (19,20). However, the impacts of climate change on food productivity and food distribution remain a major challenge that must be anticipated in multisectoral policies (21).

These findings are consistent with global literature emphasizing the need for a dynamic systems approach and multisectoral interventions to effectively reduce stunting ((19,21) Studies in the Netherlands and the United States have shown that changing the local food environment requires cross-sectoral collaboration and adaptation at multiple policy levels (Homer & Hirsch, 2006). In Indonesia, policies such as Presidential Regulation No. 72 of 2021 concerning the Acceleration of Stunting Reduction and strengthening the Posyandu Prima program have become examples of cross-sectoral integration, but implementation challenges still arise in terms of culture, food distribution, and inequality of access between regions (23).

The importance of adopting a systems thinking lens is further emphasized by (24), who distinguishes between *ontological* and *cognitive* complexity in managing systemic public health challenges. In the context of stunting, ontological complexity arises from the interrelated elements of food security, parental behavior, and socioeconomic status, while cognitive complexity reflects the divergent stakeholder perspectives across government, healthcare, and community actors. Jackson argues that insufficient conceptualization of this complexity often leads to ineffective policy responses. Integrating *Critical Systems Thinking* (CST) enables decision-makers to utilize multiple perspectives—including technical, cultural, political, and environmental dimensions—to design more adaptive and participatory interventions. This perspective aligns with the findings of this study, which advocate for multisectoral approaches and reinforce the need to go beyond linear cause-effect assumptions when addressing child nutrition.

This study has several limitations. First, the data used are qualitative and FGD-based, so generalization to the entire Indonesian population needs to be done with caution. Second, the CLD developed was not simulated quantitatively, so it cannot yet predict the impact of the intervention numerically. Third, the scope of the study area is limited to West Java, although this province is quite representative due to its socio-economic diversity and large population (25). Fourth, the potential for participant bias remains even though source triangulation has been carried out.

The results of this study emphasize the need to strengthen nutrition education and health literacy for parents through community programs and formal education (14,26), integration of food security programs with health and education interventions involving various stakeholders from the family, community, to government levels (19), and the development of local culture-based interventions to address negative knowledge transfer and cultural beliefs that do not support healthy parenting practices (Bella et al., 2020). In addition, increasing access and affordability of nutritious food through innovations in food distribution, subsidies, and strengthening the family economy is very important (7,23)in addition to increasing the role of fathers and extended families in supporting child care and monitoring child growth and development (15)

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Identifying Causes of Project Delays and Management Recommendations in Paper Machine Installation

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Abstract
This study investigates the causes of project delays and develops management recommendations for PT Tuntas Lugas Cemerlang (TLC) paper machine installation project in Purwakarta, Indonesia. Using a sequential exploratory mixed-methods approach, the research systematically identified delay factors through the analysis of Work Breakdown Structures (WBS), Gantt charts, meeting minutes, stakeholder interviews, and quantitative surveys. The study revealed that Schedule Management emerged as the most critical knowledge area, with 15 occurrences of delay-related issues, followed by Communication Management and Procurement Management (10 occurrences each) and Scope Management (9 occurrences). Key findings indicated that decision-making delays (problem score 4.44), schedule adaptation to field conditions (4.11), and resource shortages (3.56) were the primary contributors to project delays. The existing project management tools demonstrated significant structural weaknesses, including a lack of hierarchical Work Breakdown Structure (WBS) structure, the absence of critical path dependencies, and insufficient integration of commissioning activities. In response, comprehensive improvements were developed, including a four-tiered hierarchical Work Breakdown Structure (WBS) with formalized numbering and deliverable definitions, an enhanced Critical Path Method that incorporates end-to-end commissioning activities, and optimized Gantt charts with parallel scheduling and weekly time scales. The integrated solutions address the technical, communication, and managerial factors identified in the conceptual framework, aligning with the PMBOK knowledge areas. The implementation of these improvements is projected to reduce project completion delays and enhance coordination efficiency, enabling PT TLC to meet the critical July 2025 tender deadline, valued at 22 billion rupiah.

Keywords: Project Delays, Paper Machine Installation, PMBOK, Critical Path Method, Work Breakdown Structure, Industrial Project Management

1. Introduction

The global paper industry remains a cornerstone of manufacturing excellence, demonstrating remarkable resilience and adaptability in the modern digital era. Despite initial predictions of a decline in traditional paper products such as writing and printing materials, the industry has successfully diversified into emerging markets, including specialty papers, eco-friendly packaging solutions, and hygiene products. According to the Global Paper and Pulp Industry Outlook (2022), the global paper industry market is projected to expand at a compound annual growth

rate (CAGR) of 1.8%, growing from $351.5 billion in 2021 to an estimated $370.1 billion by 2025. This sustained growth trajectory highlights the industry's ability to adapt and meet evolving consumer demands while maintaining its fundamental importance to global economic activities.

Indonesia has strategically positioned itself as a significant force in the global paper production landscape, leveraging its natural resources and manufacturing capabilities to become a significant industry player. The paper industry serves as one of the primary drivers of Indonesia's GDP and represents a crucial sector within the country's economic framework. In 2020, the manufacturing sector contributed 19.87% to Indonesia's GDP, making it the largest economic sector (Ministry of Industry, 2020). Within this substantial manufacturing contribution, the pulp and paper industry specifically accounted for 3.9% of GDP, supported by robust export performance totaling US$6.83 billion in the same year. The sector's economic significance extends beyond direct financial contributions, employing approximately 260,000 individuals directly and creating an additional 1.1 million indirect employment opportunities (Bank Mandiri, 2018).

The expansion trajectory of Indonesia's pulp and paper sector reflects both national economic priorities and international market demands. Statistical data from Statista (2023) demonstrates consistent growth in Indonesia's manufacturing sector over the past decade, with an increasing percentage contribution to the country's overall GDP. The pulp and paper industry has emerged as one of the fastest-growing manufacturing subsectors, driven primarily by escalating global demand for paper products and Indonesia's competitive positioning in raw material access and production capabilities. FAO (2023) reports that Indonesia generated 8.98 million metric tonnes of pulp, confirming its critical role in the global supply chain and highlighting the country's substantial production capacity.

However, Indonesia's paper industry confronts multiple complex challenges that threaten its continued expansion and competitiveness. Regional competition from countries such as China, Vietnam, and Thailand, which are also developing their paper production capabilities simultaneously, creates intense market pressure (ResourceWise, 2023). Additionally, growing sustainability concerns have intensified global scrutiny of forest management practices and environmental impacts associated with Indonesian paper mills (Mongabay, 2024). Infrastructure limitations, particularly suboptimal logistics networks in certain regions, lead to increased distribution costs that impact overall competitiveness (Fleetx, 2023). Furthermore, the sector's dependence on imported raw materials and sophisticated machinery creates vulnerability to fluctuations in exchange rates and disruptions to the global supply chain. At the same time, the limited availability of human resources with advanced technical expertise constrains the effective operation of modern pulp and paper technology (CRIF Asia, 2024).

PT TLC represents a significant new entrant in Indonesia's specialty paper manufacturing landscape, embodying both the opportunities and challenges characteristic of the sector's current development phase. As a newly established company in the paper manufacturing industry, PT TLC is currently constructing a factory in Purwakarta, Indonesia, with ambitious plans to produce specialty and security paper products that command higher profit margins compared to commodity paper products. The company decided to acquire a used paper machine from a UK or European papermaking company, demonstrating that they were prudent with their finances and opted for a proven technology. It aligns with the main industry trends, which focus on producing more valuable goods and utilizing new technologies in developing countries.

The implementation of PT TLC's paper machine installation project illustrates the complex technical and managerial challenges facing modern industrial construction in Indonesia's manufacturing sector. Nearly one year into the Paper Machine Installation Project in Purwakarta, the company continues to work toward operational targets while managing intricate coordination between multiple stakeholder groups, including production teams, finishing specialists, engineering units, machine installation contractors, and civil construction teams. The project is managed by the Head of Manufacturing, who serves as the Project Manager at the site office and is overseen by the Board of Directors in Jakarta, Indonesia. The latest project report (March 2025) indicates that the machine installation is running approximately 4 weeks behind schedule, which could impact the goal for the plant's operation.

A review of the project's current performance reveals significant discrepancies between the planned and actual outcomes, which should be addressed promptly. According to the data, 66% of the planned installation activities have been finished, even though 91.08% of the given schedule has passed—additionally, 38% of the completed tasks required correction due to errors in the original work. As a result of these inefficiencies, about 2.8 billion rupiahs have been wasted, and the commissioning could be delayed until the end of December 2025, which might cause PT TLC to miss a key tender deadline worth 22 billion rupiahs in July 2025. Because these delays are systematic, it is clear that the project's execution methodology needs significant changes, so urgent action is required.

To address these critical issues and prevent further harm to the project, this research aims to achieve three primary objectives. First, to identify and analyze the specific technical, coordination, and management factors causing delays in PT TLC's paper machine installation project through a systematic investigation of current practices and bottlenecks. Second, assess the project schedule by using the Gantt Chart and Critical Path analyses to find out which actions are causing the delay and set the most important points for intervention. Third, to put in place new methods for project management, such as better planning and communication, which help reduce delays and increase how well projects are carried out. If these objectives are met, PT TLC can fulfill its operations and also establish best practices that can be applied to similar projects, thereby helping to improve Indonesia's paper industry.

2. Literature Review

2.1 Project Management Theory (PMBOK)

The Project Management Body of Knowledge (PMBOK) serves as the foundational framework for understanding and implementing effective project management practices across diverse industries and organizational contexts (Project Management Institute, 2021). Developed and maintained by the Project Management Institute (PMI), PMBOK provides a comprehensive guide that standardizes project management terminology, processes, and best practices based on decades of collective industry experience and academic research (Kerzner, 2022). PMI has set up the project lifecycle management framework with five groups that direct the project: Initiating, Planning, Executing, Monitoring and Controlling, and Closing (PMI, 2021). All of these process groups are brought together with ten different knowledge areas, such as Project Integration Management, Scope Management, Schedule Management, Cost Management, Quality Management, Resource Management, Communications Management, Risk Management, Procurement Management, and Stakeholder Management (Larson & Gray, 2021). Research by Turner (2020) demonstrates that organizations implementing comprehensive PMBOK methodologies achieve 28% higher project success rates compared to those using ad-hoc project management approaches.

Within the context of industrial construction projects such as paper machine installations, PMBOK's emphasis on schedule management and risk management becomes particularly critical for successful project delivery (Meredith & Mantel, 2019). The framework advocates for the development of detailed Work Breakdown Structures (WBS) that decompose complex projects into manageable components, enabling more accurate estimation, resource allocation, and progress monitoring (Schwalbe, 2021). Critical Path Method (CPM) and Gantt chart methodologies, as endorsed by PMBOK guidelines, provide essential tools for identifying project dependencies, optimizing resource utilization, and maintaining schedule adherence (Burke, 2020). Based on Kezner's study (2022), projects with a complete Work Breakdown Structure (WBS) framework experience 42% fewer delays in their schedules than projects with incomplete decomposition. The framework helps address the coordination issues that arise in multidisciplinary projects involving international contractors, local technical teams, and various organizational levels (Harrison & Lock, 2021). Furthermore, PMBOK's risk management processes establish proactive methodologies for identifying, analyzing, and mitigating potential project delays before they impact critical milestones, with empirical evidence showing a 35% reduction in cost overruns when properly implemented (Wysocki, 2020).

2.2 Prior Studies on Project Delays and Industrial Project Management

Extensive research in construction and industrial project management has consistently identified recurring patterns of delay factors that transcend geographic boundaries and industry sectors. In 2006, Assaf and Al-Hejji looked into construction delays in Saudi Arabia and found 73 possible reasons for delays grouped into eight main areas: project-related, owner-related, contractor-related, consultant-related, design-related, materials-related, equipment-related, and external factors. It was found that the main reasons for project delays were insufficient planning, poor teamwork among the parties, and delays in getting the needed materials. In the same way, Sambasivan and Soon (2007) studied delays in Malaysian construction projects, stating that poor coordination among contractors, lack of good project management skills, and lack of technical talent in the project teams were the main reasons for delays.

Recent studies have examined industrial manufacturing projects and found that there are extra challenges related to bringing in technology and installing special equipment. Pourrostam and Ismail (2012) examined delays in industrial construction projects in Malaysia and found that those involving imported machines and international experts encounter unique issues, such as customs delays and difficulties in sharing technical knowledge and coordinating between international consultants and local workers. Their research highlighted the importance of comprehensive project planning that accounts for cross-cultural communication barriers and technical competency gaps. Furthermore, Marzouk and El-Rasas (2014) applied statistical analysis to identify critical delay factors in industrial projects, demonstrating that projects with inadequate Work Breakdown Structure implementation experienced 34% longer completion times compared to projects with comprehensive WBS frameworks. These empirical findings support the theoretical foundation that systematic project management methodologies, when properly implemented, can significantly reduce delay occurrences and improve overall project performance in complex industrial environments.

2.3 Conceptual Framework

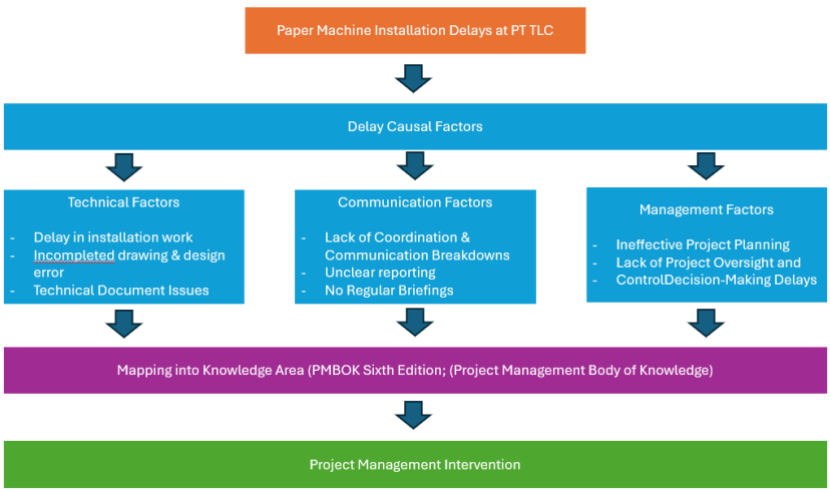

Figure 1: Conceptual Framework

The conceptual framework (Figure 1) for this study establishes a systematic approach to identify, analyze, and address the factors contributing to delays in PT TLC's paper machine installation project through a comprehensive project management intervention strategy. The framework begins with the identification of three primary delay causal factor categories: technical factors encompassing delays in installation work, incomplete or incorrect engineering drawings, and technical document issues; communication factors including lack of coordination between teams, communication breakdowns, unclear reporting protocols, and absence of regular briefings; and management factors involving ineffective project planning, insufficient project oversight and control, and delays in critical decision-making processes. These empirically identified delay factors are then systematically mapped

into the internationally recognized PMBOK (Project Management Body of Knowledge) sixth edition knowledge areas, creating a theoretical bridge between field observations and established project management standards, including Project Integration Management, Project Scope Management, Project Schedule Management, Project Communications Management, and Project Risk Management. This mapping process enables the development of evidence-based project management interventions that directly target the root causes of delays through structured process improvements, enhanced coordination mechanisms, strengthened monitoring systems, and optimized decision-making protocols, ultimately providing a practical roadmap for improving project execution efficiency and ensuring timely completion of the paper machine installation project.

3. Methodology

This study adopts a Sequential Exploratory Mixed Methods approach, which systematically combines qualitative and quantitative methodologies to provide a comprehensive understanding of the factors contributing to project delays in PT TLC's paper machine installation project (Figure 2). The study starts by gathering and studying qualitative data to understand the problem and then moves on to collect and analyze quantitative data to confirm, measure, and determine the importance of the first findings about delay factors (Creswell & Plano Clark, 2018). First, the researcher investigates the project execution challenges qualitatively and then confirms and measures these findings with standard instruments. The mixed-methods approach was specifically chosen to address the multi-dimensional nature of industrial project delays, which encompass technical, managerial, and coordination factors that require both contextual understanding and empirical validation to develop effective interventions.

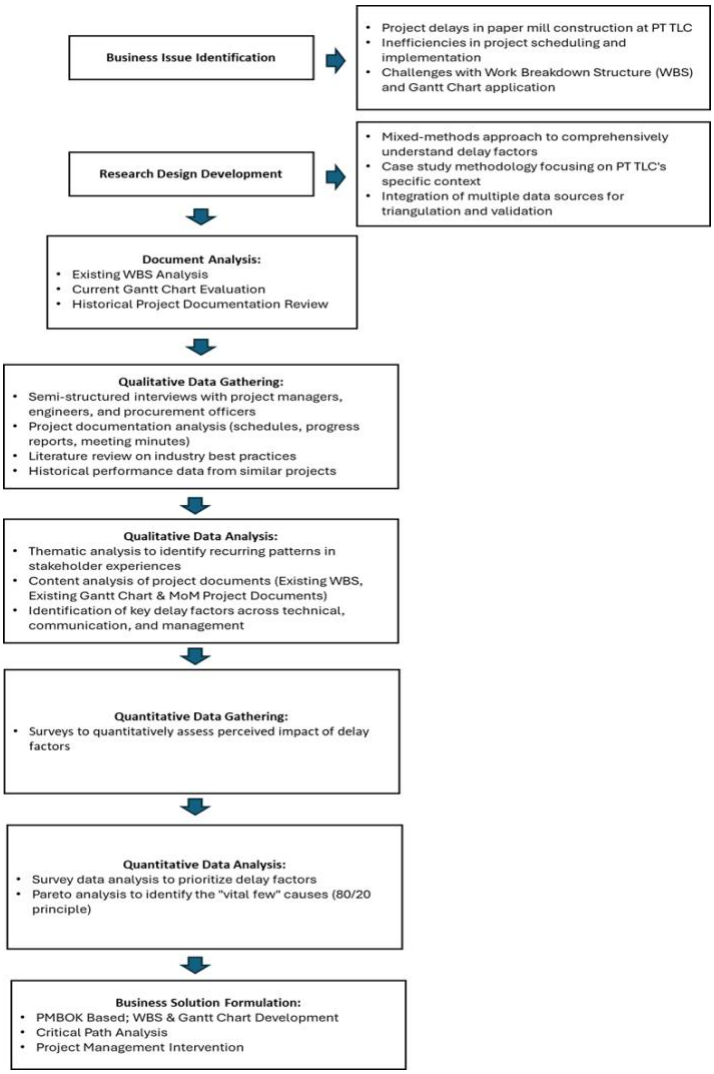

Figure 2: Research Design

In the qualitative phase, researchers employ various methods to collect data and thoroughly explore the reasons for delays. Interviews are used as the main way to collect qualitative data, involving project managers, installation engineers, and procurement officers to learn about challenges and gaps during implementation seen by different members of the organization. Secondary data analysis focuses on critical project documentation, including Work Breakdown Structure (WBS) documents, baseline and updated Gantt Charts, Minutes of Meetings (MoM) from project coordination forums, installation logs, progress reports, and internal correspondence. The qualitative data are analyzed using thematic analysis following Braun and Clarke's (2006) six-phase framework to identify recurring patterns and dominant causes of delays, which are then categorized into technical, communication, and managerial factors. Additionally, content analysis is conducted on project documents to identify structural weaknesses in scheduling and task sequencing, while visual and structural analysis of the Gantt Chart and WBS reveals deviations from baseline plans and coordination inefficiencies.

The quantitative phase builds directly upon qualitative findings to validate and prioritize identified delay factors through empirical measurement and statistical analysis. A structured survey questionnaire utilizing Likert-scale items is developed based on themes emerging from the qualitative analysis, targeting individuals directly involved in project execution to capture stakeholder perceptions regarding the frequency and severity of each delay factor. The quantitative data are analyzed using descriptive statistics to rank the influence of each factor, followed by a Pareto analysis to isolate the "vital few" causes that contribute most significantly to project delays, applying the 80/20 principle to focus intervention efforts on high-impact areas. Besides, Critical Path Analysis (CPA) is performed on both the baseline and actual Gantt Chart to spot tasks that are most important for finishing the project quickly and suggest actions to speed up the project. By using this design, the research combines different types of data, which helps validate and strengthen the findings and offers valuable solutions for PT TLC’s industry (Johnson & Onwuegbuzie, 2004).

3.1 Data Collection

This study employed a comprehensive mixed-methods data collection strategy encompassing both secondary and primary data sources to ensure a thorough investigation of delay factors in PT TLC's paper machine installation project. Secondary data collection focused on a systematic analysis of critical project documentation, including Work Breakdown Structure (WBS) documents, baseline and updated Gantt Charts, Minutes of Meetings (MoM) from project coordination forums, installation logs, progress reports, and internal correspondence. The WBS analysis evaluated task hierarchy clarity and completeness according to PMBOK Guide standards, while the Gantt Chart analysis involved a retrospective comparison between original baseline plans and actual progress to identify scheduling deviations, critical path disruptions, and resource misalignments. By analyzing MoM and internal coordination notes, it was found that delays were caused by miscommunication, late choices, unsure vendor actions, and unresolved technical issues (Bowen, 2009). A thorough review of the documents allowed me to understand the places where scheduling, technical, and managerial issues occurred during the project.

In line with the mixed-methods approach, the first stage was conducting interviews, and the second stage was administering the Survey. Project managers, engineers, and procurement officers responsible for various tasks within the project were interviewed using semi-structured interviews. Every interview session ran for 20-40 minutes and was based on questions that fit the role, so project managers discussed planning issues and stakeholder cooperation, engineers talked about technical problems and workflow problems, and procurement officers discussed issues with service coordination and timeline integration. After studying the interview transcripts, a questionnaire was created and sent to many project stakeholders to confirm and measure how often and how seriously each delay factor occurred. Five main areas were covered in the Survey by using a 5-point Likert scale: planning and scheduling the project, coordinating internally, working with contractors and vendors, decision-making and leadership, and using resources effectively (Fowler, 2014). This sequential approach ensured that quantitative measurement was grounded in qualitative insights while enabling methodological triangulation to enhance research validity.

3.2 Data Analysis

Qualitative data analysis employed multiple complementary analytical approaches to extract comprehensive insights from interview transcripts and project documentation. Thematic analysis served as the primary analytical framework, following Braun and Clarke's (2006) six-phase model encompassing transcript familiarization, initial coding, theme development, theme review, theme definition, and report generation to identify recurring patterns related to project delays, including communication bottlenecks, coordination breakdowns, and technical execution challenges. This analysis utilized both deductive approaches based on established delay taxonomies and inductive approaches, allowing emergent patterns from field data to surface organically. Simultaneously, integrated document analysis combined content analysis of textual materials (MoM, internal communications) to extract delay-related issues, visual analysis of Gantt Charts to identify baseline deviations and scheduling inconsistencies, and structural analysis of WBS documents to assess task hierarchy clarity and alignment with PMBOK standards. These qualitative analytical methods were systematically cross-referenced and triangulated to ensure consistency and strengthen the reliability of identified delay factors, with findings serving as the foundation for developing the quantitative survey instrument.

Quantitative data analysis focuses on validating and prioritizing qualitative findings through statistical measurement and strategic analytical techniques. Descriptive statistical analysis was conducted on survey responses from nine project participants, beginning with data preparation procedures including reverse coding of positively framed items to create a unified problem severity scale using the formula: Problem Score = 6 - Average Score. Average scores were calculated for each survey item and categorized using established thresholds, where scores above 3.5 indicated critical concerns requiring immediate attention, scores between 2.0 and 3.5 represented moderate concerns, and scores below 2.0 suggested minor issues (Vagias, 2006; Dawes, 2008). To further prioritize intervention strategies, Pareto analysis was applied, following the 80/20 principle, to identify the "vital few" delay factors that contribute disproportionately to project timeline disruptions (Craft & Leake, 2002). The Pareto analysis involved the systematic categorization of delay factors, frequency tabulation based on both qualitative and quantitative evidence, ranking, and percentage conversion to assess relative contributions, as well as cumulative percentage calculation to determine factor combinations accounting for approximately 80% of project delays. Additionally, Critical Path Analysis (CPA) was conducted on baseline and actual Gantt Chart data to identify task sequences with the highest time sensitivity and map potential interventions for accelerating project completion, ensuring that analytical findings directly informed practical recommendations for schedule recovery and future project optimization.

4. Result

4.1 Existing WBS Analysis

The evaluation of the existing Work Breakdown Structure (WBS) at PT TLC revealed significant deviations from standardized project management practices through a comprehensive analysis that identified ten distinct weaknesses within the current implementation (Figure 3, Table 1). These issues encompassed fundamental structural problems, including the absence of clear deliverables per level, lack of hierarchical numbering systems, inappropriate work package sizing, missing duration, and resource allocations, activity redundancy and overlap, inconsistent terminology usage, undefined outputs or deliverables, exclusion of critical testing and commissioning phases, poor integration with other project areas, and absence of defining milestones or gates. The analysis demonstrated that the existing WBS functioned merely as an activity list rather than a proper hierarchical structure showing the progression from project goals to phases, deliverables, and specific tasks, thereby undermining the effectiveness of project planning, monitoring, and control processes.

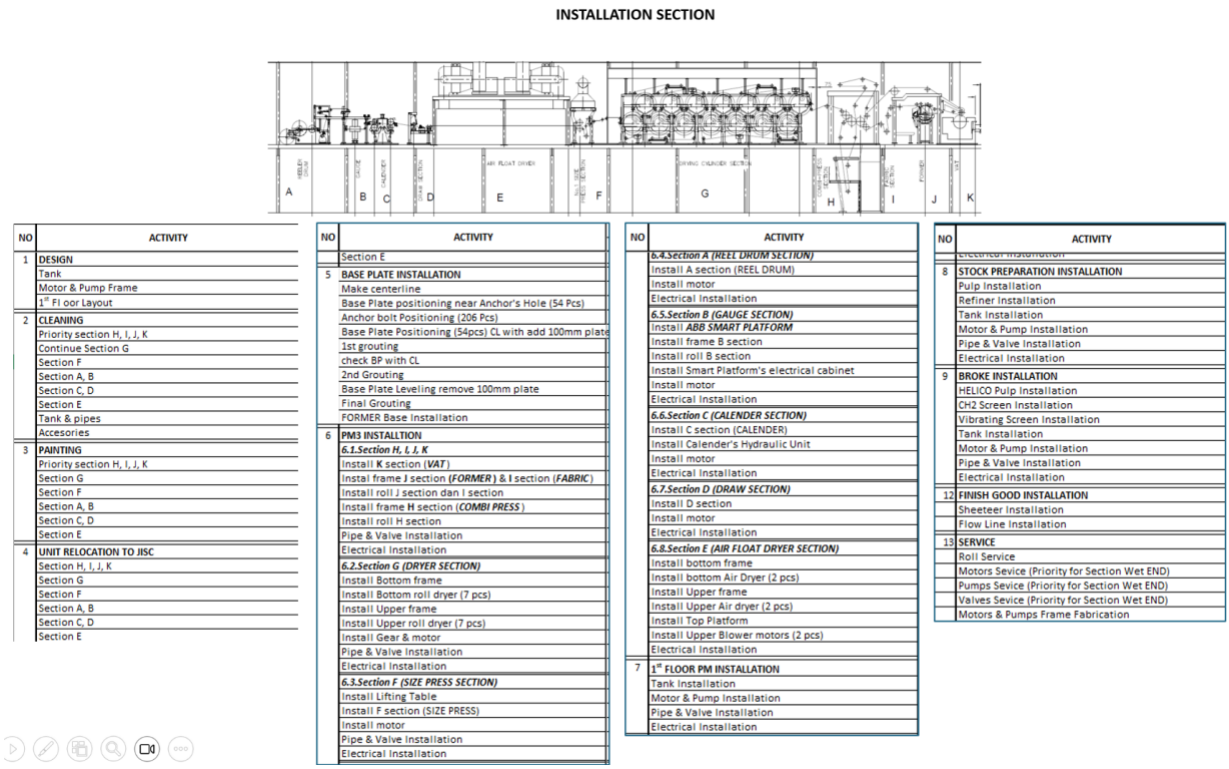

Figure 3: Existing WBS Installation Section

The systematic mapping of these identified weaknesses to relevant PMBOK Knowledge Areas (Table 1) revealed that Scope Management and Schedule Management were the most frequently impacted areas, each appearing three times in the frequency analysis (Table IV.3), indicating concentrated weaknesses in project scope definition and time planning. Integration Management followed with two occurrences, reflecting poor alignment between WBS structure and overall project control, while Communication Management and Procurement Management each appeared once, highlighting specific but important coordination and communication gaps. This mapping process facilitated the development of targeted intervention strategies, such as assigning durations and resources to activities, clarifying deliverables at each WBS level, implementing hierarchical numbering systems, standardizing terminology, and aligning procurement schedules with installation timelines. The findings emphasized the critical need to strengthen WBS development by applying structured project management standards to ensure better project execution and control.

Table 1: Existing WBS Identification based on PMBOK concept

No.	PMBOK Categories	Issue	Detail
1	Scope Definition	WBS does not have clear deliverables per level	WBS is just an activity; it does not show the hierarchy of goals (project → phase → deliverable → task)
2	WBS Numbering	There is no hierarchical numbering (example: 1.0, 1.1, 1.1.1)	It makes tracking activities difficult, does not conform to standard level-based WBS structure
3	Work Package Clarity	There are activities that are too large or too small to be called a work package	Example: “Install Refiner” (too general), “Install Dryer (2 pcs)” (too narrow without sub-tasks)
4	Lack of Duration & Resource	No mention is made of estimated duration, resources, or dependencies between activities	It cannot be used for scheduling or monitoring
5	Redundancy or Overlap	Some activities appear to overlap between sections	Example: "Motor & Pump Installation" appears in several sections without clarity as to

			whether it refers to the same or different items.
6	Inconsistent Terminology	There are differences in writing style between sections (some use technical details, some are general)	Example: "Install Section A" vs. "Install Refiner Motor & Pump"
7	Lack of Deliverables or Outcomes	The output of each activity is not listed (for example, components completed, installed, tested, handed over)	It is challenging to determine whether activities are completed to the required standards.
8	No Work Package for Testing & Commissioning	Focus only on installation; does not include testing and commissioning	An important step for the final validation of unit performance before going live
9	Lack of Integration with Other Areas	It does not cover communication, quality, or vendor coordination	Not by the integration principle between PMBOK Knowledge Areas
10	There is no defining milestone (Gate)	There are no critical milestones such as: "Baseplate Completed," "Mechanical Completion," and "Ready for Commissioning."	It is not easy to evaluate progress based on key targets.

4.2 Existing Gantt Chart Analysis

The evaluation of the existing Gantt chart used in the machine installation project at PT TLC (Figure 3) revealed significant structural and functional weaknesses that compromise the project's ability to manage time, resources, and scope effectively according to PMBOK-based project scheduling best practices. The analysis identified ten critical findings (Table IV.3), including the absence of activity dependencies that prevent critical path determination, lack of visible estimation methods for durations despite their presence in the chart, missing essential project control features such as float calculations and milestone definitions, absence of baseline and progress indicators that hinder objective performance tracking, poor integration with the Work Breakdown Structure (WBS), and insufficient visibility of resource allocations per task. Additionally, while technical activities were detailed across sections such as cleaning, painting, and base plate installation, the chart failed to include crucial commissioning activities necessary for project closure. Furthermore, the existing "Service" activity at the end lacked proper detailing for industrial project requirements.

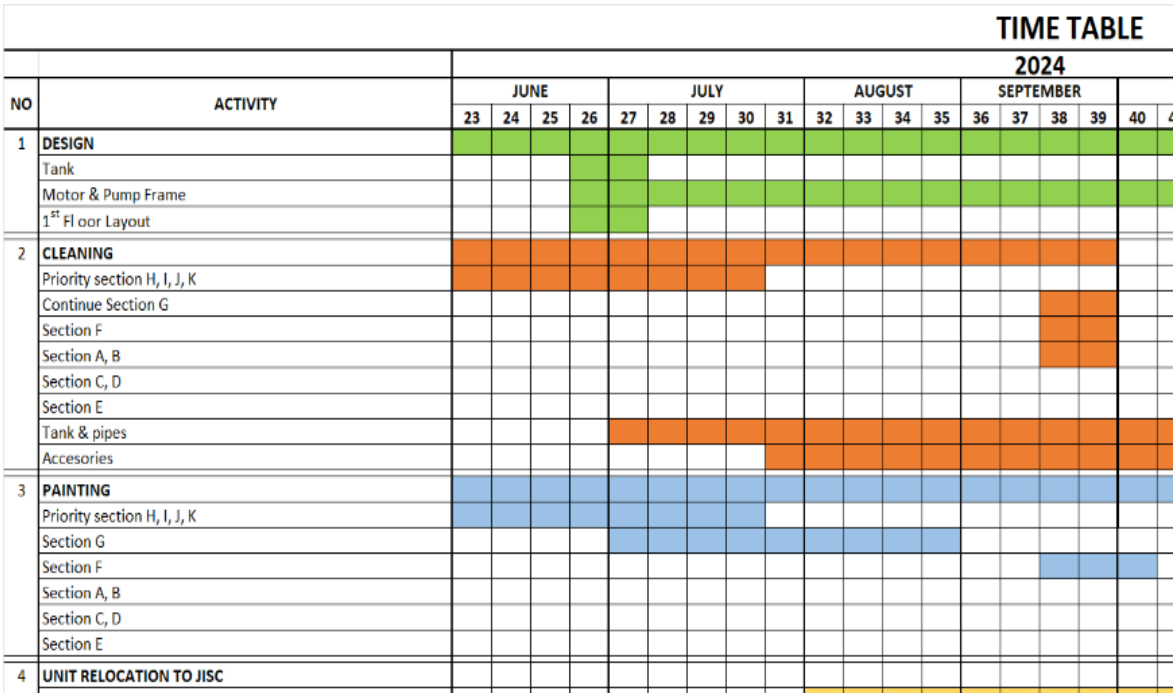

Figure 3: Existing Gantt Chart

The systematic mapping of these identified weaknesses to corresponding PMBOK Knowledge Areas (Table 2) demonstrated that Schedule Management was the most significantly impacted area, covering four of the eight identified issues, including problems in activity sequencing, estimation methods, milestone definition, and overall schedule development. Integration Management appeared in two instances, reflecting poor alignment between the Gantt chart and the project's WBS structure as well as missing control baselines, while Resource Management and Scope Management each appeared once, highlighting the absence of resource details and missing commissioning activities, respectively. These findings emphasized the critical need to enhance the Gantt chart by incorporating essential project control elements such as logical activity dependencies to establish critical path analysis, proper duration estimation methods, float calculations, key project milestones, resource allocation details, and comprehensive commissioning stages to ensure improved clarity, coordination, and schedule accuracy in alignment with PMBOK standards.

Table 2: Existing Gantt Chart Identification based on PMBOK concept

No.	Initial Code	Theme	Mapped PMBOK Knowledge Area	Freq	Recommended Intervention
1	No duration/resource assignment	Schedule Integration Problem	Schedule Management	3	Assign durations and resources to each activity for effective planning.
2	Overlap between activities	Structural & Control Weakness			Rearrange the activity sequence to eliminate overlapping tasks.
3	Lack of commissioning milestone	Execution Incompleteness			Include commissioning stages in the project schedule baseline.
4	No clear deliverables per level	WBS Structural Deficiency	Scope Management	3	Clarify deliverables at each WBS level by providing detailed scope definitions.
5	Overly general/narrow task definition	Work Package Clarity			Refine the work package definitions to match the actual work scope better.
6	Undefined output or deliverables	Work Control Problem			Clearly define expected outputs and quality criteria for each task.
7	No numbering hierarchy	WBS Structural Deficiency	Integration Management	2	Implement a hierarchical numbering system to support integration and project control.
8	No milestone (Gate) defined	Execution Monitoring Gap			Set major project milestones (Gates) as checkpoints for performance tracking.
9	Inconsistent terminology	Communication Gap	Communication Management	1	Standardize terminology and provide a project glossary for common understanding.
10	Not integrated with procurement/vendor	Integration Deficiency	Procurement Management	1	Align procurement schedule with equipment installation timelines.

4.3 Pareto Analysis

The Pareto analysis conducted to validate and quantify the seven significant delay categories factors identified through thematic analysis of PT TLC's paper mill project demonstrated a precise distribution of issues across

PMBOK Knowledge Areas, with the results visualized in Figure 4. showing the relative frequency and cumulative impact of project delays by knowledge area. This quantitative validation, derived from structured survey questionnaires administered to key stakeholders, effectively bridged the gap between qualitative thematic findings and statistical evidence by mapping each identified delay factor to specific survey items, thereby enabling comprehensive coverage of project issues while providing empirical support for the prevalence and significance of various delay categories. The Pareto chart revealed the concentration of delay factors within specific knowledge areas, following the 80/20 principle where a minority of knowledge areas contributed to the majority of project delays, thus providing project management with clear prioritization guidance for intervention strategies and resource allocation to address the most critical delay-causing factors in the paper machine installation project.

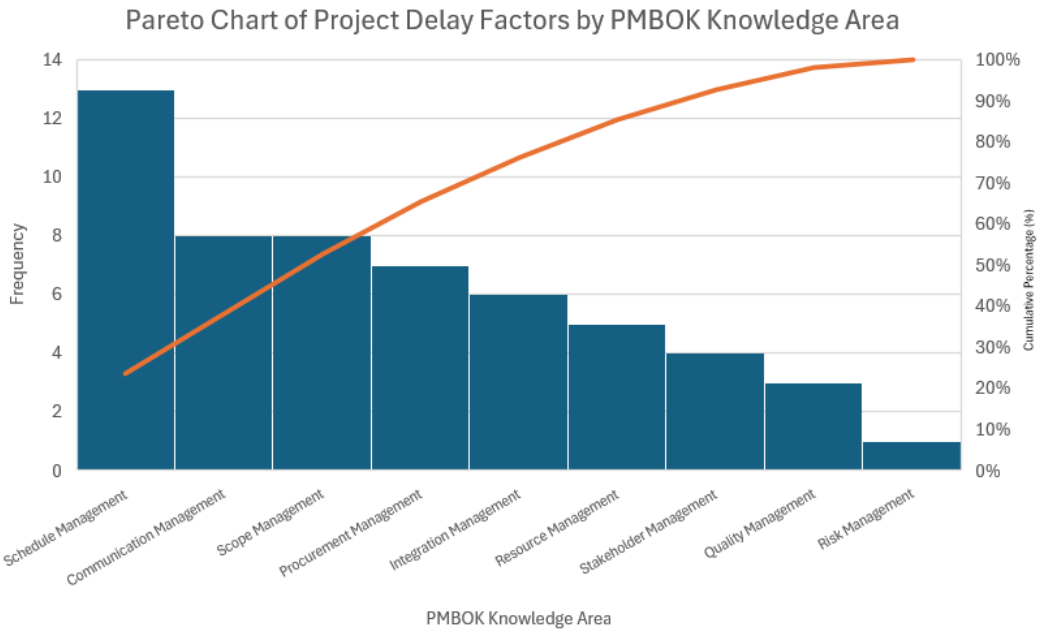

Figure 4: Pareto Analysis of PMBOK Knowledge Area

4.4 Integrated Master Delay Factor

The construction of a comprehensive understanding of dominant project delay factors was achieved through an integrated master delay factor analysis that systematically aggregated findings from five key data sources including Work Breakdown Structure (WBS) analysis, Gantt Chart evaluation, Minutes of Meeting (MoM) document review, thematic analysis of stakeholder interviews, and quantitative survey results, with each identified issue being thematically coded and mapped into the ten PMBOK knowledge areas for structured classification (Table 3). The integrated analysis revealed that Schedule Management emerged as the most frequently cited knowledge area associated with project delays with 15 total occurrences across all data sources, followed by Communication Management and Procurement Management each recording 10 occurrences, and Scope Management with 9 occurrences, indicating that the most pressing challenges were rooted in ineffective scheduling practices, coordination breakdowns, and vendor-related obstacles. This cross-functional integration approach captured both technical deficiencies and organizational governance weaknesses while reducing bias from any single dataset, thereby supporting a triangulated understanding of systemic delay drivers where Resource Management (8 occurrences), Integration Management, and Stakeholder Management (7 occurrences each), Quality Management and Risk Management (2 occurrences each) represented additional but less critical areas of concern. The aggregated frequency data provided a robust foundation for subsequent prioritization analysis using Pareto principles to determine the most impactful areas for project improvement interventions, ensuring that improvement strategies would address the root causes of delays rather than merely treating symptoms (Table 3).

Table 3: Integrated Master Delay Factor Frequency by PMBOK

No.	PMBOK Knowledge Area	Delay Source					Total
		WBS	Gantt Chart	MoM	Interview	Survey	
1	Schedule Management	3	4	2	4	2	15
2	Communication Management	1	0	5	2	2	10
3	Scope Management	3	1	2	2	1	9
4	Procurement Management	1	0	2	4	3	10
5	Integration Management	2	2	0	2	1	7
6	Resource Management	0	1	2	2	3	8
7	Stakeholder Management	0	0	0	4	3	7
8	Quality Management	0	0	1	1	0	2
9	Risk Management	0	0	2	0	0	2

4.5 Proposed Solution

This subchapter presents a structured set of proposed improvements for PT TLC's machine installation project by adopting a comparative approach that systematically evaluates deficiencies in the original project planning documents, specifically the Work Breakdown Structure (WBS), Critical Path Method (CPM), and Gantt chart including resource visibility, and contrasts them with revised tools developed in response to findings from the integrated analysis conducted. The proposed solutions address six major identified problems as summarized in Table 4, including designing a hierarchical WBS with defined outputs and numbering to resolve scope and integration issues, recalculating CPM with proper dependencies, float calculations, and milestone definitions to enhance schedule and integration management, adding resource columns for workforce, vendor, and equipment visibility to strengthen resource management, improving RFI response SOPs with assigned communication focal points to eliminate communication bottlenecks, synchronizing delivery plans with WBS milestone checkpoints to address procurement management challenges, and aligning terminology across WBS and MoM documents while defining clear deliverables per task to enhance scope and quality management. The subchapter is systematically organized into three main components that provide evaluation of the existing WBS and its improvement, comparison between original and improved CPM and Gantt Chart structures, and a comprehensive summary of key improvements with detailed explanations of their impact on project clarity, timing, and resource management, thereby ensuring that each proposed solution directly addresses the root causes identified through multiple evidence sources including WBS analysis, Gantt chart evaluation, MoM reviews, thematic interviews, and survey data.

Table 4: Summary of Delay Issues and Improvement Focus Areas

Identified Problem	Evidence Source	PMBOK Area	Proposed Improvement
WBS lacks hierarchy, deliverables, and numbering	WBS analysis, Interview	Scope & Integration	Design hierarchical WBS with defined output numbering
Activities unlinked to milestones and float not calculated	Gantt Chart & MoM	Schedule & Integration	Recalculate CPM, define dependencies, float, and milestone
No resource visibility per task	Gantt Chart & Survey	Resource Management	Add resource columns in the schedule for workforce/vendor/equipment

Communication & and RFI bottlenecks	Thematic interviews, Survey	Communication Management	Improve RFI response SOP, assign communication focal points
Vendor schedule mismatch delivery delays	Interview & MoM	Procurement Management	Synchronize delivery plan with WBS milestone checkpoints
Inconsistent terminology & and unclear output	WBS, MoM, Interviews	Scope/Quality Management	Align language in WBS & MoM; define deliverables per task

4.6 Improved WBS design

To address the structural and clarity issues identified in the evaluation of the existing WBS, an improved Work Breakdown Structure was developed based on hierarchical formatting aligned with PMBOK best practices and incorporating findings from delay analysis conducted through interviews, Gantt chart review, and survey data. The revised WBS introduces a comprehensive four-tiered structure consisting of Level 1 (Overall project - Paper Machine Installation at PT TLC), Level 2 (Project phases including Project Management, Engineering & Design, Construction & Installation, and Commissioning), Level 3 (Major deliverables), and Level 4 (Sub-deliverables or activities), which enables better task traceability, more explicit deliverable definitions, embedded milestone integration, and accurate resource and duration estimates to support enhanced scheduling and progress control. The enhanced WBS design directly resolves the previously identified deficiencies by establishing clear hierarchical relationships, eliminating redundancy and overlap, providing consistent terminology throughout all levels, defining specific deliverables and outcomes for each work package, and ensuring proper integration with scheduling and resource management systems, thereby creating a robust foundation for effective project planning, monitoring, and control.

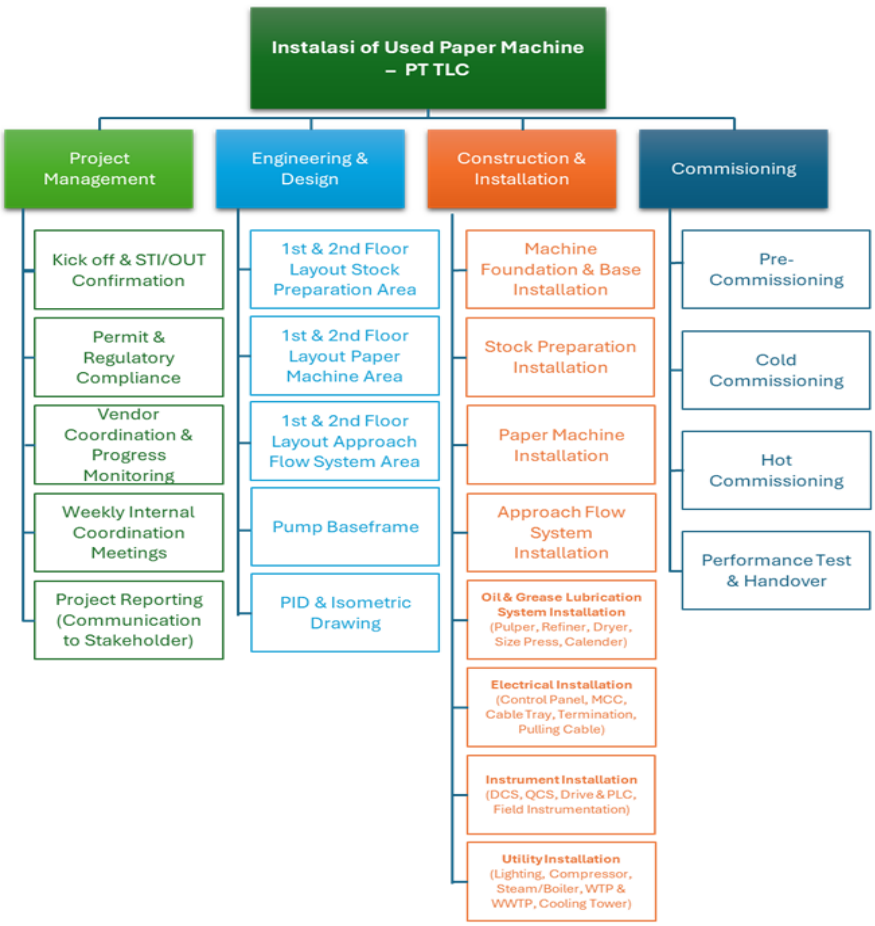

Figure 5: Improved WBS Overview by Project Phases

4.7 Critical Path Method

As part of the project improvement strategy, a comprehensively revised Critical Path Method (CPM) was developed in full alignment with the enhanced hierarchical WBS, featuring complete activity mapping from Engineering and design through Construction and installation to Commissioning and handover phases (Table 5). The improved CPM significantly expanded the critical path to include essential downstream commissioning stages such as Cold and hot Commissioning, Pre-Commissioning, and Final Acceptance and handover, with activities including Hot Commissioning (M), Performance Testing (N), and Final Acceptance (O) now correctly identified as critical with zero float values, ensuring that any delays in these areas would directly impact project completion dates. The dependency logic underwent substantial revision, exemplified by Pre-Commissioning (K) now being linked to a comprehensive set of predecessors (E, F, G, H, I, and J) representing physical readiness and functional verification requirements before testing commences, thereby ensuring the updated CPM accurately reflects real-world sequencing and interdependencies. The detailed comparison presented in Table IV.14 demonstrates key improvements, including the transformation from a technical section-based structure to a hierarchical phase-based organization, full inclusion of commissioning activities end-to-end rather than partial coverage, defined durations for all tasks, eliminating previous scheduling gaps, expanded delay risk coverage beyond installation to include end-phase and handover risks, and enhanced critical path visibility extending through final acceptance rather than terminating at installation. Through this improved structure, the CPM evolves into a strategic management tool capable of highlighting critical risks throughout the entire project lifecycle, enabling the project team to identify latent risks in downstream activities and implement early interventions such as resource reallocation or schedule compression to avoid delays and successfully meet the July 2025 deadline.

Table 5: Improved Critical Path Method (After Improvement)

Machine Installation - Project Activity Plan											
No.	Activity	Start	Finish	Duration (Days)	Predecessors	ES	EF	LS	LF	FLOAT	CRITICAL
A	Layout Drawings	4/1/2024	12/31/2024	274	-	0	274	0	0	0	YES
B	Pump Baseframe Drawings	10/1/2024	10/31/2024	30	A	274	304	274	304	0	YES
C	PID & Isometric Drawings	10/31/2024	1/31/2025	92	A	274	366	274	366	0	YES
D	Machine Foundation & Base Constructed	8/20/2024	10/31/2024	72	B	274	346	274	346	0	YES
E	Stock Preparation System Installed	2/10/2025	6/20/2025	131	D	346	477	427	558	81	NO
F	Paper Machine Installed	11/30/2024	6/30/2025	212	D	346	558	346	558	0	YES
G	Approach Flow System Installed	4/1/2025	6/30/2025	91	D	346	437	467	558	121	NO
H	Electrical System Installed	4/25/2025	6/18/2025	54	E, F, G	558	612	558	612	0	YES
I	Instrumentation Systems Installed	5/1/2025	7/31/2025	92	H	612	704	647	739	35	NO
J	Utility Systems Installed	2/11/2025	7/15/2025	127	A	612	739	612	739	0	YES
K	Pre-Commissioning Checklist Completed	5/20/2025	6/30/2025	41	E, F, G, H , I, J	739	780	739	780	0	YES
L	Cold Commissioning Report	6/2/2025	6/20/2025	1	K	780	781	780	781	0	YES
M	Hot Commissioning	6/30/2025	7/24/2025	25	L	781	806	781	806	0	YES
N	Performance Testing (Performance Commissioning)	7/2/2025	7/24/2025	23	M	806	829	806	829	0	YES
O	Final Acceptance & Handover	7/13/2025	7/31/2025	1	N	829	830	829	830	0	YES

4.8 Gantt Chart

The evaluation of the initial Gantt Chart (Figure 6) used in PT TLC's paper machine installation project revealed significant structural weaknesses including predominantly linear activity scheduling with minimal overlapping that reduced time compression opportunities, treatment of critical activities such as relocation, PM3 installation, and baseplate installation as standalone sequences rather than integrated phases, absence of clear linkage between design completion and early site execution resulting in time gaps and underutilized resources, and lack of indicators for deliverables, responsible parties, or resource alignment that hindered cross-functional coordination. In response to comprehensive delay analysis findings from Sections 4.3 and 4.4, an improved Gantt Chart was developed (Figure IV.11) that directly integrates WBS hierarchy into scheduling logic, enables parallel scheduling of installation phases with foundation work and layout drawing co-occurring, introduces strategic overlap between machine installation and utility work including electrical, instrumentation, and piping to reduce idle periods, and incorporates commissioning stages and performance testing as visible milestones for enhanced preparation and handover readiness control. The improved Gantt Chart delivers superior visual logic, enhanced activity sequencing, and better alignment with actual field practices and engineering workflow, transforming the scheduling tool from a basic linear timeline into a sophisticated project management instrument that optimizes resource utilization, minimizes project duration through strategic activity overlapping, and provides clear visibility into critical dependencies and milestone achievements throughout the entire project lifecycle.

Table 6: Gantt Chart (After Improvement)

PROJECT TIMELINE						NOV		DEC				JAN				FEB			
No.	Activity	PIC	Start	Finish	Duration (Days)	3	4	1	2	3	4	1	2	3	4	1	2	3	
A	Layout Drawings	Arif	4/1/2024	12/31/2024	274														
B	Pump Baseframe Drawings	Dudung	10/1/2024	10/31/2024	30														
C	PID & Isometric Drawings	Wida	10/31/2024	1/31/2025	92														
D	Machine Foundation & Base Constructed	Eri	8/20/2024	10/31/2024	72														
E	Stock Preparation System Installed	Lantip	2/10/2025	6/20/2025	131														
F	Paper Machine Installed	Lantip	11/30/2024	6/30/2025	212														
G	Approach Flow System Installed	Soni	4/1/2025	6/30/2025	91														
H	Electrical System Installed	Feri	4/25/2025	6/18/2025	54														
I	Instrumentation Systems Installed	Dwi	5/1/2025	7/31/2025	92														
J	Utility Systems Installed	Rifky	2/11/2025	7/15/2025	127														
K	Pre-Commissioning Checklist Completed	Cikal	5/20/2025	6/30/2025	41														
L	Cold Commissioning Report	Cikal	6/2/2025	6/20/2025	1														
M	Hot Commissioning	Cikal	6/30/2025	7/24/2025	25														
N	Performance Testing (Performance Commiss	Cikal	7/2/2025	7/24/2025	23														
O	Final Acceptance & Handover	Cikal	7/31/2025	7/31/2025	1														

4.9 Discussion

The comprehensive comparison of project management tools at PT TLC reveals fundamental transformations that align with established PMBOK framework principles and address the technical, communication, and managerial factors identified in the conceptual framework. The WBS enhancement represents a significant evolution from a list-based sectional format to a hierarchical structure that incorporates PMBOK-compliant scope management practices (PMI, 2017). According to Turner (2014), effective WBS design requires a clear decomposition of project scope into manageable work packages, which the improved structure achieves through its four-tiered hierarchy and formalized numbering systems. The integration of explicit deliverables and Person-in-charge (PIC) assignments reflects what Kerzner (2017) identifies as essential accountability structures in project management while addressing gaps noted by Crawford (2002) regarding scope control deficiencies. However, unlike previous studies that focus primarily on WBS structure (Haugan, 2002), this research highlights the critical importance of integrating WBS improvements with downstream scheduling and resource management tools, which many existing studies overlook.

Table 7: Before vs. After Improvement

Tool	Evaluation Aspect	Before Improvement	After Improvement
WBS	Structure Format	List-based by section	Hierarchical (Project → Phase → Task)
WBS	Hierarchy Levels	2 levels (main/sub-activity)	3–4 levels (e.g., 1.2.1.1)
WBS	Numbering System	No formal numbering	Formalized (e.g., 3.2.1.2)
WBS	Scope Clarity	Generic/overlapping tasks	Clear, specific deliverables
WBS	Deliverables Defined	Not clearly stated	Key deliverables defined per task
WBS	Resource Allocation	Absent	PIC listed per task
WBS	Duration Estimation	Missing	Included per task (in days)
WBS	Milestone Integration	Absent	Milestones embedded (e.g., commissioning)
WBS	Traceability to Schedule	Not linked to schedule tools	Fully traceable to Gantt Chart and CPM
WBS	Responsibility (PIC)	Not explicit	Named PICs per task

WBS	Issue Mapping	Not present	Linked to MoM/interview issues in the remarks column
CPM	WBS Structure	Technical section-based only	Hierarchical, phase-based
CPM	Commissioning Activities	Partially or not included	Fully included end-to-end
CPM	Duration Definition	Some tasks are missing durations/schedules	Defined duration for all tasks
CPM	Delay Risk Coverage	Focused on installation delays only	Includes end-phase and handover risks
CPM	Critical Path Visibility	Limited (ends at installation)	Full timeline through to final acceptance
Gantt Chart	Activity Structure	Integrated across all phases but not modular	Modular breakdown: Design → Cleaning → Painting → Move
Gantt Chart	Unit Relocation	Not Included	Explicitly listed as the final task
Gantt Chart	Preparation Tasks	Missing (no cleaning or painting shown)	Included and logically sequenced
Gantt Chart	Activity Dependencies	Not Visible	Implied through phased and section-based layout
Gantt Chart	Time Scale	Monthly	Weekly
Gantt Chart	Execution Logic	Less visible, less field-friendly	Better suited for actual on-site coordination
Gantt Chart	Activity Scheduling	Linear with minimal overlapping	Parallel scheduling with strategic overlaps
Gantt Chart	Cross-functional Coordination	Limited indicators for deliverables/resources	Enhanced with deliverables, PICs, and milestones
Gantt Chart	Commissioning Integration	Partial or missing	Fully integrated with visible milestones

The CPM improvements demonstrate significant advancement beyond traditional approaches documented in project management literature. While Meredith and Mantel (2017) emphasize the importance of activity identification and dependency mapping, their focus remains primarily on construction phases, neglecting what Burke (2013) identifies as critical commissioning and handover activities. This research addresses this limitation by transitioning from a technically focused approach to a comprehensive lifecycle perspective that includes end-to-end commissioning activities. The enhanced delay risk coverage reflects modern risk management principles outlined in PMBOK's Project Risk Management knowledge area (PMI, 2017). However, it extends beyond what Hillson (2009) describes as traditional risk identification by incorporating systematic bottleneck analysis throughout the entire project system. Previous CPM studies by Kelley and Walker (1959) and subsequent research by Larson and Gray (2021) have not adequately addressed the integration challenges between the installation and commissioning phases that this study specifically targets.

The Gantt chart optimization represents a significant advancement in visual project communication that addresses limitations identified in current project scheduling literature. While Verzuh (2015) advocates for parallel scheduling techniques, most existing research fails to address the practical field implementation challenges that this study tackles explicitly through weekly time scales and field-friendly execution logic. The shift from monthly to weekly time scales enhances schedule control capabilities, as defined by PMBOK's Project Schedule Management (PMI, 2017), but goes beyond what Lewis (2007) suggests by integrating preparation tasks and

explicit resource coordination, which previous studies have treated as separate concerns. Unlike Cleland and Ireland's (2007) emphasis on communication tools as standalone elements, this research demonstrates how integrated Gantt chart improvements can simultaneously address resource management, stakeholder communication, and schedule control, filling a significant gap in the literature where these elements are typically studied in isolation.

The comprehensive improvements demonstrate the successful application of PMBOK knowledge areas in ways that address critical limitations in existing project management research. While PMI (2017) provides the theoretical framework for Project Integration Management, most empirical studies fail to demonstrate how WBS, CPM, and Gantt charts can be systematically integrated to create cohesive project management systems. This research addresses the gap between project management theory and practice, as identified by Shenhar and Dvir (2007), by embedding issue mapping and lessons learned integration that serves the dual purposes of current project control and future improvement. The systematic approach supports PMBOK's emphasis on continuous improvement (PMI, 2017). However, it extends beyond what Kerzner (2017) describes by directly linking identified delay factors to specific tool improvements, which previous studies have not systematically demonstrated. Furthermore, while Morris and Pinto (2007) emphasize the importance of considering the project lifecycle, their research does not provide practical methodologies for integrating commissioning and handover activities into critical path analysis, as this study accomplishes.

The demonstrated improvements provide significant implications that challenge existing project management practice assumptions and address gaps in the current literature. While most studies focus on individual tool improvements (Haugan, 2002; Lewis, 2007), this research demonstrates that systematic application of integrated PMBOK principles delivers superior results compared to isolated tool implementation approaches commonly advocated in existing literature. The emphasis on end-to-end project lifecycle consideration, particularly the inclusion of commissioning and handover activities in critical path analysis, addresses a significant research gap identified by Nicholas and Steyn (2017), where transition phases are inadequately studied despite their high failure rates. Unlike previous research that treats technical, communication, and managerial factors as separate domains (Turner, 2014; Burke, 2013), this study demonstrates how comprehensive tool integration can simultaneously address all three-factor categories, providing a more holistic approach to project delay mitigation than currently available in the literature. The transformation from fragmented, technically focused tools to integrated, lifecycle-oriented instruments challenges the conventional wisdom in project management literature, which suggests that incremental improvements are sufficient. Instead, it supports the need for comprehensive, systematic transformation to achieve superior project outcomes.

5. Conclusion

This research successfully identified and analyzed the specific factors causing delays in PT TLC's paper machine installation project and developed comprehensive project management interventions to address these challenges. The integrated master delay factor analysis revealed that Schedule Management, Communication Management, and Procurement Management were the most critical knowledge areas requiring immediate intervention, with systematic weaknesses identified across Work Breakdown Structure design, Critical Path Method implementation, and Gantt chart functionality.

The study's key findings demonstrate that the existing project management framework suffers from fundamental structural deficiencies, including the absence of hierarchical task decomposition, lack of critical path dependencies, insufficient integration of commissioning activities, and inadequate resource visibility. These deficiencies directly contributed to decision-making delays (4.44 problem score), schedule adaptation challenges (4.11), and resource shortage impacts (3.56), collectively accounting for the 4-week project delay and potential loss of the 22 billion rupiah tender opportunity.

The comprehensive improvement solutions developed through this research provide a systematic response to identified delay factors by implementing a four-tiered hierarchical WBS with formalized numbering and clear deliverable definitions, enhanced Critical Path Method incorporating end-to-end commissioning activities with

proper dependency mapping, and optimized Gantt charts featuring parallel scheduling, weekly time scales, and field-friendly execution logic. These integrated improvements address the technical, communication, and managerial factors identified in the conceptual framework, ensuring complete alignment with the PMBOK knowledge area principles.

The practical implications of this research extend beyond PT TLC's immediate project needs to provide valuable insights for similar industrial construction projects in Indonesia's manufacturing sector. The systematic application of PMBOK-based project management principles, combined with integrated tool improvements, offers a replicable framework for addressing project delays in complex industrial environments. The study demonstrates that comprehensive tool integration delivers superior results compared to isolated improvement approaches, challenging conventional project management practices that treat scheduling, scope, and resource management as separate domains.

For future research, this study establishes a foundation for investigating the long-term effectiveness of integrated project management interventions and their impact on organizational project management maturity. The methodological framework developed through this research can be adapted for similar studies in other industrial sectors. At the same time, the specific findings provide benchmarks for project performance improvement in Indonesia's paper industry. The research contributes to both a theoretical understanding of project delay mechanisms and practical knowledge for implementing effective project management solutions in emerging market industrial contexts.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to confidentiality agreements with PT TLC regarding proprietary project information and commercial sensitivity of the paper machine installation project details.

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The Role of Economic Globalization and Institutions on Regional Inequality in ASEAN Countries

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Abstract
The purpose of this study is to analyze the influence of economic and institutional globalization on regional inequality that occurs in ASEAN. Regional inequality in this study uses theil index and economic globalization in this study uses the KOF Globalization index. Meanwhile, from an institutional perspective, the corruption perception index and the policy quality index are used. This study also includes foreign investment, per capita income, and government spending on education. The model used in this study is panel data analysis using a fixed effect model for 8 ASEAN countries during 2012-2019. The results of the study found that economic globalization has a positive effect on regional inequality. From the institutional aspect, the corruption perception index has a significant positive relationship to regional inequality, while policy quality has a negative relationship to regional inequality. From the findings in this study, it is hoped that the governments of ASEAN countries can improve the regulatory quality, which encourages an increase in per capita income and equal distribution of education to reduce regional inequality.

Keywords: Economic Globalization, Institution, Regional Inequality

1. Introduction

ASEAN is one of the regions that has succeeded in achieving the fastest economic growth in the world, with an average economic growth of 4.94 percent from 2014-2019. ASEAN, which consists of ten member countries (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam) is also one of the most successful regional organizations in the world (Hew, 2006). ASEAN which is dominated by developing countries has the potential to become a developed region(Tonby et al., 2014), there are at least five factors that influence ASEAN to become a developed region, the five factors are economic strength where ASEAN countries which are emerging markets country has a large GDP and an increasingly productive workforce. Second, ASEAN has a diverse society, so it is not a monolithic or homogeneous market. Third, ASEAN has a huge market potential with a population of 661 million people in 2019. Fourth, it is geographically in a strategic location which is one of the world's largest economic and trade routes. Fifth, the investment value is very large and tends to increase.

Although ASEAN has great potential to become a developed region, each country has different roles and advantages, both competitive and comparative advantages. Behind the potential of ASEAN which has considerable economic strength, this cannot be separated from the problems faced by ASEAN countries. The main problems that occur in ASEAN are regional inequality, income inequality, human resources, institutions, infrastructure, and the unequal regional distribution mechanism (Chia, 2014).

Regional inequality is an important issue for ASEAN because it is related to one of ASEAN's goals, namely reducing regional disparities (Bangkok Declaration, 1967). The issue of regional inequality is a problem that occurs globally. Economic inequality is a major problem that occurs in a country, both in developed and developing countries, including those that occur in ASEAN countries. Regional inequality has always been a hotly debated issue because it is related to various aspects such as its relation to Education and Health (Zhang & Kanbur, 2009), industrial location, and regional inequality (Lall & Chakravorty, 2005) and regional inequality related to human capital and economic growth (Fleisher et al., 2010).

Regional inequality in ASEAN cannot be avoided as one of the negative impacts of massive economic integration in ASEAN. Economic integration has caused economic activity to become very open by narrowing economic barriers between countries in an economic area such as ASEAN. Economic integration has boosted trade efficiency, increased purchasing power, expanded the labor market, and facilitated investment flows and technology exchange. On the other hand, economic integration or economic globalization has a negative impact, which results in reduced government control because economic activity is more determined by market forces, thus exacerbating regional inequality.

Economic globalization is the process of integrating a country's economy into a larger economic system, both regionally and globally(Fakih, 2002). The form of economic globalization can be seen in the increasing openness of a country's economy to international economic activities so that economic globalization will lead to economic relations between countries that influence each other. The process of globalization tends to be driven more by global market forces so individual government control is fading. International trade activities will affect the economic growth of a country, because all countries compete in the international market (Todaro & Smith, 2006)

Economic globalization has a role in influencing regional inequality because it is one of the exogenous factors (Sjafrizal, 2012). This study is focused on analyzing the impact of economic globalization on regional inequality, especially in ASEAN. Empirically economic globalization and regional inequality have been investigated by (Ezcurra & del Villar, 2021; Ezcurra & Rodríguez-Pose, 2013; Lee et al., 2019). This study also focused on analyzing the role of institutions in regional inequality that had previously been investigated (Jong-Sung & Khagram, 2005; Kuncoro & Murbarani, 2016; Muštra & Škrabić, 2014; Syadullah et al., 2019). This article does not forget to include control variables from other economic aspects, namely education, investment, and per capita income as investigated by (Lessmann, 2013; Xu et al., 2021).

2. Literature

2.1 Economic Globalization and Regional Inequality

Since the late 1980s, globalization has become an important dimension of our daily lives. Regions have become more interconnected than ever before and global powers have become influential in national and regional development. Technology has played a more important role in economic development. Globalization, technological developments, and social change have inspired new thinking about regional development and inequality. The widely observed increase in inequality since the recent Global Financial Crisis has sparked renewed debate and widespread concern about inequality (Piketty & Saez, 2014; Stiglitz, 2012).

Research on regional inequality has been heavily influenced by economic development, development studies, and economic geography. The concept of development has been broadened to include income distribution, human development, quality of life, happiness, and increasingly sustainable development.

The globalization of economic activity has emerged as an important trend in the world economy. Several structural and technological forces have facilitated the globalization of production. The theory of industrial organization or market imperfection has attempted to explain the globalization of capital through technology, organizational structure, transaction costs, market power, and the rate of profit (Kojima, 1982). The company's relocation abroad is also facilitated by two technical conditions: the development of transportation and communications that reduce moving costs and increase travel efficiency, and changes in production technology and organization that make it possible to decipher complex production processes and perform with minimum labor skills.

The impact of globalization and global (*external*) forces on regional inequality is an important topic in the development literature. However, regions within countries face most of the challenges in adjusting to the new, increasingly dynamic world order. Some economists have observed trends in income convergence across countries(Sala-i-Martin & Barro, 1995) and have speculated on the convergence and homogenization of the world and the emergence of "global villages". Economists have also discussed the localization of global capital and the importance of local institutions and attributes in regional development(Amin & Thrift, 1995). Borders still affect regional inequality dynamics.

Research on global powers and regional development has mostly focused on foreign direct investment (FDI) and multinational corporations (MNEs) or transnational corporations (TNCs), although other factors such as international trade, financial institutions, and technological change are also considered. Multinational corporations have progressed through three stages of development (Malecki, 1991) extracting natural resources and primary products from developing countries, secondly the expansion of markets among large countries, and thirdly, recently, production moving overseas to other countries. Developing countries, often called the globalization of production, are accompanied by the globalization of finance, trade, and services and the formation of transnational enterprises and global production networks. A large amount of FDI has been found in the newly industrialized countries of Asia, especially China.

The penetration of global power and the globalization of production tends to lead to an increase in urban primacy and regional inequality in developing countries(Kasarda & Crenshaw, 1991). FDI tends to be located in large cities and core regions in developing countries, as these places have advantages in infrastructure, labor, and access to markets and political power, as evidenced by the concentration of FDI in coastal China (Huang & Wei, 2016). Transnational companies often have links to local economies, form their local production networks, and are referred to by some as pseudo-embeddedness (Wei et al., 2009). The spatial concentration of foreign capital tends to lead to a polarized urbanization process and strengthens the advantages of urban areas and regional inequality (Li & Wei, 2010). World cities or global cities have also emerged as major centers for the distribution and accumulation of international capital (Friedman & Schwartz, 1986). However, some economists argue that foreign investment has a little causal effect on regional inequality (Fuchs et al., 1987; Knox et al., 2014), largely due to state intervention and the spread of manufacturing investment in peripheral regions.

The literature is limited on the impact of other dimensions of globalization such as foreign trade and the diffusion of innovation on regional inequality. Foreign trade tends to benefit cities and regions with location and comparative advantages, such as port cities and coastal areas. However, some argue that, over time, the gap tends to decrease with the relocation of capital and industry to the periphery (Kim, 2008).

2.2 Institutional and Regional Inequality

Next is the relationship between the quality of government, the ability of local governments to control corruption, and regional inequality. Regarding the relationship between regional inequality and institutions, (Kyriacou et al., 2015) argue that regional inequality is of which is caused by the quality of government policies which ultimately leads to a decline in public trust. (Kyriacou et al., 2015) provide empirical evidence showing that regional inequality can lead to conflicts in the redistribution of resources, so policy improvements are needed as an effort to improve the quality of public policies and control corruption. Improving the quality of government policies can reduce income inequality.

Other literature also shows that the quality of government can affect positive changes in regional inequality. (Ezcurra & Rodríguez-Pose, 2013)argue that effective local development strategies and sound public policies can naturally attract foreign direct investment (FDI).

In another study, (Kyriacou et al., 2015) considered the direct impact of the quality of government policies on regional inequality. They found that better governance tends to directly reduce regional inequality, while (Ezcurra & Rodríguez-Pose, 2013) defines the quality of government policies can be seen from the press freedom index as an exogenous factor that shows a negative correlation to regional inequality. In contrast Ezcurra and Kyriacou, (Muštra & Škrabić, 2014) emphasize the role of institutions in reducing regional inequality, their approach is to look at the correlation between corruption, and the quality of government policy as exogenous factors that influence regional inequality.

3. Method

The object of research leads to the main focus of the research following the problems formulated. The object that is the focus of this research is formulated based on an empirical literature review so that the object of research consists of Regional Inequality as an affected variable, Economic Globalization, Corruption Perception Index, and Policy Quality as influencing variables, as well as Foreign Investment, Per capita Income, and Education as a control variable.

While the research subject leads to the locus which is the limitation of the study. This study tries to analyze economic globalization and regional inequality in ASEAN, officially ASEAN consists of 10 countries namely Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. However, about the object of research, especially regional inequality as measured by theil index, it cannot be done for countries that do not have subnational, namely Singapore and Brunei Darussalam, so the subject in this study, namely ASEAN, is limited to 8 countries, namely Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, and Vietnam with the period used is 2012-2019.

Data on research objects and subjects were collected from secondary sources, namely data obtained from various data-providing institutions. For regional inequality data, the processing is carried out to produce theil index concerning the formula below.

$$T_i = \sum_{j=1}^{J} p_j \log\left(\frac{\mu}{y_j}\right) \qquad (1)$$

Where T is theil index where the larger the value indicates the wider the level of regional inequality, y is GDP per capita, p is the population and u is the accumulation of GDP. Data on Policy Quality, GDP Per capita, Foreign Investment, and Education are sourced from the World Bank. Meanwhile, Corruption (*Corruption Perception Index)* was sourced from Transparency International, while Economic Globalization data, namely, KOF Index sourced from ETH Zurich. To identify the influence of economic and institutional globalization on regional inequality, the study will use panel data analysis consisting of 8 ASEAN countries as a cross-section and the period 2012-2019 as a time series.

Table 1: Description Variable

Variable	Definition	Measure	Source
Regional Inequality (RI)	The level of disparity that occurs between sub-nationals/provinces within each ASEAN country.	Enthropy Theil Index The greater the value, the higher the inequality	Global Datalab
Economic Globalization	The level of economic integration covering goods and services,	KOF EcG Index	ETH Zurich

Variable	Definition	Measure	Source
(EG)	finance and capital as well as the restrictions of each ASEAN country.	The bigger the value, the more globalization the economy	
Corruption (CPI)	The level of perception of corruption	CPI The larger the value, the lower the corruption	Transparency International
Regulatory Quality (RQ)	Quality or effectiveness of government policy	RQ The higher the quality of the policy, the better	World Bank
Income Percapita (GDPC)	The average income level of society in each ASEAN country.	GDP/Population	World Bank
Foreign Direct Investment (FDI)	Percentage of foreign investment to GDP of each ASEAN country.	FDI Net Inflow %GDP	World Bank
Education Budget (EDU)	The level of government spending on education	% to Government Spending	World Bank

The model in this study refers to the model developed by Ezcura & Pose (2013), Ezcurra & Villar (2021) which modified the control variable adjustments by referring to Lessmann (2013), Jong-Sung & Khagram (2005), Kuncoro & Murbarani (2016), Pose (2012), Lee et al. (2019), Mustra (2014) and Cheong & Wu (2013). So that the specifications of the model that are estimated and formulated in this study are as follows:

$$RI_{it} = \beta 0 + \beta 1 EG_{it} + \beta 2 CPCORRUPT_{it} + \beta 3 RQ_{it} + \beta 4 GDPC_{it} + \beta 5 FDI_{it} + \beta 6 EDU_{it} + \varepsilon_{it} \quad (2)$$

4. Result And Discussion

The purpose of this study is to analyze the role of economic and institutional globalization in overcoming the problem of inequality in ASEAN. The estimation results in this study are based on the previously formulated model. The estimation results are described in Table 2.

Table 2: Estimation Result

Variabel	Model 1 Fixed Effect Model		Model 2 Random Effect Model	
	Koefisien	Prob.	Koefisien	Prob.
C	-0.071690	0.7841	-0.095980	0.7416
ECGLOB	0.010478	0.0001***	0.009962	0.0001***
CORRUPT	0.008044	0.0002***	0.008202	0.0001***
FDI	0.001522	0.6154		
LOG(GDPC)	-0.061654	0.0543*	-0.057622	0.0660*
RQ	-0.126773	0.0005***	-0.124510	0.0004***
EDU	-0.004634	0.0409**	-0.003608	0.0935*
	Fixed Effects (Cross)		Random Effects (Cross)	
CAMBODIA--C	-0.138370		-0.099671	
INDONESIA--C	0.453624		0.448951	
LAO--C	-0.871540		-0.858535	
MALAYSIA--C	-0.071907		-0.070943	
MYANMAR--C	0.096704		0.106949	
PHILIPINES--C	0.126403		0.128735	
THAILAND--C	0.644101		0.571070	
VIETNAM--C	-0.239015		-0.226555	
R-squared	0.996415		0.392093	
Adjusted R-squared	0.995483		0.339687	

F-statistic	1068.941	7.481852
Prob(F-statistic)	0.000000	0.000018

* Significant in 10%
** Significant in 5%
***Significant in 1%

In analyzing panel data, we must choose the right method whether to use common effects, fixed effects, and random effects. The three models must be selected one model that fits certain criteria by performing several testing steps. The first is the Chow test which must be done to choose whether the suitable model to use is the fixed effect or common effect. After the Chow, the test has been carried out and the results have been selected for a fixed effect model, then it must be continued with the Hausman test to determine whether the best model that can be used in this study is fixed effect or random effect. Based on the results of the Chow test and Hausman test, the method chosen for model 1 in this study is a fixed effect model, while model 2 uses a random effect model.

Table 3: Chow Test

Model 1			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	772.435244	(7,50)	0.0000
Cross-section Chi-square	300.328961	7	0.0000
Model 2			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	809.371527	(7,51)	0.0000
Cross-section Chi-square	302.035455	7	0.0000

Table 4: Hausman Test

Model 1			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	156.025018	6	0.0000
Model 2			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	7.206580	5	0.2057

Countries that have a medium level of economic globalization such as ASEAN tend to have a wide level of regional inequality. Economic globalization in ASEAN has become increasingly open due to increased regional economic integration through the ASEAN economic community and increased trade and investment cooperation with ASEAN's main partners. Increased activity of economic globalization in ASEAN has proven to have positive benefits for each member country so that economic stability tends to be maintained, and the trend of foreign investment is increasing and increasing exports and imports. On the other hand, economic globalization in addition to providing aggregate benefits to the economies of each ASEAN country also gives rise to the emergence of losing and winning regions within each country. The winning regions can take advantage of the increasingly open economic globalization because they are supported by infrastructure, resources, and their competitive and comparative advantages. Meanwhile, the losing regions tend to have stagnant income because they are unable to take advantage of economic globalization activities due to certain limitations. This is what causes the increasingly open economic globalization that supports the occurrence of wider regional inequality so that in this case the increase in economic globalization in ASEAN has not been able to create an equitable distribution of economic development in each country. The findings in this study are in line with previous research conducted by (Ezcurra & del Villar, 2021; Ezcurra & Rodríguez-Pose, 2013; Lee et al., 2019; Xu et al., 2021) which confirmed that increasing economic globalization has contributed to the exacerbated regional disparities.

Corruption is a major problem for developing countries, including ASEAN countries, which is indicated by the value of the corruption perception index in almost all countries in the subject of this study, the value is less than 50 which indicates that ASEAN countries are classified as developing countries that tend to be corrupt. The practice of corruption in ASEAN countries has different characteristics following the pattern and system of government used. This study found interesting things about the ASEAN case, ideally an increase in the corruption

perception index which indicates a lower level of corruption should be able to cause a decrease in inequality or have a negative correlation as research conducted by Mustra who conducts research in Europe as a developed country. However, this study found different results, the corruption perception index has a positive relationship with regional inequality, this finding is in line with (Keneck-Massil et al., 2021) which analyzes the role of corruption on inequality in developed and developing countries. Kenefick explained that a low level of corruption can significantly increase inequality in developing countries due to unequal political power, as we know that ASEAN countries have different characteristics from developed countries such as Cambodia and Myanmar which tend to be authoritarian. Laos and Vietnam tend to be socialist, Indonesia and the Philippines are more democratic, and Thailand and Malaysia with a monarchical system. Besides Kenneck, a similar pattern was also found in research conducted (Iskandar, 2018) which explains the positive relationship between the corruption perception index and inequality in Indonesia.

Regional inequality is caused by the interaction between regions and market mechanisms. But from an institutional perspective, the government also has an intervention role by strengthening the quality of policies to reduce regional inequality so that it does not widen. Strengthening the quality of policies is very important to do in ASEAN to realize ASEAN's goals, especially to create equality or reduce inequality. The findings in this study are in line with (Kyriacou et al., 2015) who consider the direct impact of the quality of government policies on regional inequality and explain that better governance tends to reduce regional inequality directly, while Ezcurra and (Ezcurra & Rodríguez-Pose, 2013) defines that the quality of government policy can be seen from the index of press freedom as an exogenous factor that shows a negative correlation for regional inequality. In contrast Ezcurra and Kyriacou, (Muštra & krabić, 2014) emphasize the role of institutions in reducing regional inequality.

Per capita income in ASEAN countries has an increasing trend during the 2012-2019 research year. The increase in per capita income is one indication of an increase in community welfare and the achievement of development goals, as we know that the goal of development is ultimately to create an increase in people's welfare (people prosperity) and an increase in regional welfare (spatial prosperity). The negative relationship between per capita income and regional inequality in this study is in line with the findings (Lee et al., 2019), but has differences with (Ezcurra & Rodríguez-Pose, 2013; Kuncoro & Murbarani, 2016; Lessmann, 2013; Rodríguez-Pose, 2012), but if it is related to the conditions of ASEAN, these findings are more relevant and in line with ASEAN's goal number 1, namely accelerating economic growth, social progress, and cultural development in the region through joint efforts in the spirit of equality and partnership to strengthen the foundation for the community of nations. a prosperous and peaceful Southeast Asian nation.

Foreign investors in this study, especially in model 1, have not shown a significant effect on regional inequality. The assumption used is that such as economic globalization, foreign investment is also very closely related to the direction and system of government of each country which is different, such as Cambodia, Myanmar, Laos, and Vietnam which tend to have a socialist style, even though until now there has been the implementation of foreign policies that better, also has a different character from Indonesia, Thailand, and Malaysia which tend to be more aggressive in capturing foreign investment opportunities.

Inequality is indeed an important issue for ASEAN as an unavoidable impact of the development process. The problem is how to reduce regional inequality so that it is not too wide so that economic development can be more evenly distributed in each region in each ASEAN country. The solution to be able to reduce regional inequality can be through strengthening the quality of policies, equitable distribution of infrastructure, and others, but no less important is through education. An increase in education spending will encourage an increase in the quality of human resources and improve technology, so that in the long term if in terms of education there has been equity, it will encourage equitable distribution of income and reduce inequality, both individual inequality, and regional inequality.

5. Conclusion

Economic globalization has a positive influence on regional inequality in ASEAN, this finding is in line with the hypothesis and previous research where economic globalization on the one hand has considerable benefits for increasing the integration of member countries, resulting in accelerated economic growth, and increased import-export activities and increased foreign investment. This study found that the corruption perception index has a positive relationship with regional inequality. This is happening in ASEAN because it is motivated by differences in political power and the system of government applied in each ASEAN country. Foreign investment in this study does not have a significant effect on regional inequality in ASEAN. This indicates that foreign investment has not played a major role in overcoming the problem of regional inequality. The income per capita in this study has a negative relationship with regional inequality in ASEAN. Policy quality has a positive effect on regional inequality in ASEAN countries. Improved policy quality can encourage income distribution in the ASEAN region. Government spending on education has a negative relationship with regional inequality in ASEAN countries. An increase in education spending will encourage an increase in the quality of human resources and improve technology, it is expected to encourage equitable distribution of income and reduce regional inequality. From the findings in this study, it is hoped that the governments of ASEAN countries can improve the quality of policies, which encourage an increase in per capita income and equal distribution of education to reduce regional inequality. For further research, it is possible to develop a more comprehensive research model so that it can complete the discussion on this topic which is still rarely done. For example, by entering variables from regional characteristics, re-examining the relationship between corruption and its influence on inequality, or grouping research subjects based on categories of low, middle, and high-income countries.

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Towards Quota-based Fishery: Current Status and Future Needs of The Quota-Based Fisheries Management in Indonesia

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Abstract
Indonesia's capture fisheries sector plays a crucial role in economic growth, food security, and marine biodiversity conservation. To address challenges such as overfishing, illegal, unreported, and unregulated (IUU) fishing, and governance inefficiencies, the Indonesian government has introduced Quota-Based Fisheries Management (QBFM). This study examines the current status of fisheries management in Indonesia, evaluates the challenges in implementing QBFM, and proposes policy recommendations for improving governance, enforcement, and economic sustainability. Through qualitative interviews with key stakeholders, including government officials, fishers, and industry representatives, this research identifies overlapping authorities, digital infrastructure gaps, economic disparities, and environmental aspects as key obstacles to effective QBFM implementation. Findings suggest that stronger regulatory coordination and digital monitoring integration are essential to ensure sustainability and compliance. By addressing these challenges, this study contributes to the ongoing discourse on sustainable fisheries governance and the blue economy strategy in Indonesia.

Keywords: Quota-Based Fisheries Management, Marine Capture Fisheries, Sustainable Fisheries, Governance, Digital Transformation

1. Introduction

The sustainability of the ocean should be a priority for each party involved. This is related to Sustainable Development Goals (SDG) 14: Live Below Water, which aims to achieve conserve and sustainably use of the oceans, seas, and marine resources (United Nations, 2021a). Though the ocean has many benefits to humans, it is known that several issues change this ecosystem due to industry-scale fishing, offshore energy, the development of coastal, invasive species, and climate change (United Nations, 2021b). Fisheries are one of the activities that have a major impact on the sea ecosystem and are directly related to food security, so this sector needs to be well planned.

In recent years, as fish stocks have dwindled and the industry has been plagued by economic and social challenges, capture fisheries management has received general attention from the international community and governments

(Huang & Tang, 2019). One of the efforts that can be made to achieve marine and fisheries sustainability is to implement quota-based fisheries with an output approach. This regulation has become a trend due to several countries that are trying to develop and implement it, such as China, New Zealand, Iceland, Australia, and Indonesia (Sanchirico et al., 2005; Shen & Heino, 2014). China started to implement output control in 2017, which includes individual fishing quotas (IFQs), vessel catch limits, and total allowable catch (Yang, 2018). New Zealand started to implement QMS (Quality Management System) in 1906 that was regulating quotas for 17 inshore species and 9 offshore species (Bess, 2005). Meanwhile, for Indonesia, this type of regulation was implemented in January 2023.

In its implementation, quota-based fisheries management can cover many aspects, ranging from fishing areas (Morzaria-Luna et al., 2020), community groups (Rout et al., 2024), business entity groups (Hara et al., 2014), vessel and port management, and catch distribution (Aguión et al., 2022). In Indonesia, this regulation includes the division of areas based on zoning and quota types. The implementation of quota-based in several countries has shown an increase in sustainability, prevented IUU, and ensured a fairer distribution of fishery products (Arton et al., 2024; Jacobsen & Delaney, 2014; Nilsson et al., 2019). This is in line with the blue economy policy agenda. Despite the implementation, Indonesia's transition to QBFM faces several challenges. Many aspects of policy implementation, stakeholder adaptation, and technological readiness remain unclear. This study aims to analyze the current status of Indonesia's fisheries governance under QBFM, identify challenges, and propose policy recommendations for improving its effectiveness. By addressing these gaps, this research contributes to the sustainable transformation of Indonesia's fisheries sector.

2. Methods

2.1. Data collection

This research uses a qualitative method by conducting interviews with stakeholders related to the implementation of the Quota-Based Fisheries Management (QBFM) regulation. It is conducted to gather information from the representatives of the central government, local government, port authorities, fishermen, boat owners, and fishmongers. Key informants were selected using the purposive sampling method because by using this method, authors can select appropriate respondents who are directly involved with the case to provide insightful information and express their experiences thoughtfully and persuasively (Palinkas et al., 2013). Interviews were conducted using a semi-structured method that includes open-ended questions and follow-up inquiries that glean data from recent, pertinent literature on the subject (Jamshed, 2014). The interview lasted 45–60 minutes on average and was conducted both offline and online. Before the interview was recorded, important participants were informed about the subject and requested their permission.

2.2. *Data analysis*

The interview records were transcribed as references in data processing using NVivo. To find themes that surfaced from the qualitative data, the information was examined using thematic content analysis approaches. Because thematic content analysis is an independent qualitative descriptive approach that allows flexibility and simplicity of adjustment based on the study strategy, it was selected to analyze, produce, describe, and report rich and thorough data and themes inside a study (Nowell et al., 2017). We gave a thorough explanation of the current situation's background based on the themes that were chosen. The data triangulation method will be used to validate this study. This approach was chosen because it can lessen bias and increase the study's validity and credibility (Bans-Akutey & Tiimub, 2021). The interview data were used in this study, with additional information from news articles, statistical reports, and administrative guidelines. This approach will enable cross-validation and make it easier to investigate how quota-based fisheries policy might be implemented.

3. Result and Discussion

3.1. Current Status of Fisheries Management in Indonesia

The quota-based fishery is regulated in The Government Regulation of Indonesia Republic No. 11/2023 on Measurable Capture Fisheries. Measurable capture fisheries mean controllable and proportional fish harvesting executed in certain zones based on the predetermined capture quota to preserve fish resources, ensure sustainability, and realize equitable national economic growth. Fish quota signifies the fish resource allocations that can be utilized based on the resource's potential (President of The Republic of Indonesia, 2023). This regulation covers several scopes, including: (1) defining fishery area-based fishing zones (WPPNRI); (2) regulating quota sharing between industry, local fishers, and non-commercial sectors; (3) requiring fisheries business licenses and installation of vessel monitoring systems; (4) controlling the distribution of catches through authorized ports and fish transport rules; and (5) Set sanctions for violations of the quota-based fisheries system.

Quota-based control implemented for capturing fisheries in Indonesia is considered one of the efforts in realizing the blue-economy strategy. The establishment of this policy is based on the increase of fish catch production in 2022, which reached the amount of 1.5 million tonnes and contributed around 3.875 trillion rupiahs in Non-Tax State Revenues (PNBP). It is also predicted that in 2024, the fish harvest will reach 5 million tonnes, with the PNBP value reaching 14.554 trillion rupiahs. Based on this opportunity, followed by a comprehensive calculation of the sustainability of fish stocks and the ecosystem, the government initiated a quota-based fishing policy. It is designed to string together end-to-end business processes of capture fisheries by accurately quantifying potential stocks, allowable catch allocation, and catch quota (Ministry of Marine Affairs and Fisheries, 2022).

Before the implementation of this policy, The Ministry of Marine and Fisheries used an input control to regulate marine capture fisheries by limiting the number of ships, size of the ships, and fishing gear. By using this system, the barrier to entry is low so it is possible for a number of ships to get the required license. However, it causes a negative externality due to unlimited fish catch, overfishing, underreporting for ships, ship productivity manipulation, and low PNBP value. PNBP billing is requested before the catching operation begins based on the stock prediction, resulting in no control for the number of fish one boat can carry. This system can damage the marine ecosystem and loss of PNBP revenue. Meanwhile, using the new output control policy, the PNBP will be charged based on the mass of fish landed in the port according to the quota given previously for each boat. The bill will be adjusted based on the auction price, average price, or price set by the head of the port (Ministry of Marine Affairs and Fisheries, 2022).

3.2. Challenges in Implementing QBMF

The analysis presented in this section presents a comprehensive analysis of the themes identified from the coding process of the interviews with key informants. This analysis aims to find the main challenges in implementing QBFM in Indonesia.

3.2.1. Governance and Policy

QBFM is developed as one of the Blue Economy strategies in Indonesia namely expanding 30% of the conservation area, measurable capture fishery based on Fishery Management Area, developing sustainable aquaculture, sustainable management for coastal and small islands, and marine litter handling and management through The Ocean Love Month Program. This policy implementation in Indonesia is mainly regulated in The Government Regulation of Indonesia Republic No. 11/2023 on Measurable Capture Fisheries. However, there are also another five regulations related in order to support the implementation of this regulation. The related policy regulates resource (mainly fish) prices, logistics, production value, non-tax state revenue, and fishery organization.

Though all the regulation is established and acknowledged through different policies under different instances under the central and local government, there is barely any connectedness between the regulations. This condition creates overlapping or missing responsibilities in certain areas of work. For example, under the Directorate General of Capture Fisheries, the Directorate of Logistics manages the logistics and transportation along the chain. This distribution depends on fuel, contributing to 60-65% of the total logistic cost. However, the fuel regulation for fishery activities is not under the same ministry. To overcome this issue, The Logistic Directorate manages the route with the shortest distance and places several distribution centers along the route with high-capacity cold

storage. Another example is tackling Illegal, Unreported, and Unregulated (IUU) Fishing, where the taken resources are under the Ministry of Marine and Fishery. However, these illegal activities are handled under a different ministry, namely The Indonesian Sea and Cost Guard under The Ministry of Transportation.

Permit management is divided into two types of licensing: one is for the vessels under 30 GT using the local government permit, meanwhile for the vessels above 30 GT using the central government permit. This license also regulates the fishing zone, whereas the vessels with a capacity under 30 GT are only allowed to fish under 12 miles, and those above 30 GT have to fish above 12 miles. The challenge for this regulation is that several local fishers are using vessels with a capacity below 30 GT and harvesting the marine resources located above 12 miles. One of the actions taken by the central government to tackle this issue is by providing a "permit migration" where fishers who do activities above 12 miles but only have local permits can change to a central government permit. In any other condition where the fishermen refuse to migrate their permit, every catching activity above 12 miles is considered illegal.

3.2.2. Technical and operational challenges

The implementation of this policy is supported by an online application called e-PIT (electronic Perikanan Tangkap Terukur). Previously, several applications were used either to monitor or request permits. These application works on their own under different ministries, causing overlapping and no data center that collects and analyzes the data gained from the fishing activity. A fast network is required for the digital system and must be a priority to provide a real-time data report. The delay in the system can cause an error in the PNBP billing.

The implementation of e-PIT integrates upstream and downstream services of the capture fisheries sector into a unified system. This encompasses the entire process from the submission of Operational Standard Compliance, Sailing Approval Letters, e-logbooks, Arrival Reporting Certificates, and Self-Assessment Reports to the calculation of Non-Tax State Revenue from Fisheries Levies post-production.

Digital platforms are necessary to increase transparency and compliance (Rowan, 2023; Zeller et al., 2016). The implementation of this system necessitates robust infrastructural support, with high-speed internet connectivity being a priority. However, in reality, the digital infrastructure in certain regions remains inadequate. For example, digital scales, which are already internet-based and connected to the licensing system, sailing approvals, and even PNBP payment billing connected to finance. Therefore, ports are indeed required to have a ready internet network as it would greatly disrupt operations if not supported by this. Because everything is no longer manual (application-based), providing a fast internet network is a fundamental and mandatory requirement.

The aforementioned infrastructure needs can potentially create numerous investment opportunities, such as the construction of cold storage facilities, processing plants, procurement of high-technology vessels, shipyards, and fish-based industries. The government can focus on developing a particular location in stages before moving on to another area in order to create an environment that is conducive to investment. Furthermore, the banking industry can take part by making funds more easily accessible. For example, in Aceh Province, one of the most critical investments required is the downstream processing of fisheries, including the transformation of fish into value-added products such as frozen fish fillets, canned tuna, fish floss, and fish crackers. With proper planning, Indonesia can predict the business trends for the next 10-20 years based on the carrying capacity of available resources, fleet resources, issued permits, and investments that will be made toward the port, as all of these factors will have an impact.

3.2.3. Economic challenges

Economically, fisheries in Indonesia show a gap in the export sector. For fish export in 2023, Indonesia is still less competitive with the Netherlands, India, and Denmark (Trend Economy, 2023). This also happened to other commodities. For example, comparing shrimp export to Indonesia, the basic price of shrimp production in Ecuador is cheaper at $0.7 per kilogram, India is cheaper at $0.5 US dollars per kg, and Vietnam is cheaper at $0.3 US dollars per kg. The disparity in the competitiveness of Indonesian shrimp commodities against Ecuador, India, and

Vietnam was triggered by the average productivity of shrimp ponds in Indonesia, which is still low (Shrimp Insights, 2023). Indonesia is also an exporter of tuna, skipjack, and mackerel. However, on the other hand, Indonesia is also one of the largest importers of fishmeal.

In addition, there is also a national fish distribution gap. Areas that have large amounts of fish, namely the central and eastern regions of Indonesia, actually have low fish consumption values as well. This gap is because many of the fish that are caught in these areas are distributed directly to western Indonesia, which is the center of industry. It is also the basis for the implementation of the QFBM regulation where vessels must land fish in designated WPP areas. However, in practice, monitoring and control at sea is important because there is the potential for fishing vessels to transfer the catches to other vessels in the middle of the ocean.

For small-scale and local fishermen, one of the main obstacles to fishing is high operating costs, particularly gasoline expenditures. The well-being of the fishermen is also impacted by price fluctuation and market uncertainty. In order to incentivize fishermen to continue fishing, the government's role in maintaining market availability and price stability is crucial while adopting QBFM. With the regulation that fish must be landed at the designated port in the same area, fishers also have the opportunity to sell to the industry and open up opportunities for fish processing industries in the area.

3.2.4. Environmental concerns

One of the main reasons for environmental issues in Indonesian fisheries is IUU (illegal, unreported, and unregulated) fishing. This action not only harms marine biodiversity but also depletes fish stocks. To ensure that fish stocks are restored while balancing ecological and economic demands, quota systems that are both legally binding and supported by science must be established (Pascoe et al., 2020). This requires a reform in fisheries management. The implementation of QBFM is made more difficult by issues with the climate and regulations. Because traditional fishing patterns and habitats are disrupted by changing marine ecosystems and rising sea temperatures, Indonesia's fisheries are extremely sensitive to climate change. This climate vulnerability highlights the necessity for adaptable methods in fisheries governance. Consistent enforcement and high stakeholder compliance are much needed to ensure that the regulatory framework is matched and aligned with the reality on the ground, making it easier to achieve the fisheries management objectives.

4. Conclusion

Based on the analysis that shows the challenges in implementing Quota-Based Fishery Management (QBMF) in Indonesia, the most important thing that can be done is to strengthen governance and regulatory coordination with clear boundaries for each role and responsibility. This is supported by several studies that discuss how governance is important to encourage collective action based on sustainability goals to control all the activities in the fisheries value chain (Perez-Quesada & Hendricks, 2021; Zaga-Mendez et al., 2021). Harmonizing between central and local governments with clear roles will prevent overlapping authority. This can be done with a digital transformation that stakeholders can access. For fishermen and business actors, this platform can be a solution to ensure their rights and obligations. Meanwhile, for the central and local governments, this platform can be a way to improve enforcement and real-time monitoring to ensure that the entire fishing process takes place in accordance with applicable regulations.

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