

# How Companies Create Value Through Management Accounting Practices in the Era of the Covid Pandemic

*Cómo las empresas crean valor a través de prácticas de contabilidad de gestión en la era de la pandemia del COVID*

Dwi Puryati

STIE Ekuitas,

East Java – Indonesia, [dwi.puryati@ekuitas.ac.id](mailto:dwi.puryati@ekuitas.ac.id)

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## Abstract

**Purpose:** This study aims to explore Management Accounting Practices (MAPs) in Indonesia and the impact that Covid-19 had on them. It also aims to establish the factors that affected MPAs during the pandemic, and the effect that these practices had on business performance.

**Design/methodology:** Descriptive and verification methods were used. The former was employed to detail MAPs in manufacturing companies in Indonesia and the impact that the Covid-19 pandemic had on these practices. The verification method (using multiple linear regression) was employed to examine the factors that influence their MAPs and the effect of these practices on business performance. This study used primary data obtained from controllers who work for different Indonesian manufacturing companies. The total sample was composed of 41 questionnaire responses.

**Findings:** This paper shows that most manufacturing companies in Indonesia have adopted MAPs for cost systems, decision-making, business strategies, and advanced manufacturing technology. In general, these MAPs are at Stage 4 as defined by the IFAC. This means that, in Indonesia, MAPs are implemented to create value and maintain companies' sustainability in the era of Industry 4.0.

**Conclusions:** The pandemic increased the implementation of MAPs, which had a significant effect on the intensity of market competition and firm performance. The results of this study support Statement 1 on Management Accounting by the IFAC, according to which accounting practices in Stage 4 are focused on the effective use of organizational resources to create value.



**Originality:** This study focuses on manufacturing companies in Indonesia and the period of the Covid-19 pandemic, which brought about special conditions that impacted business operations. These results are in line with changes in the current business environment, and companies can consider them to create value and continuously improve their performance.

**Keywords:** intensity of market competition, management accounting practices, management accounting strategies, pandemic's influence, performance improvement, value creation.

**JEL classification:** L60, M41

### Highlights

- The Management Accounting Practices (MAPs) of manufacturing companies in Indonesia are in Stage 4 (focused on value creation) in the management accounting evolution model by the IFAC.
- The Covid-19 pandemic increased the implementation of MAPs by companies that wanted to survive.
- The implementation of MAPs significantly influences the intensity of market competition and has a significant effect on business performance.

### Resumen

**Objetivo:** este estudio busca explorar las Prácticas de Contabilidad de Gestión (PCG) en Indonesia y el impacto que el COVID-19 tuvo en ellas. También busca establecer los factores que afectaron las PCG durante la pandemia y el efecto que estas prácticas tuvieron sobre el desempeño empresarial.

**Diseño/metodología:** se utilizaron métodos descriptivos y de verificación. El primero se usó para describir las PCG en empresas manufactureras en Indonesia y el impacto que la pandemia del COVID-19 tuvo en estas prácticas. El método de verificación (usando regresión lineal múltiple) se empleó para examinar los factores que influyen sus PCG y el efecto de estas prácticas en el desempeño empresarial. Se utilizaron datos primarios obtenidos de directores financieros que trabajan para diferentes empresas manufactureras en Indonesia. La muestra total estuvo compuesta por 41 respuestas a un cuestionario.

**Resultados:** este trabajo muestra que las empresas manufactureras en Indonesia han adoptado PCG para sistemas de costeo, toma de decisiones, contabilidad estratégica de gestión y tecnología de producción avanzada. En general, estas PCG están en la Etapa 4, según la define la Federación Internacional de Contadores (IFAC, por sus siglas en inglés). Esto significa que, en Indonesia, las PCG se implementan para generar valor y mantener la sostenibilidad de las empresas en la era de la Industria 4.0.

**Conclusiones:** la pandemia incrementó la implementación de las PCG, lo cual tuvo un efecto significativo en la intensidad de la competencia y el desempeño empresarial. Los resultados de este estudio respaldan la Declaración 1 sobre contabilidad de gestión emitida por la IFAC, según la cual las prácticas en la Etapa 4 están enfocadas en el uso efectivo de recursos organizacionales para generar valor.

**Originalidad:** este estudio se enfoca en empresas manufactureras en Indonesia y el periodo de la pandemia del COVID-19, la cual trajo consigo condiciones especiales que tuvieron un impacto en las operaciones empresariales. Estos resultados están alineados con cambios en el ambiente empresarial

actual, y las empresas pueden considerarlos para generar valor y mejorar su desempeño continuamente.

**Palabras clave:** intensidad de la competencia, prácticas de contabilidad de gestión, estrategias de contabilidad de gestión, influencia de la pandemia, mejoramiento del desempeño, generación de valor.

**Clasificación JEL:** L60, M41

### *Highlights*

- Las Prácticas de Contabilidad de Gestión (PCG) de las empresas manufactureras en Indonesia están en la Etapa 4 (enfocada en generación de valor) en el modelo de evolución de la contabilidad de gestión de la IFAC.
- La pandemia del COVID-19 aumentó la implementación de PCG por parte de las compañías que deseaban sobrevivir.
- La implementación de PCG influye de forma significativa la intensidad de la competencia y estas prácticas tienen un efecto significativo en el desempeño empresarial.

## 1. INTRODUCTION

This study was motivated by the conditions of Industry 4.0—where uncertainty is increasing, business competition is intensifying, and technology is more advanced. As a result, companies have reconsidered existing organizational structures and strategies to better suit the changing environment. The dynamic conditions of Industry 4.0 have created new opportunities and vulnerabilities (Al-Banna et al., 2023) that should be managed and regulated to have a positive impact on business and society (Kagermann et al., 2013). This argument is supported by Mohd Nafi et al. (2019), who state that a shift in environmental conditions can cause changes in organizations and alter their Management Accounting Practices (MAPs). In addition, Secundo et al. (2018) claim that a company should be ready for and understand how competitive changes in the environment could lead to opportunities and challenges. Management strategies and management accounting innovation are the keys to success for companies in the digital era (Oncioiu, 2019; Waked et al., 2023). During the pandemic, many companies did not operate optimally, which affected their financial performance. Therefore, they should be able to adjust their strategies and MAPs so they can survive the pandemic and ensure business continuity (George & Pothiyadath, 2022).

According to Alam and Hossain (2021), and Pires et al. (2023) management accounting should adapt to the changing landscape in the milieu of global and institutional settings, focusing on the accounting profession. In the digital economy, the roles of management accounting and management accountants are changing, and some authors have predicted major trends in management accounting (Capusneanu et al., 2020). MAPs are recognized as necessary factors in a successful organization (Hongren et al., 2015; Qiu et al., 2023). An effective adoption of management accounting by manufacturing companies is a step they take to anticipate challenges regarding competition, changes, and costs to improve performance (Hongren et al., 2015). Management accounting practices and techniques can help the management (e.g., at manufacturing companies) to plan,

direct, and control their firms' operational activities through budgeting, cost systems, performance evaluation, strategic management, and information for decision-making—all of them could affect the achievement of optimal company performance (Adu Gyamfi & Chipwere, 2020). Obed (2016) argues that an efficient cost control system is integral to effective management accounting. This indicates that there is a relationship between MAPs and the performance of manufacturing companies.

Most companies in developing countries are more focused on using traditional MAPs than employing contemporary ones (Pham et al., 2020; Terdpapong et al., 2019). Traditional MAPs can be classified in Stages 1 (*Cost determination and financial control*) and 2 (*Information for management planning and control*) in the management accounting evolution model proposed by the International Federation of Accountants (IFAC) (Terdpapong et al., 2019). However, contemporary management accounting (for instance, activity-based management) has not been fully implemented in the balanced scorecard (Oyerogba, 2015).

Effective management accounting can competently scan business operations in the environment and provide the management with information that facilitates decision-making (Costa & Lucena, 2021), produces a competitive advantage, and captures the value of the company (Terdpapong et al., 2019). Companies that have a tendency to innovate can achieve better performance (Li et al., 2017). Larojan and Thevaruban (2014) hold that MAPs affect company performance. This argument is supported by the results found by Tuan Mat and Smith (2014) and Shahzadi et al. (2018). MAPs can be implemented in economic systems ranging from command economies to capitalist systems. In particular, Vietnam applied sustainable MAPs to boost its competitiveness during the transition from communism to capitalism (Nagirikandalage et al., 2020). In addition to external aspects, internal organizational factors—e.g., firm size, management commitment, Advanced Manufacturing Technology (AMT), and number of products—have been found to have a relationship with changes in management accounting. Tuan Mat and Smith (2014) in Malaysia, Pham et al. (2020) in Vietnam, and Amara and Benelifa (2017) in Tunisia agree on the idea that external environmental and organizational factors have a positive relationship with MAPs and a positive impact on organizational performance.

There has been limited research on MAPs in Indonesia during the Covid-19 pandemic. This study explores (1) how MAPs have anticipated changes in the business environment and manufacturing technology, (2) the impact of the Covid-19 pandemic on MAPs, and (3) factors affecting MAPs. It is hoped that the results of this study can be used to recommend MAPs in line with changes in the current business environment so that companies can create value and improve their sustainability. The difference between this study and previous research is that the object of study here is a group of manufacturing companies in Indonesia and the research period is the Covid-19 pandemic, which brought about special conditions that impacted the operation of these firms.

## 2. THEORETICAL FRAMEWORK

### Basic Framework for the Development of Management Accounting Practices According to International Federation of Accountant (IFAC) 1998

According to Statement 1 by the IFAC, MAPs can be classified into four stages (Rozaiunun et al., 2019), as follows:

1. Stage 1 (before 1950): Focused on costs and financial control. At this stage, MAPs are not completely independent and separate from financial accounting.
2. Stage 2 (1950–1965): Focused on providing information for decision-making using techniques such as standard costs, break-even accounting, and analysis of insureds. At this stage, accounting was far from what is considered financial accounting.
3. Stage 3 (1965–1985): Focused on reducing excess resources using mathematical tools such as multiple regression models and economic order quantity.
4. Stage 4 (1985–present): Focused on creating corporate value by using resources effectively. This stage is characterized by technical analyses of customer profitability, value-added analysis, just-in-time systems, the balanced scorecard, and strategic management accounting.

This basic framework will be used here to explore MAPs at manufacturing companies in Indonesia.

### **Institutional and stakeholder theories**

The management accounting process includes measuring, analyzing, and preparing reports on financial and non-financial information to support managerial decision-making and thus achieve company objectives (Hongren et al., 2015). This study uses two theories to analyze external and internal factors affecting management accounting and the relationship between MAPs and company performance.

#### ***Institutional theory***

This theory suggests that an enterprise's environmental, social, and economic performance is strongly influenced by the institutional environment in which it operates. This theory places the institution at the center of the analysis of organizational design and behavior. According to Berthod (2018), institutions consider specific beliefs, rules, and norms that shape the creation and dissemination of organizational forms, design features, and practices. Adhering to institutionalized rules is considered a means of gaining legitimacy, reducing uncertainty, and clarifying the actions and activities of the organization.

#### ***Stakeholder theory***

This theory holds that companies should involve their stakeholders to ensure sustainable performance and strengthen their relationships to secure a competitive advantage in the market (Abdullah et al., 2019). Freeman et al. (2010) state that this theory is the idea of how a business works. To be considered a successful business, a company must create value for all the stakeholders involved, such as customers, suppliers, employees, society, financiers, shareholders, banks, and other financial institutions. Nevertheless, managers should find out how the interests of customers, suppliers, communities, employees, and financiers can go in the same direction.

### **Management Accounting Practices (MAPs)**

As management accounting evolved, several studies on MAPs have been conducted in developing and transitional economies. Over time, authors that have investigated MAPs in multiple developing

countries have found similar results showing that businesses there mostly rely on traditional management accounting techniques as they are easier to apply, e.g., Oyerogba (2015) in Nigeria, Curdriorean (2017) in Romania, Terdpapong et al. (2019) in Thailand, Adu Gyamfi and Chipwere (2020) in Ghana, and Pham et al. (2020) in Vietnam. However, more than traditional MAPs are needed to provide the accounting information that is necessary nowadays. It is argued that traditional MAPs were too focused on the past and use outdated information (reports on transactions that have already taken place and not what is expected), which makes them too narrow and could mislead managers when they plan, evaluate, and make decisions. In addition, it is also argued that they neglect environmental issues, causing mismanagement decisions unsuitable for businesses in the context of the 21st century. Due to the current business environment, some contemporary MAPs have become more attractive for managers to apply them when conditions permit (Nagirikandalage et al., 2020). According to Tuan Mat and Smith (2014), the change from traditional to contemporary MAPs is driven by several factors: environmental uncertainty, structures, size, activities, market competition, technology, design, information complexity, and strategies. Therefore, manufacturing companies need to shift from traditional to more innovative MAPs, using the necessary tools to compete effectively in the 21st century.

### **Relationship between firm age and MAPs**

Shumway (2001) defined firm age as the number of years after a company was incorporated, even though some believe that listing age is a better indicator. Listing age is more economical since listing is a defining moment in the company's life. Majumdar (1997) investigated the impact of firm size and age on the performance of 1,020 Indian firms. Mature companies implement MAPs that are relatively complex to support increased performance. New companies are more conservative in the strategy they should adopt. Hence, company age significantly influences a firm's accounting practices. Armitage et al. (2016), who studied Small and Medium - Sized Enterprises (SMEs) in Canada and Australia, found that firm age is related to MAPs. In addition, Erserim (2012), in Turkey, found that firm age affects MAPs.

H1: There is a significant positive relationship between firm age and MAPs at Indonesian manufacturing firms.

### **Relationship between firm size and MAPs**

The size of an organization is a significant predictor of its structure. This means that, usually, the smaller the firm, the more simple and less sophisticated its accounting information system. Firm size is the essential factor in structural contingency, which explains and justifies the use of management control tools. Therefore, firm size influences MAPs. Abdel and Luther (2008) claim that firm size is a significant factor for MAPs. Pham et al. (2020) in Vietnam; Nair and Yee (2017), and Tuan Mat and Smith (2014) in Malaysia; and Ismail and Mahmoud (2012) in Egypt found a significant positive relationship between firm size and MAPs at manufacturing firms. Their studies also found that larger firms required more resources than SMEs to facilitate MAPs.

H2: There is a significant positive relationship between firm size and MAPs at Indonesian manufacturing firms.

### **Relationship between intensity of market competition and MAPs**

In this changing environment, markets have become more competitive, mainly in terms of higher quality and competitively priced products. Organizations may respond to this change by reorganizing their work processes, adopting an organizational design and strategies that are more customer-oriented. Pham et al. (2020) found a significant effect of the intensity of market competition on MAPs at Vietnamese manufacturing firms. More intense competition in a market is associated with increased managerial use of management accounting information. Previous studies on contingency (Hoque, 2011) suggest that today's firms need management accounting systems that can provide timely, accurate, and relevant information on various topics, including product costs, productivity, quality, customer service, customer satisfaction, and profitability. Said systems should be adapted or developed focusing on a particular company's value-added activities relative to its competitors.

H3: There is a significant positive relationship between intensity of market competition and MAPs at Indonesian manufacturing firms.

### **Relationship between Advanced Manufacturing Technology (AMT) and MAPs**

In order to compete in this environment, many companies have adopted Advanced Manufacturing Technology (AMT)—such as computer-integrated manufacturing and just-in-time systems (Baines & Langfield-Smith, 2003)—to increase quality, productivity, and flexibility and reduce costs. According to Shields (1997), competition, technologies, organizational design, and strategies are potential change drivers. Choe (2004) studied Korean manufacturing firms and found a significant positive relationship between their level of AMT and the amount of information produced by their management accounting systems. In Malaysia, Tuan Mat and Smith (2014) described a competitive environment where companies must adopt manufacturing technologies to reorganize their production processes and improve the quality of their products. For instance, these firms implemented Advanced Manufacturing Technology (AMT) to become more successful and manage resources more effectively. Nair and Yee (2017) found that AMT has a significant effect on MAPs.

H4: There is a significant positive relationship between AMT and MAPs at Indonesian manufacturing firms.

### **Relationship between MAPs and firm performance**

MAPs help organizations survive in our competitive, ever-changing world because they provide firms with an important competitive advantage, guiding managerial actions, motivating behaviors, and creating and supporting the cultural values that are necessary to achieve their strategic objectives (Gichaaga, 2014). MAPs play an important role in ensuring the efficient management of a firm and may also improve its performance. MAPs enable the management to obtain relevant information for meaningful decision-making (Alleyne & Weekes-Marshall, 2011). An effective adoption of MAPs by manufacturing companies is a step they take to anticipate challenges regarding competition, changes, and costs to improve their performance (Hongren et al., 2015). Pham et al. (2020), Shahzadi et al. (2018), Capusneanu et al. (2020), and Tuan Mat and Smith (2014) have found a significant positive relationship between AMT and MAPs.

H5: There is a significant positive relationship between MAPs and performance at Indonesian manufacturing firms.

### 3. METHODOLOGY

This study applied a quantitative method with an explanatory approach to investigate the implementation of MAPs by Indonesian manufacturing companies. It also adopted descriptive and associative methods. The descriptive method was used to explore MAPs at Indonesian manufacturing companies. The associative method was employed to analyze internal (i.e., firm size, firm age, and AMT indicators) and external factors (i.e., intensity of market competition) related to MAPs. Because the population had not been measured, the sample size in this study was based on remarks by Fraenkel et al. (2012), who claimed that, for correlational studies, the minimum number of samples is 30.

The data were collected by administering questionnaires to respondents in management positions (accounting/financial managers and company executives) at manufacturing companies in Indonesia. The design of the research instrument was based on six variables: (1) *MAPs*, measured as costing system, decision-making, business strategies, and AMT; (2) *firm age*, measured as the amount of time the company has been in operation; (3) *firm size*, measured as total assets; (4) *intensity of market competition*, measured as level of competition; (5) *AMT*, measured as the use of advanced technology in the production process; and (6) *firm performance*, measured as return on assets. The questionnaire was composed of survey statements that were rated by the participants on a Likert scale from 1 to 5. These statements represented the variables above, which were adopted from Ahmad (2014) and Sumkaew et al. (2014).

In this paper, validity was supported if the Pearson correlation coefficient was greater than or equal to 0.254 ( $r \geq 0.254$ ) and the validity test produced a Cronbach's alpha greater than 0.06.

Multiple linear regression was implemented after testing classical assumptions about the data. Said regression was also employed to analyze contingent factors that affect MAPs in Indonesia. The regression equation was the following (Equation 1):

$$\text{MAPs} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon, \quad (1)$$

Where:

MAPs : Management accounting practices

X1 : Firm age

X2 : Firm size

X3 : Intensity of market competition

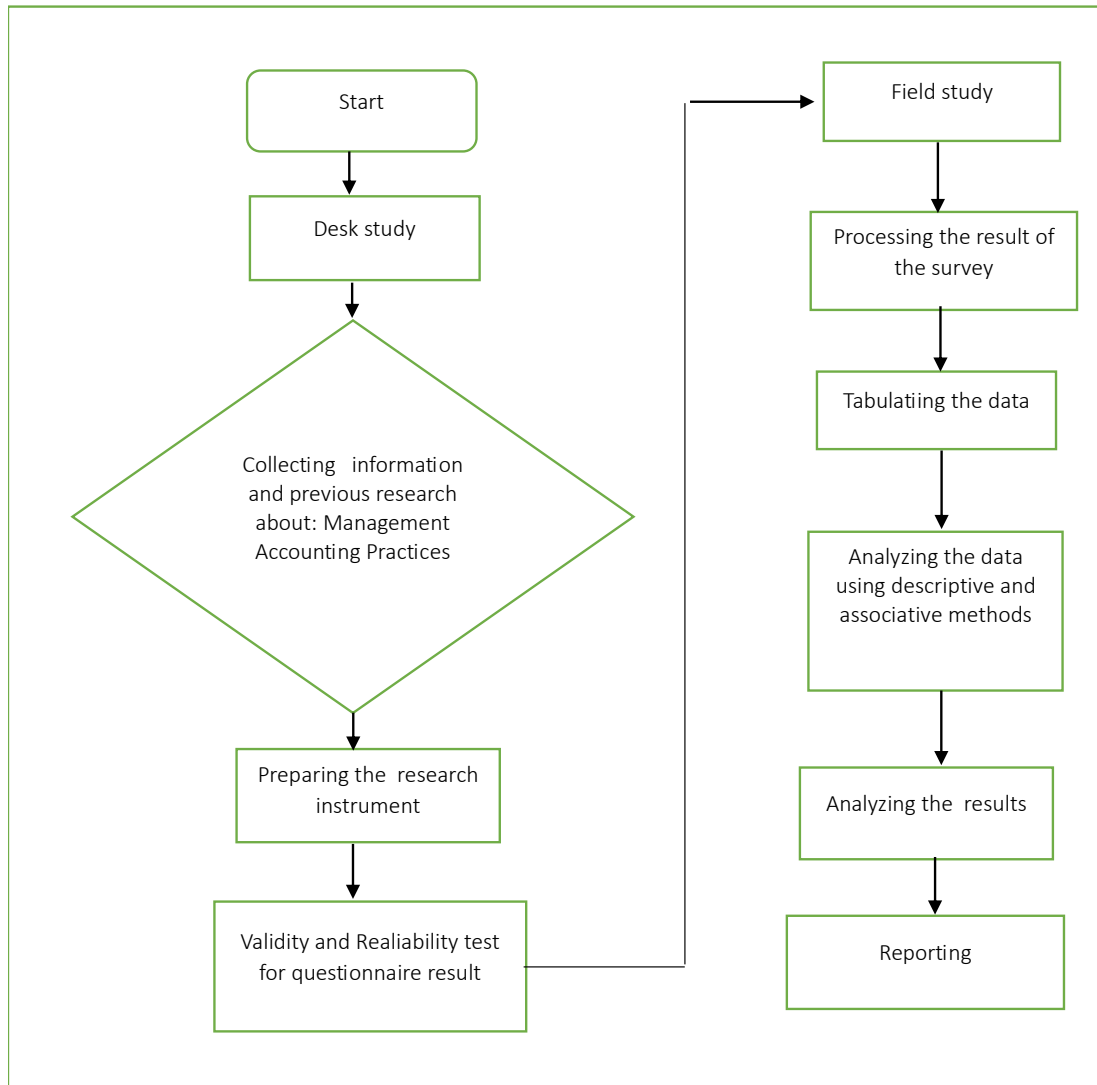
X4 : Advanced Manufacturing Technology (AMT)

$\beta_i$  : Coefficient

$\epsilon$  : Error

$$\text{PERFORMANCE} = \beta_0 + \beta_1 \text{MAPs}$$

The steps followed in this study to conduct Structural Equation Modeling (SEM) are detailed in Figure 1.



**Figure 1. Steps in the methodology followed in this study**

Figura 1. Pasos en la metodología aplicada en este estudio

Source: Own work.

## 4. RESULTS

### Respondent characteristics and research data

The research data was collected by distributing a questionnaire on Google Forms among the management of 125 manufacturing companies in Indonesia. A total of 41 responses were received. Tables 1 and 2 detail the characteristics of the respondents and their companies.

**Table 1. Respondent information**  
 Tabla 1. Datos de los encuestados

Criterion	Description	Number	%
Gender	Men	32	78%
	Women	9	22%
		41	100%
Age	20–30	1	3%
	30–40	37	90%
	40–50	1	2%
	> 50	2	5%
		41	100%
Educational attainment	High school completion	2	5%
	Bachelor's degree	12	29%
	Master's degree	19	46%
	Ph.D. degree	8	20%
		41	100%
Position at the firm	Operations management	2	5%
	Middle management	32	78%
	Top management	7	17%
		41	100%
Job tenure	< 2 years	10	24%
	3–5 years	4	10%
	6–8 years	19	46%
	> 8 year	8	20%
		41	100%

Source: Data processed by the author.

From Table 1, it can be concluded that the general characteristics of the respondents in this study are the following: mostly male respondents of working age (i.e., 30–40 years old) with a bachelor's degree who are in middle management and have worked for their companies for 6–8 years.

Table 2 shows that the largest percentage of companies sampled in this study are multinational or international firms with more than 1,000 employees that have operated for more than 10 years and have assets worth more than one billion rupiah.

### Instrument results

Validity and reliability tests showed that all the statements in the instrument (questionnaire) used here are valid, with a Pearson's  $r$  critical value greater than that in the table of critical values of  $r$  (i.e., 0.2543). As the validity test returned a Cronbach's alpha greater than 0.06, it was inferred that the variables were reliable.

**Table 2. Company characteristics**

Tabla 2. Datos de las empresas

Criterion	Description	Number	%
Firm size	Local	9	22%
	National	15	37%
	Multinational/international	17	41%
		41	100%
Number of employees	< 50	4	10%
	50–150	8	20%
	151–500	10	24%
	501–1000	0	0%
	> 1000	19	46%
	41	100%	
Firm age	< 3 years	1	2%
	3–5 years	4	10%
	6–10 years	6	15%
	> 10 years	30	73%
	41	100%	
Total assets	IDR < 100 million	4	10%
	IDR 100–500 million	9	22%
	IDR 501–1.000 million	4	10%
	IDR > 1 billion	24	58%
	41	100%	

Source: Data processed by the author.

### Management Accounting Practices (MAPs)

This study focuses on MAPs in manufacturing companies in Indonesia. To interpret how the firms in the sample implement management accounting, their MAPs were classified into four categories: costing system, information for decision-making, business strategies, and AMT (Terdpapong et al., 2019). Each category will be interpreted as being part of each of the four stages in the development model of management accounting proposed by the IFAC (1998). The IFAC used management accounting concepts to analyze the evolution and change in management accounting and identified four recognizable stages. Stage 1 focused on cost determination and financial control; Stage 2, on information for management planning and control; Stage 3, on the reduction of waste of resources in business processes; and Stage 4, on creation of value through effective resource use.

#### *MAPs for costing systems*

MAPs for costing systems can be classified into three categories: product costing, activity-based costing, and standard costing. Most firms in the sample have implemented product costing. This can be seen in the percentage of companies that have implemented a costing system: more than 80% (see Table 3). These results support the research by Adu Gyamfi and Chipwere (2020), Terdpapong et al. (2019), and Mehta and Bhojwani (2020). The management of these firms have clearly understood the importance of calculating the cost of the goods they produce for planning, controlling, and making decisions.

**Table 3. MAPs for costing systems**  
 Tabla 3. PCG para sistemas de costeo

No.	Description	IFAC stage	Percentage of use
1	Product costing	1	88
2	Activity-based costing	3	91
3	Standard costing and cost variance analysis	2	90

Source: Data processed by the author.

### *MAPs for decision-making*

MAPs for decision-making can be classified as five types of analyses: Cost-Volume-Profit (CVP), operating cash flow, profitability, product profitability, and consumer profitability analyses (which are listed in Table 4). Almost all the companies in the sample provide management accounting information about profitability as the basis for making company decisions. Furthermore, based on the profit obtained, they carry out comparative profit and profit analyses per product and per customer so that their decision-making process can be more precise and accurate. In addition, companies can also analyze their operational cash flow to ensure the continuity of their operations. The results of this study are in line with those reported by Oyerogba (2015).

**Table 4. MAPs for decision-making**  
 Tabla 4. PCG para la toma de decisiones

No.	Description	IFAC stage	Percentage of use
1	CVP analysis	2	88
2	Cash flow analysis	2	93
3	Profitability analysis	1	93
4	Product profitability analysis	2	93
5	Customer profitability analysis	4	90

Source: Data processed by the author.

### *MAPs for business strategies*

In this study, MAPs for business strategies were classified into ten types of activities, as presented in Table 5. Said table shows that two of them are classified in Stage 3, while the other eight are classified in Stage 4, which focuses on creation of value. Most companies in this study have implemented MAPs through business strategies, as can be seen in the table because the percentages of almost all the indicators are above 90% (except for just-in-time systems, with 80%). Existing Industry 4.0 literature holds that knowledge management and decision-making strategies are crucial factors for organizations (Abdullah et al., 2016). These results show that a vast majority of the firms in the sample apply MAPs for business strategies. Furthermore, the results of this study support previous research on this matter (Oyerogba, 2015; Shahzadi et al., 2018; Nartey & Van, 2021).

**Table 5. MAPs for business strategies**  
 Tabla 5. PCG para la estrategia empresarial

No.	Description	IFAC stage	Percentage of use
1	Value chain analysis	4	91
2	Competitive pricing analysis	4	93
3	Product development competition analysis	4	95
4	Promotion media competition analysis	4	95
5	Market share analysis	4	93
6	Product life cycle analysis	3	93
7	Total quality management	4	93
8	Activity-based management	4	93
9	Just-in-time systems	3	80
10	Target costing	4	95

Source: Data processed by the author.

### MAPs for AMT

MAPs for AMT were assessed in the form of eight indicators. The results show that most companies in the sample have implemented AMT to a good extent (see Table 6). These firms are already aware of the fact that, due to the development of IT and increasingly fierce competition, companies should transform their production processes. Environmental uncertainty, contingency theory, and external and internal factors affect MAPs (Shahzadi et al., 2018; Tuan Mat & Smith, 2014).

**Table 6. MAPs for AMT**  
 Tabla 6. PCG para tecnología de producción avanzada

No.	Description	IFAC Stage	Percentage of use
1	Robotics	4	68
2	Flexible Manufacturing System (FMS)	4	78
3	Computer-Aided Design (CAD)	4	71
4	Computer-Aided Engineering (CAE)	4	71
5	Computer-aided process planning	4	83
6	Testing machines	4	80
7	Computer-integrated manufacturing	4	71
8	Direct material control	4	81

Source: Data processed by the author.

### Impacts of the Covid-19 pandemic on MAPs

The evidence suggests that the Covid-19 pandemic changed the implementation of different types of MAPs—increasing or decreasing their utilization. Nevertheless, at some companies, the implementation of MAPs has not changed due to the pandemic. The results in Table 7—obtained from 41 questionnaire responses—detail the impact of the Covid-19 pandemic on MAPs for costing systems (shown as a percentages).

**Table 7. Impact of the Covid-19 pandemic on MAPs for costing systems**  
 Tabla 7. Impacto de la pandemia del COVID-19 en las PCG para sistemas de costeo

No.	Description	Decreased significantly	Decreased, not significantly	No change	Improved, not significantly	Improved significantly	Not doing it
1	Product costing	7%	5%	27%	22%	27%	12%
2	Activity-based costing	0%	2%	34%	32%	22%	10%
3	Standard costing	0%	2%	37%	29%	22%	10%

Source: Data processed by the author.

Table 7 shows that, during the pandemic, 27% - 37% of the companies in the sample did not change the systems they used to determine the cost of their goods. However, there was a significant increase in MAP implementation as well: 22% - 27%. Additionally, from 10% to 12% of the companies in the sample do not have a specific strategy to calculate the cost of their goods. Meanwhile, only a few companies presented a relative decline in the implementation of MAPs. Based on Table 7, manufacturing companies in Indonesia did not change their costing systems during the Covid-19 pandemic. Nevertheless, these firms are aware of the importance of MAPs for costing systems.

**Table 8. Impact of the Covid-19 pandemic on MAPs for decision-making**  
 Tabla 8. Impacto de la pandemia del COVID-19 en las PCG para la toma de decisiones

No.	Description	Decreased significantly	Decreased, not significantly	No change	Improved, not significantly	Improved significantly	Not doing it
1	CVP analysis	0%	7%	34%	13%	34%	12%
2	Operating cash flow analysis	12%	2%	10%	49%	20%	7%
3	Profitability analysis	9%	6%	14%	38%	26%	7%
4	Product profitability analysis	7%	2%	17%	35%	32%	7%
5	Customer profitability analysis	5%	9%	7%	30%	42%	7%

Source: Data processed by the author.

Regarding decision-making using management accounting information, 13% - 49% of the companies in this study saw a nonsignificant increase in accounting information use, whereas 20% - 42% experienced a significant increase attributed to the impact of the Covid-19 pandemic. Except for the CVP analysis, most firms experienced no changes in MAP implementation due to the pandemic. Moreover, 5% - 12% of companies witnessed a decrease in cash flow and profitability. Based on the information presented in Table 8, the impact of the pandemic on decision-making was, on average, high. The management of these firms should be able to make appropriate and quick decisions to anticipate changes in business processes resulting from the Covid-19 pandemic.

**Table 9. Impact of the Covid-19 pandemic on MAPs for business strategies**  
 Tabla 9. Impacto de la pandemia del COVID-19 en las PCG para la estrategia empresarial

No.	Description	Decreased Significantly	Decreased, not significantly	No Change	Improved, not significantly	Improved significantly	Not doing it
1	Value chain analysis	0%	2%	27%	34%	27%	10%
2	Competitive pricing analysis	7%	5%	22%	29%	27%	10%
3	Product development competition analysis	3%	7%	17%	22%	46%	5%
4	Promotion media competition analysis	2%	7%	10%	28%	48%	5%
5	Market share analysis	2%	7%	15%	32%	37%	7%
6	Product life cycle analysis	5%	2%	32%	37%	17%	7%
7	Total quality management	2%	7%	19%	34%	31%	7%
8	Activity-based management	2%	2%	22%	42%	25%	7%
9	Just-in-time systems	0%	10%	28%	22%	20%	20%
10	Target costing	2%	5%	22%	34%	32%	5%

Source: Data processed by the author.

As can be seen in Table 9, 10% - 32% of the companies in the sample did not experience changes in MAP implementation for their business strategies during the Covid-19 pandemic, while only 2% - 10% witnessed a decline. Additionally, 5% - 20% of the companies did not adopt MAPs in their business strategies during the pandemic. Undeniably, the Covid-19 pandemic played a key role in improving firms' strategies across all areas. Their management, indeed, was required to refine the business strategy to ensure continuity during these challenging times. Firms should be able to enhance and monitor the implementation of the various business strategies to align with the established plans.

**Table 10. Impact of the Covid-19 pandemic on MAPs for AMT**  
 Tabla 10. Impacto de la pandemia del COVID-19 en las PCG para tecnología de producción avanzada

No.	Description	Decreased Significantly	Decreased, not significantly	No change	Improved, not significantly	Improved significantly	Not doing it
1	Robotics	5%	5%	24%	22%	12%	32%
2	Flexible Manufacturing System (FMS)	2%	7%	17%	29%	24%	21%
3	Computer-Aided Design (CAD)	2%	5%	20%	24%	20%	29%
4	Computer-Aided Engineering (CAE)	2%	7%	17%	22%	24%	28%
5	Computer-aided process planning	2%	5%	22%	22%	32%	17%
6	Testing machines	0%	12%	17%	27%	24%	20%
7	Computer-integrated manufacturing	0%	12%	17%	27%	15%	29%
8	Direct material control	0%	10%	15%	24%	31%	20%

Source: Data processed by the author.

Table 10 shows that, on average, the companies in this study increased their implementation of MAPs for AMT during the Covid-19 pandemic. Notably, 12% - 32% of the companies experienced a

significant increase, with computer-aided process planning exhibiting the highest increase and the use of robotics in the production process seeing the smallest increase. A decline in the use of advanced technology was only observed in a few firms (2% - 12%). Also, many companies reported not to adopt MAPs for AMT. Since the pandemic imposed restrictions on activities, firms were compelled to reduce the use of human resources in direct production and opt instead for computer-based solutions. Additionally, 15% - 24% of the companies experienced no changes in the use of advanced technologies.

**Table 11. Impact of the Covid-19 pandemic on product performance**  
 Tabla 11. Impacto de la pandemia del COVID-19 en el desempeño de los productos

No.	Description	Decreased significantly	Decreased, not significantly	No change	Improved, not significantly	Improved significantly
1	Product delivery time	6%	16%	32%	22%	24%
2	Product quality	0	5%	23%	31%	41%
3	After-sales service	6%	6%	27%	27%	34%
4	Product design	0	2%	27%	39%	32%
5	Product distribution	0	8%	16%	21%	55%
6	Product uniqueness	0	0	26%	37%	37%

Source: Data processed by the author.

Concerning product performance—which was measured using six indicators—Table 11 reports that 21% - 55% of the companies in the sample showed an increase in product performance, 16% - 32% exhibited no changes, and only 6% - 16% experienced a decrease. From this, it is clear that the Covid-19 pandemic had a positive impact on product performance.

**Table 12. Impact of the Covid-19 pandemic on financial performance**  
 Tabla 12. Impacto de la pandemia del COVID-19 en el desempeño de las empresas

No.	Description	Decreased significantly	Decreased, not significantly	No change	Improved, not significantly	Improved significantly
1	Net profit	9%	7%	20%	38%	26%
2	Sales growth	9%	12%	14%	33%	32%
3	Return on assets	9%	9%	34%	26%	22%
4	Operating cash flow	9%	12%	22%	33%	24%

Source: Data processed by the author.

In this study, firms’ financial performance was measured using indicators such as net profit, sales growth, return on assets, and operating cash flow. As observed in Table 12, 22% - 38% of the companies in the sample increased their financial performance during the Covid-19 pandemic, with the highest changes and improvements reported in sales growth. Meanwhile, 14% - 34% of the companies did not report a change in their financial performance. Notably, the most stable indicator was return on assets. Decline in financial performance was only observed in a few companies, with the most significant decline observed in operating cash flow.

## Results of the regression analysis and hypothesis test

### *Classical assumption test*

Prior to the regression analysis, a classical assumption test was conducted, yielding the following results:

1. The Kolmogorov–Smirnov Test yielded an Asymp.Sig. (2-tailed) value of 0.200. Since this value is greater than 0.05, it can be concluded that the data used in this research is normally distributed.
2. The collinearity test revealed tolerance values above 0.10 for all variables, along with Variance Inflation Factor (VIF) values below 10, suggesting the absence of multicollinearity between the independent variables considered in this study.
3. The results of the heteroskedasticity test demonstrated that data points were scattered both above and below point 0 (zero) on the Y axis, forming a no discernible or irregular pattern. Consequently, it can be inferred that the data employed in this study did not exhibit heteroskedasticity.

### *Regression analysis*

Table 13 presents the results of the regression analysis conducted in this study.

**Table 13. Results of the regression analysis**  
Tabla 13. Resultados de la prueba de regresión

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	
	B	Std. error	Beta			
	(Constant)	2.506	.699			
1	X01	.125	.138	.169	.908	.370
	X02	-.089	.095	-.170	-.935	.356
	X03	.284	.107	.422	2.659	.012
	X04	.074	.173	.070	.427	.672

Source: Software output.

From the results obtained for the unstandardized coefficients (B), it is possible to derive the following equation:  $Y = 2.506 + 0.125 X_1 - 0.089 X_2 + 0.284 X_3 + 0.074 X_4 + \epsilon$ .

### **Hypothesis Test Result- Variables Affect MAPs**

Based on the information presented in Table 13, specifically in the “Sig.” column, the following conclusions can be drawn regarding the hypothesis test:

1. Since the significance value for variables X01, X02, and X04 is greater than 0.05, the null hypothesis (H0) is supported. Therefore, it can be concluded that X01, X02, and X04 have no significant effect on Y.
2. Since the significance value for variable X03 is less than 0.05 ( $0.012 < 0.05$ ), the null hypothesis (H0) is rejected. Consequently, it can be inferred that X03 has a significant effect on Y.

**Table 14. F-test results- MAPs**  
 Tabla 14. Resultados de la prueba F – PCG

ANOVA <sup>a</sup>						
	Model	Sum of squares	df	Mean square	F	Sig.
1	Regression	3.086	4	.771	2.767	.042 <sup>b</sup>
	Residual	10.036	36	.279		
	Total	13.122	40			
a. Dependent variable: Y						
b. Predictors: (Constant), X04, X02, X03, X01						
Source: Software output.						

As observed in Table 14, the significance value is below 0.05 ( $0.042 < 0.05$ ), which confirms the model’s fitness.

**Determination coefficient test**

Table 15 shows the results of the determination coefficient test. As can be seen, R-squared is 0.235, which suggests that MAPs were influenced by variables X01, X02, X03, and X04 by 23.5%, while the remaining 76.5% are influenced by other variables not addressed in this study.

**Table 15. Results of the determination coefficient test**  
 Tabla 15. Resultados de la prueba del coeficiente de determinación

Model summary <sup>b</sup>					
Model	R	R-squared	Adjusted R-squared	Std. error of the estimate	Durbin–Watson statistic
1	.485 <sup>a</sup>	.235	.150	.52800	2.130
a. Predictors: (Constant), X04, X02, X03, X01					
b. Dependent variable: Y					
Source: Software output and data processed by the author.					

**Hypothesis Test Result MAPs-Performance**

As can be seen in Table 16, the significance value is below 0.05 ( $0.000 < 0.05$ ), which confirms the model’s fitness.

**Table 16. F-test results (MAPs–performance)**  
 Tabla 16. Resultados de la prueba F (PCG–desempeño)

ANOVA <sup>a</sup>						
	Model	Sum of squares	df	Mean square	F	Sig.
1	Regression	4.701	1	4.701	22.153	.000 <sup>b</sup>
	Residual	8.275	39	.212		
	Total	12.976	40			
a. Dependent variable: Y						
b. Predictors: (Constant), X						
Source: Software output.						

Furthermore, since the hypothesis test yielded a value below 0.05 ( $0.000 < 0.05$ ), the null hypothesis ( $H_0$ ) is rejected. Therefore, it can be concluded that MAPs have a significant effect on firm performance (see values in Table 17).

**Table 17. Results of the hypothesis test (MAPs–performance)**  
 Tabla 17. Resultados de la prueba de hipótesis (PCG–desempeño)

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	
	B	Std. error	Beta			
1	(Constant)	1.543	.532		2.899	.006
	X	.599	.127	.602	4.707	.000

Source: Software output.

## 5. DISCUSSION

### MAPs in Indonesia

According to the findings, all the companies sampled in this study have adopted a MAP known as strategic costing, specifically costing systems. This involves the use of strategy, costs, and market-oriented data to prioritize and develop strategies that can provide a competitive advantage on an ongoing basis. As a result of strategic costing, accounting information now plays a big part in the strategic decision-making process. In addition, research indicates that strategic costing improves firm performance. The more effectively an organization implements strategic costing, the better its overall performance (Mbawuni & Anertey, 2014). In the face of an unpredictable environment, the accounting information generated by strategic costing helps companies make strategic decisions. This is consistent with the contingency theory, which stresses the importance of defining how strategic management accounting techniques can be influenced by the suitability between environmental and organizational factors. Strategic costing—categorized as a strategic management accounting technique—has proven to help companies in enhancing organizational performance (Aksoylu & Aykan, 2008).

Furthermore, the results revealed that activity-based costing, known for its greater precision in calculating the cost of goods produced when compared to traditional methods, was the most prevalent technique in terms of costing systems. It was found to be adopted by 91% of the companies in the sample. This demonstrates that the firms' management believes that costing system techniques, such as activity-based costing, can be used as tools for improving the performance of their business or organization. This finding is in line with that of Nartey and Van (2021). In addition, the accounting information generated by strategic costing can aid companies in making strategic decisions, particularly in the face of uncertain environments such as the Covid-19 pandemic.

In general, this study's findings align with those of Adu Gyamfi and Chipwere (2020) in Ghana, which showed that MAPs are implemented through a costing system. From the data presented in Table 3, it is clear that the companies in the sample have implemented MAPs through a costing system to a good extent. Notably, such implementation was found to be superior to that of companies in Thailand, as reported by Terdpapong et al. (2019).

Regarding the adoption of MAPs for decision-making, these were found to be implemented by over 80% of the companies in the sample and included activities such as CVP analysis, cash flow analysis, and profitability analysis per customer and per product. This underscores firms' awareness of the importance of management accounting information in decision-making (Curdriorean, 2017). To facilitate profit planning, CVP analysis is often employed to determine a company's break-even point and the sales target needed to achieve the targeted profit (Zyznarska-Dworczak, 2018). In this study, the majority of companies performed a CVP analysis, with the results supporting those of Oyerogba (2015). Importantly, firms should conduct operating cash flow analyses to make informed decisions regarding cash receipts and expenditures from operational activities, thus ensuring the continuity of their operations.

Profitability analysis encompassed a general analysis, as well as per-product and per-customer analyses. Conducting a profitability analysis on a per-product and per-customer level is crucial for deciding the best course of action in the event of a decrease in profit per product and customer. In this study, MAPs related to the business strategy focused on Stage 4 (creation of value) of the IFAC. According to the results, the majority of companies in the sample have implemented MAPs in their business strategies, as the percentages of almost all the indicators were above 90% (except for just-in-time systems, with 80%). As reported by Aksoylu and Aykan (2008), strategic costing can be categorized into five dimensions: activity-based costing, value chain costing, quality costing, life-cycle costing, and target costing. Importantly, strategic costing is one of the strategic management accounting techniques that can help companies improve their performance.

According to Oyewo et al. (2021), in order for organizations to survive in the contemporary business environment, they must focus on customers and competitors while considering the implementation of MAPs. Companies should strategically adopt MAPs in the context of market competition, competitive strategy, advanced management technology, total quality management, and just-in-time systems. In theory, innovation in distribution channels is crucial to improving the performance and effectiveness of these channels, which, in turn, has an immediate positive impact on firm performance.

Moreover, companies need to be able to implement a competitive business strategy to thrive in an increasingly competitive and technologically evolving business environment. In this regard, Secundo et al. (2018) emphasize the need for firms to understand how their business strategy must evolve as a result of an increasingly competitive environment, which presents both new opportunities and challenges. In addition, Oncioiu (2019) states that companies need to develop management strategies and management accounting innovations to survive in the digital era.

In this study, the adoption of MAPs in AMT was assessed using eight indicators. The results showed that the majority of the companies in the sample have implemented these technologies. These firms are, indeed, aware of the fact that, due to the development of IT and increasingly fierce competition, companies should transform their production processes. In this respect, Amara and Benelifa (2017) claim that MAPs should be able to anticipate changes in the external and internal environment. Likewise, Tuan Mat and Smith (2014) hold that contemporary MAPs, such as AMT, activity-based costing, computer-aided design, computer-aided manufacturing, and robotics, are being employed to cope with changes in the environment.

## Impacts of the Covid-19 pandemic on MAPs

The Covid-19 pandemic had a tremendous impact on the global economy and affected countries. Strong nations feeling the effects of the pandemic included Singapore, South Korea, Japan, the United States, New Zealand, the United Kingdom, and France. In Indonesia, for instance, the national economy contracted by 5.32% (Junaedi & Salistia, 2020) over two consecutive quarters. As reported by Rababah et al. (2020), small- and medium-sized companies were the most affected by this pandemic, and severely impacted areas and industries experienced a decline in financial performance.

According to this study's results, as outlined in Tables 7 to 10, the Covid-19 pandemic had an impact on companies' implementation of MAPs. This impact varied across all dimensions of these practices, ranging from nonsignificant to significant. Additionally, the pandemic's impact could also manifest as no change in the researched dimensions.

Based on the findings, companies were required to maintain their attained performance and continue to implement existing MAPs to survive the pandemic. A management accounting information system is essential to facilitating coordination, as it includes target specifications that illustrate the influence of segment interactions and provides information on decisions that affect the operations of all organizational sub-units. This system is designed to produce outputs using inputs and process them to achieve management-specific goals. As indicated by Rozaiunun et al. (2019), management accounting serves two main objectives: furnishing information essential for calculating service and product costs, and providing useful information for decision-making, including planning and control.

Thus, it is expected a management accounting information system is influenced by the locus of control held by companies' leadership. A company's success is contingent upon its locus of control for addressing internal issues. This success is further facilitated by the effective use of the management accounting information system, coupled with business actors' ability to exert self-control. In a highly competitive environment, company leaders must be able to motivate and help employees to perform at their best in order for the company to survive. They must also leverage their scientific competencies for the company's benefit. In fact, company leaders play a key role in mobilizing others toward achieving the company's goals.

Clearly, management accounting information systems have an impact on firm performance. However, during the Covid-19 pandemic, many firms did not adopt MAPs in the context of AMT. According to the results of this study, the use of robots was the least implemented practice, whereas computer-aided process planning was the most implemented one. Notably, the most significant improvement was observed in the implementation of computer-aided process planning. Currently, changes in the use of advanced technology are driven by human resource factors and cost-benefit considerations.

In this study, the Covid-19 pandemic was found to positively impact product performance. The manufacturing companies in the sample, for instance, sought to improve product performance by implementing MAPs, particularly through an activity-based management strategy. The aim was to create corporate value through effective activity management, ultimately leading to increased customer satisfaction. Customer satisfaction can be enhanced through timely product delivery, high

product quality, after-sales service, attractive product design, efficient product distribution, and product uniqueness. As argued by Poister (2010), in order to make strategies more meaningful in the future, strategic planning should evolve to a broader process of strategic management. This involves managing an company's overall strategic agenda continuously rather than sporadically, as well as ensuring that strategies are implemented effectively. Ansoff et al. (2018), for their part, state that successful firms often discern a unique strategy. To increase efficiency, firms must create or incorporate aspects such as advantages, types, times, and locations into their financial analysis to identify shortcomings and achievements over a specific period. The results of this analysis are then reflected in the company's financial statements, which provide valuable insights into its financial position. A company's financial performance is assessed by the management in order to fulfill their obligations to the owners and to achieve the company's goals (Robinson, 2020). Financial performance appraisal can be used as a decision-making tool.

As indicated in Table 15, the financial performance of most companies in the sample showed an improvement during the Covid-19 pandemic. In this study, financial performance was measured using indicators such as operating profit, sales growth, return on assets, and operating cash flow. A decline in financial performance was only observed in a few companies, with the most substantial decrease observed in operating cash flow. This finding is supported by the research conducted by Rababah et al. (2020). Also, the research of Amalia et al. (2021) suggests that the Covid-19 pandemic had no significant impact on companies' ability to generate profits from their assets (return on assets). Additionally, it was reported not to have a significant impact on health care companies' effectiveness in using all assets for sales and profit generation. The profitability ratio serves as an indicator of a company's ability to generate profit.

A higher profitability implies a larger profit margin and a lower probability of bankruptcy (Shumway, 2001). This is due to the strong relationship between the profitability ratio and bankruptcy. A decrease in return on equity indicates a decline in management's effectiveness in leveraging existing resources to generate profits. This downturn is also influenced by external factors, namely the impact of the Covid-19 pandemic. The consumer goods industry in Indonesia, for instance, crucial for everyday life and requiring a fast financial turnover, experienced a growth of 5.02 percent in the first quarter of 2019 and a decline in growth of 2.83 percent in the first quarter of 2020 (Ministry of Industry of the Republic of Indonesia, 2020). In this study, both industries exhibited a decline in growth. As can be observed from the data, the distribution of net profit to total assets decreased during the pandemic compared to the previous year, resulting in a decline in return on assets. This decline can be attributed to pandemic-related challenges, such as project delays, reduced demand for consumer goods, and difficulties in supervising projects due to regional restrictions. According to the empirical results reported by Esomar and Christianty (2021), no significant differences in liquidity and market ratios were observed between the periods before and after the first recorded Covid-19 case in Indonesia. Nonetheless, significant differences were observed in the solvability and profitability ratios between the two periods.

As stated by Oyewo (2021), the existence of management accounting units or departments plays a pivotal role in improving the realization of existing benefits when applying contemporary MAPs. These practices are not only influenced by variables related to the company's strategy, such as competitors and customers, but also by compelling institutional factors. To survive in the contemporary business environment, companies should consider customers and competitors in their

management accounting activities. Also, organizations may need to establish functions responsible for sustainable environmental scanning, intelligence gathering, and market research in addition to focusing on competitor activities, customer preferences, and externally oriented market sentiment (Oyewo, 2021). Shahzadi et al. (2018) revealed the primary aspects of uncertainty affecting an organization's structure are uncertainty in environmental conditions, advanced production technologies, just-in-time strategies, and integrated quality management. Their findings also revealed that MAPs affect all processes and transform all systems, from simple to complex, in the Pakistani industry.

### Factors affecting MAPs

This study's findings show that variables such as firm age, firm size, and the use of AMT have no significant effect on MAPs at manufacturing companies in Indonesia. The only variable that was found to have a notable effect on these practices was intensity of market competition. According to Armitage et al. (2016), three key factors—perceived decision-usefulness, the complexity of the operating environment, and firm age—influence the adoption of MAPs. Likewise, Oyerogba (2015) hold that MAPs are influenced by several factors, including company structure, human resources, competition, technological progress, infrastructure, regulatory framework, and availability of materials.

As mentioned above, firm age was not found to have a significant effect on MAPs. This is due to the fact that the companies sampled in this study have mostly implemented MAPs at stages 3 and 4, with the majority being in operation for more than ten years. This suggests that, given the long time that these companies have been in operation, there has been an increased awareness of the importance of MAPs in supporting strategic and operational activities. Firm age is, thus, deemed irrelevant when choosing management accounting techniques (Abdullah et al., 2016), which contradicts the findings of Dabor (2017), who found a significant correlation between firm age and efficient MAPs.

Regarding firm size, which was here measured by the number of assets, the results of the hypothesis test revealed that it had no significant effect on MAPs. This demonstrates the management's high commitment to implement MAPs, regardless of the assets that they must manage. They, indeed, recognize that, as a key agents, they must optimize the principal business through the application of MAPs. This result runs counter to the studies by Oyerogba (2015) and Pham et al. (2020), which claim that firm size is a significant factor influencing the choice of MAPs. Larger companies have more adequate MAPs than smaller ones.

Furthermore, the results of the hypothesis test indicate that intensity of market competition has a significant effect on MAPs. To survive and thrive in the business world, companies must adapt their MAPs in response to changes in the business environment, which is characterized by intense competition. The firms' management recognizes that companies that do not make changes cannot survive in a competitive business environment. This result aligns with previous research by Pham et al. (2020), Shahzadi et al. (2018), Tuan Mat and Smith (2014), and Amara and Benelifa (2017), which reported that intensity of market competition is positively and significantly correlated with MAPs. It, however, contradicts the findings of Shahzadi et al. (2018), who stated that intensity of market competition does not explain companies' improvement in MAPs.

Finally, the use of AMT was not found to have a significant effect on MAPs. Since companies are aware that the advanced technology brought globalization and digitalization will alter the cost structure, MAPs should be designed to support such technological advances rather than resist innovative processes and technologies (Abdel & Luther, 2008). Changes in the economic environment, indeed, force companies to adapt their business management systems by incorporating AMT.

### **Impacts of MAPs on firm performance**

According to the results of the hypothesis test, MAPs have a significant effect on companies' financial performance. Particularly, the adoption of MAPs in costing systems, decision-making, business strategies, and AMT was found to have a positive impact on companies' financial performance. These results support those of the studies by Shahzadi et al. (2018), Adu Gyamfi and Chipwere (2020), Larojan and Thevaruban (2014), Abdullah (2020), and Mehta and Bhojwani (2020).

## **6. CONCLUSIONS**

This study's results revealed that manufacturing companies in Indonesia have effectively adopted MAPs in cost systems, decision-making, business strategies, and AMT. Regarding cost systems, MAPs included product costing, activity-based costing, and standard costing. In terms of decision-making, MAPs were assessed using five indicators: CVP analysis, operating cash flow, profitability analysis, product profitability analysis, and customer profitability analysis. Concerning business strategies, MAPs were measured using ten indicators, with eight aligning with Stage 4 (creation of value) of the IFAC. Finally, for AMT, MAPs were assessed using eight indicators. Notably, the majority of companies in this study were found to implement AMTs, placing them in a suitable category.

According to the IFAC, MAPs in Indonesia are at stage 4, which means that they are implemented to create value and maintain companies' sustainability in the era of Industry 4.0. Based on the results, the Covid-19 pandemic increased the implementation of MAPs, which, in turn, had an effect on firm performance. Also, intensity of market competition was found to significantly influence the adoption of MAPs. Firm age, firm size, and AMT, for their part, had no significant effect on MAPs in Indonesia.

Importantly, this study showed that MAPs exert a significant effect on firm performance. This study's results can be used to recommend MAPs in line with changes in the current business environment so that companies can create value and improve their performance continuously.

### **CONFLICTS OF INTEREST**

The authors declare no conflict of financial, professional, or personal interests that may inappropriately influence the results that were obtained or the interpretations that are proposed here.

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