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Research Article

An analysis of performance measures in manufacturing and the development of an improved framework: Case of Ethiopian selected manufacturing industries

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Abstract

The purpose of this study is to investigate the existing performance measurement practices of selected manufacturing industries and put forward an improved solution for better company performance measurement and improvement system. Both quantitative and qualitative research approaches have been used to investigate and solve problems related to the current measurement and improvement systems. The data was collected from 135 companies of large and medium sized manufacturing companies using questionnaire, backed by semi-structured interview and observation for validation purpose. The finding shows the existing performance measurement practice has serious problems in measures design, implementation, use and dynamically updating of the performance measurement system. Poor data quality for the formulation and update of strategies, poor alignment of measures, low information accuracy, inadequate measures coverage for relevant stakeholders and high measures sub-optimization were among the major characteristics of the existing PM practice. A methodological framework for Performance Measurement System (PMS) has been developed to address the identified problem. The framework bases on the principles of Stakeholder theory, network theory and corporate social responsibility, which provided the foundation needed to develop PMS that looks at the whole picture, keeps ever-changing conditions in focus, and supports sustainable growth for companies under dynamic conditions.

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1. Introduction

Competitiveness of a firm relies on effectively managing its performance, (Dev, 2010). This concept holds great importance in both strategic and operational management, as emphasized by Said and Rabia (Said & Rabia, 2009). The works of various researchers, including (Tätilä, et al., 2014), (Bititci, et al., 2012), (Braz, et al., 2011), (Lee & Yang, 2011), (Lebas, 1995), (Lynch & Cross, 1991), (Kaplan & Norton, 1996), and (Rogers, 1990), provide substantial evidence for the diverse roles of performance measurement (PM).

PM offers numerous advantages, such as enabling effective strategy execution, shaping employee behavior, facilitating organizational learning and performance enhancement, benchmarking against industry standards, and maintaining control over organizational activities. However, measuring performance is a complex and multifaceted process that presents implementation challenges for organizations.

Furthermore, the literature provides various reasons why performance has become a widely discussed and relevant topic for both academics and practitioners in management. These reasons include the evolving nature of work, heightened competition, targeted improvement efforts, national and international recognition through awards, shifting organizational roles, changing external demands, and the influential role of information technology. Neely highlights these factors as major contributors to the current topicality of performance in the literature (Neely, 1999).

The quest for a universal Performance Measurement System (PMS) faces significant challenges due to the unpredictable nature and diverse conditions of organizations. The characteristics of an organization are influenced by factors such as its size, type, stakeholder profile (Richard, et al., 2009), geographical location, and the evolving trends in business, global affairs, natural phenomena (Bititci, et al., 2012), and advancements in technology (Goshu & Daniel, 2017). These factors introduce complexity when defining the appropriate measures, their composition, and the number of measures to be included in a specific organization's PMS. Consequently, developing a universal PMS becomes a daunting task and necessitates ongoing research that can adapt to the dynamic nature of organizations.

Performance Measurement (PM) has experienced changes and developments since its inception. The primary catalysts for the evolution of PM encompass a wide range of dynamic factors, including shifts in business trends, global dynamics, natural phenomena (Bititci, et al., 2012), and technology (Goshu & Daniel, 2017). These studies demonstrate that PM is a dynamic process that is continuously influenced and modified by these change drivers.

In response to various challenges faced by Performance Measurement Systems (PMS), such as the need for strategic focus and the provision of information regarding quality, delivery time, and flexibility (Skinner, 1974), the promotion of local optimization (Hall, 1983), and the absence of customer requirements and competitor information ((Kaplan & Norton, 1992; Camp, 1989), several PM frameworks and PMSs have been developed. These frameworks and systems aim to address these challenges effectively. Notable among these popular and contemporary PM frameworks and PMSs are activity-based costing, the Sink and Tuttle model, balanced scorecard, the performance pyramid, and the performance prism (Tangen, 2005).

Numerous researchers in the field of Performance Measurement (PM) have acknowledged the limitations of traditional financial measurement systems. One of the main issues is their tendency to promote short-term thinking and overlook important factors such as quality, delivery time, and flexibility. Scholars like Hall (1983) have argued that these systems often encourage local optimization, focusing on individual components rather than considering the bigger picture. Moreover, traditional systems have been criticized for their failure to provide crucial information about customer requirements and competitor status, which are vital for making informed decisions.

The limitations of traditional financial Performance Measurement Systems (PMS), coupled with the dynamic nature and wide array of performance measures and applications, have prompted continuous and diligent efforts by academics and professionals to seek solutions. As a result, Performance Measurement (PM) has consistently remained a prominent subject on the research agenda (Tangen, 2005), fueling PM-related research for over three decades (Bititci et al., 2012).

Although these contemporary PM frameworks and PMSs are expected to have a solid academic foundation and aim to address PMS challenges by, for instance, reducing the number of performance measures to prevent information overload and avoiding sub-optimization, they each possess certain weaknesses (Tangen, 2005).

Hence, recognizing the existing gap in research knowledge, the researchers of this study were inspired to tackle specific problematic aspects within the field of Performance Measurement Systems (PMS). The study aimed to examine the current PM practices within the context of selected large and medium manufacturing industries in Ethiopia. By analyzing the existing performance measurement practices, the study also sought to propose remedies for the identified gaps in measurement practices within these industries. This was accomplished through the development of a new PMS framework

2. Literature Review

Organization’s ultimate objective is to make sure the efficiency of the resources utilized and ensure how well they produce the desired products and services. This needs the quantification of their efficiency and effectiveness so that they can control the organization operations and actions. "Performance measurement" serves to define this concept (Neely, et al., 1995). However, simply understanding the term is not enough for organizational improvement. It is crucial to measure the outputs of actions to determine whether they align with the organization's goals and objectives. As Hauser and Katz point out, "You are what you measure!" (Hauser & Katz, 1998). This emphasizes the significance of metrics in driving organizational behavior and decision-making.

For a long time, performance measurement has been utilized as a means of monitoring and controlling organizational activities at various levels. However, traditional performance measurement practices have primarily relied on one-dimensional financial performance measurement systems. These practices have proven inadequate in addressing organizational changes and have been criticized for several shortcomings. These shortcomings include the encouragement of short-term thinking (Banks &

Wheelwright, 1979; Hayes & Abernathy, 1980), the lack of strategic focus and failure to provide information on quality, delivery time, and flexibility (Skinner, 1974), the promotion of local optimization (Hall, 1983), and the absence of information concerning customer requirements and competitors' status (Kaplan & Norton, 1992; Camp, 1989).

Both academics and practitioners are placing a significant emphasis on how organizations are measured and how they derive value from the data they collect. According to the research conducted by Jan van Ree (2002) and Tangen (2004), the evolution of Performance Measurement Systems has shifted from a sole focus on effectiveness in the 1950s to encompassing multiple requirements in the 2000s. These requirements include effectiveness, productivity, efficiency, flexibility, creativity, and sustainability (Goshu & Daniel, 2017). This shift is a response to the dynamic changes in business trends, global trends, natural trends, and technological demands, as highlighted by Bititci et al. (2012) and (Goshu & Daniel, 2017). As a result, organizations today are faced with multiple obligations to adapt to these ever-changing dynamics

These limitations are inherent in the traditional performance measurement practices, which rely on single-dimensional performance measurement systems.

To overcome these deficiencies, contemporary performance measurement systems have emerged, which incorporate both financial and non-financial performance measures in a balanced manner. The revolution in performance measurement literature began in the early and mid-1990s, with the introduction of the Balanced Scorecard (BSC) by Kaplan and Norton in 1992 (Kaplan & Norton, 1992). This marked a significant milestone in the development of contemporary performance measurement systems (Franco-Santos et al., 2012). Measuring the performance of intangible factors, such as employee satisfaction, innovation, and brand reputation, poses a significant challenge. These factors are critical for long-term success but are often difficult to quantify. The research by Ghalayini and Noble (1996) emphasizes the need for organizations to develop appropriate measurement models that capture both tangible and intangible aspects of performance (Ghalayini & Noble, 1996) .

Still the problem persists in recent times and the measurement of performance is not without challenges. Data availability and quality are significant challenges as performance measurement relies on accurate and reliable data (Franco-Santos et al., 2012). The study by Izraelevitz et al. (2019) focuses on the importance of data quality in performance measurement, particularly in the context of digital biograph vision PET/CT systems. The availability and quality of data are essential for accurate performance measurement. However, organizations may face challenges in obtaining reliable and timely data (Izraelevitz, et al., 2019) .

Organizations need to ensure that appropriate data collection processes are in place to capture relevant performance indicators. Subjectivity and bias can influence the selection and interpretation of performance measures, leading to potential conflicts and disagreements (Ittner et al., 2003) and can result in inaccurate assessments. Moreover, the study by Fernández-del-Río et al. (2019) highlights the use of self-report scales in assessing job performance, which can be subjective and prone to biases. To address this challenge, organizations should strive for objectivity and transparency in performance measurement by incorporating objective data and multiple sources of feedback while involving multiple stakeholders and considering different perspectives (Fernández-del-Río, et al., 2019) .

The lack of consensus on what metrics to use and how to measure performance accurately has been considered to be continuing problem. Different stakeholders may have varying perspectives on what constitutes success, leading to conflicting performance measures. The study by Martini and Suardana (2019) emphasizes the importance of adopting a balanced scorecard approach to overcome this challenge in a holistic manner (Martini & Suardana, 2019). Resistance to change is another challenge, as implementing new performance measurement systems may face resistance from employees and stakeholders (Bourne et al., 2003). Companies need to effectively communicate the benefits of performance measurement and involve employees in the design and implementation process to mitigate resistance.

organizations often face challenges in ensuring alignment of their measures with their strategy. It is crucial for performance measures to align with the overall strategic goals and objectives of the organization. The study by Taouab and Issor (2019) highlights the need for a clear definition of firm performance and the development of measurement models that align with the organization's strategy (Taouab & Issor, 2019) .

In conclusion, the limitations of traditional performance measurement practices become evident when one considers their reliance on single-dimensional financial performance measurement systems. These practices have been criticized for their shortcomings, including the promotion of short-term thinking, the lack of strategic focus and information on quality, delivery time, and flexibility, the encouragement of local optimization, and the absence of customer requirements and competitors' status. contemporary performance measurement systems have evolved to address the limitations of traditional practices. However, challenges related to data availability and quality, subjectivity and bias, resistance to change, consensus on metrics, alignment with strategic goals, and accuracy of assessments persist and require careful consideration and management. The dynamically changing factors are broadly categorized as changes in global, natural, business and technological trends pose challenges in the effective and use of performance measures and measurement systems (Bititci, et al., 2012; Goshu & Daniel, 2017).

3. Research Methodology

This study has pursued a scientific research methodology with respect to business and manufacturing systems to meet the research objective. The research approach followed in this study has been applied research approach in which the investigation and application of the existing practices and knowledge about performance measurement and improvement systems is the principal objective of the study. Consequently, the objective of the research has been approached both theoretically and empirically following dual research procedure for applied research (Tangen,

2004). The research was initiated by survey of selected large and medium-sized industries. The dual research procedure in applied research follows interplay between theory and practice as well as it experiences a progressive analysis and synthesis to meet the research objectives. Both quantitative and qualitative research approaches have been used to investigate and solve problems related to the assessment of the existing performance measurement system of Ethiopian manufacturing companies.

3.1. Sample design

The population considered is the Ethiopian manufacturing large and medium manufacturing industries. The sampling frame has been defined to be the list of large and medium scale manufacturing industries, which are firms or establishments with 10 and above employees and are using power-driven machinery from the CSA survey data (CSA, 2014) on manufacturing and electricity industry. Accordingly, in this research textile, leather, agro-processing and metal industries sectors were considered as a rudimentary prioritized group. Therefore, the sampling frame decided to include the six sub-sectors in the main groups; namely manufacture of food products and beverages, manufacture of textiles, manufacture of wearing apparel except fur apparel, tanning and dressing of leather, manufacture of footwear, luggage and hand bags, manufacture of chemicals and chemical products, manufacture of basic iron and steel and manufacture of fabricated metal products except machinery and equipment.
Since the standard deviation, sample and population mean are not known, sample for proportion with p=0.5 (maximum variability), e (sampling error) = 0.1 and 95% level of confidence has been assumed appropriate for this research. For 95% confidence interval, the value of z is 1.96. Accordingly, the infinite population sample size has been determined to be 97. Considering the finite population correction factor, the sample size fell in the range 85 and 149 for 20% and 15% error respectively.

Table 1
Sample size for the study

Establishments	Sample taken		
	Public	Private	Total
Manufacture of food products and beverages	3	65	68
Manufacture of textiles	1	9	10
Manufacture of wearing apparel, except fur apparel	-	3	3
Tanning and dressing of leather, manufacture of footwear, luggage and hand bags	-	15	15
Manufacture of chemicals and chemical products	2	14	16
Manufacture of basic iron and steel	-	4	4
Manufacture of fabricated metal products except machinery and equipment	2	17	19
Total	8	127	135

Consequently, the finite population size was calculated to be nearly 90. Therefore, for this research, a reasonable amount of sample size which was beyond the calculated sample size (90 companies), 135 companies were considered. This is assumed to be large enough to represent the population.

3.2. Data collection instrument

The data are required to explore and investigate the performance measurement and improvement systems of the selected large and medium manufacturing sector, propose and validate an improved system to help the companies better control their actions and meet their strategic objectives. To this end, questionnaire was developed to collect the quantitative survey data related to design, evaluation and factors affecting the performance measurement and improvement systems of the selected industries. The questionnaires were distributed to those who are believed to have greater role and responsibility for managing the performance of their respective companies. They were general managers, department or functional managers, as well as experts. One questionnaire was distributed for one company.
To increase the credibility and validity of the research result, a semi-structured interview was conducted with randomly selected companies' management members who are more in charge of measuring, evaluating and improving company performance. To make the questionnaire simple, clear, understandable, and easy-to-follow, a pilot study has been conducted and feedback from the respondents was considered. The pilot study was conducted on selected company managers and academicians with a total of six academicians and four company managers who were experts on the subject and who were believed to be capable to validate the content of the instrument.
During data collection, the respondents were promised confidentiality and the names of the respondents were not asked to improve accuracy of responses and response rate. In the course of the questionnaire data collection process, recipients were first informed about the survey and questionnaire by email, telephone, or face-to-face discussion. Then the questionnaire was distributed to all recipients. Follow-up was made rigorously to increase the response rate. The responses were collected back through facial presence in the company.

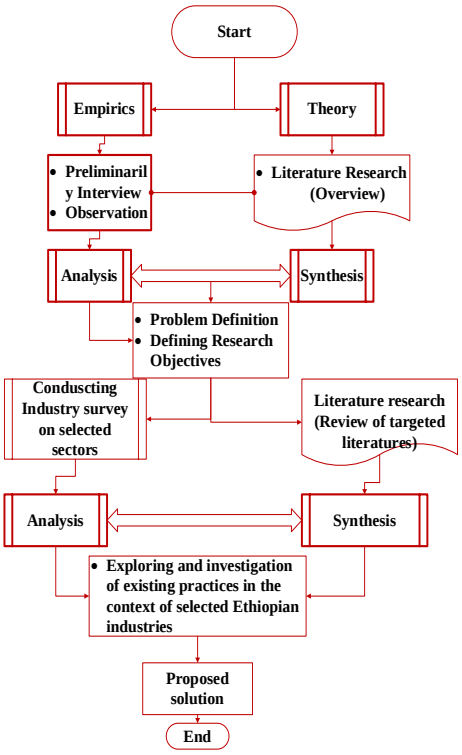

Fig. 1. Research Methodology

3.3. Instrument reliability test

The data analysis procedure was done by employing a descriptive statistics technique. SPSS software was used to test the reliability of the measuring scale and measurement items The internal consistency analysis was performed both for the whole instrument scale and separately for the different constructs from group one through six. The analysis showed that maximization of the alpha coefficient would require eliminating of items from 0 to 5 for each construct. Accordingly, the cronbach's alpha coefficient value for the whole instrument was 0.84. Table 2 shows that the maximized reliability coefficients ranged from 0.762 to 0.859, indicating that some scales are more reliable than others. In general, reliability coefficients of 0.7 or more are considered adequate and the measure is acceptable for making inference. (Iacobucci & Duhache, 2003)

Table 2
Internal consistency analysis results

Concepts to be measured	Original No of items	Items deleted	Cronbach's alpha
Managers' PMIS awareness level	5	0	0.809
Existence and workability extent of company vision and strategies	12	0	0.753
Critical criteria for the design of PM	22	0	0.859
Critical Factors affecting PMSs	14	5	0.828
Most frequently used Performance measures	20	1	0.754
overall	73 items	6	0.844

4. Data Analysis and Result

The existing performance measurement and improvement systems and practices were examined and investigated in order to understand the performance measurement and improvement systems and practices of the industries and to put forward an improved solution for better company performance measurement and improvement system.

4.1. Assessment of awareness on performance measurement and improvement systems

When managers possess a clear understanding of what to measure and how to measure it, they gain greater control over organizational actions and activities, leading to more effective decision-making and the initiation of suitable improvement strategies. The responsibility lies with management to develop and implement systems and procedures that align with established objectives and goals. This can only be achieved when managers have a comprehensive understanding of the activities being carried out and ensure their alignment with predetermined procedures, objectives, and goals. The actions taken by organizations are validated by the measurement process, which serves as a prerequisite for decision-making. Measurement serves as the interlinking element that connects the essential elements of thoughts, decisions, and actions within the company. Consequently, decisions are made based on the factual information obtained through measurements. The results obtained from the measurement process provide managers with insights into the activities being carried out, enabling them to control actions and evaluate the outcomes achieved by the organization. Ultimately, this knowledge helps in improving the organization's products and services, enhancing its competitiveness in the market

The awareness of managers who are responsible for controlling organizational activities and driving improvement is critically important for the effective management of their company. Understanding "what to measure" and "how to measure" is crucial in this regard. The first part of the questionnaire aimed to assess the level of understanding among management regarding performance measurement systems as they relate to their organization's practices. The purpose was to evaluate the existing level of awareness.

Table 3
Descriptive Statistics parameters value for awareness assessment

Items	Mean	Std. Deviation
Trainings about performance measurement systems are sufficiently available	2.95	1.004
Managers have adequate understanding and knowledge on how company performance is measured	3.69	0.465
The implementation of performance measurement measures enables companies to quantify the effectiveness and efficiency of activities	4.02	0.871
The company has interest to implement performance measurement system	3.90	1.036
The company believes competitiveness can be achieved through implementation of performance measurement system	3.88	1.223

Based on the responses received and presented in Table 3, managers, on average, agreed (mean=3.69, Std=0.465) that they have a sufficient understanding of performance measurement. They also agreed (mean=3.88, Std=1.223) that measuring and improving their company's performance contributes to the journey towards organizational success. Similarly, respondents agreed (mean=4.02, Std=0.871) that the implementation of performance measurement systems supports the achievement of their goals and strategies. Furthermore, they expressed interest (mean=3.90, Std=1.036) in implementing performance measurement systems.

However, there was a contradictory response regarding the availability of training on performance measurement and improvement systems. This finding highlights a significant issue in the manufacturing industries in Ethiopia, where there is a lack of adequate access to training or limited effort by organizations in arranging performance measurement training for their management and employees. Of the total 109 respondents, 45% (49) expressed their disagreement (n=109, mean=2.95, Std=1.004) regarding the accessibility and commitment to delivering sufficient training on performance measures and measurement systems.

4.2. Assessing the formulation and functionality of organizational visions and strategies

The second group of the Likert scale questionnaire focuses on the assessment of the organizational visions, strategies, and objectives of the companies. The purpose is to examine whether the organizational procedures are aligned in a manner that ensures understanding, measurement, and control of the organization's activities, actions, and results. This section consists of 12 items that aim to investigate the presence of practical objectives and strategies. These objectives and strategies are expected to be developed through a predefined formulation procedure rather than relying on intuition and personal interests. Based on the responses received (as shown in Table 4), it appears that the majority of companies have not clearly formulated their vision and strategies in a practical manner. When a company's vision and strategies are clearly formulated and effectively communicated both internally to the entire management and employees, as well as externally to various stakeholders, it facilitates coordination of efforts among employees and garnering necessary support from stakeholders. The mean response indicates a slightly below-average agreement (mean=2.69) regarding the clarity of the company's vision. However, approximately 36% (39 respondents) expressed disagreement, and about 16% (15) strongly disagreed that their company has a clearly defined vision. Similarly, the mean response for the formulation of the mission is slightly below average (mean=2.62). Approximately 37% (41 respondents) disagreed, and about 17% (18) strongly disagreed that their company has a clearly defined mission. Furthermore, the existence of workable and clearly defined strategic objectives in these companies is questionable. More than 51% (57 respondents) either disagreed or strongly disagreed that their companies formulate their strategies in a clear and practical manner.

Table 4
Descriptive statistics for the companies visions and strategies assessment

Items	Mean	Std. Deviation
Existence of clearly defined company's vision	2.69	1.134
Existence of clearly defined company's mission	2.62	1.142
Existence of clearly defined company's strategic objectives	2.61	1.134
Strategies are revised and updated at regular time	1.61	0..818
Quality of information used to formulate strategies	1.66	0.856
Quality of information used to review or update strategies	1.78	0.921
Senior management agreement on strategy and on measurable criteria for strategic success	3.08	.672
Existence of formal process/procedure for target setting	2.60	1.258
Targets are aligned with strategies	2.40	1.085
Targets are set at company level	3.60	0.595
Targets are set at company functional level	3.96	0.696
Targets are set at company operational levels	3.63	0.991

The revision and updating of strategies are crucial components in implementing, utilizing, maintaining, and sustaining performance measurement and improvement systems. However, according to the responses received, revising and updating strategies has been identified as a significant problem. Over 93% (101 respondents) expressed that they have no experience in regularly revising and updating their company's strategies.

Another challenge highlighted by the respondents is the quality of input information required for formulating and revising strategies. The majority of the respondents, nearly 51% (56 respondents) strongly disagreed, and 38% (41 respondents) disagreed that their companies use high-quality information or data that accurately reflects reality. Similarly, there is a lack of quality input data for reviewing and updating strategies, with approximately 45% (50 respondents) strongly disagreeing and 38.5% (42) disagreeing that their companies utilize high-quality input data for the strategy formulation process. The mean measure on the scale also indicates a below-average rating (mean=1.61).

4.3. Assessment on the status of existing performance measure and measurement design practice

Strategies are put into action through the implementation of appropriate measures within a company. Various authors, including Akyuz & Erkan (2010), Maskell (1989), Najmi et al. (2005), Tangen (2005), Yitagesu & Daniel (2017), Franco & Bourne (2003), and Yitagesu & Daniel (2016), have discussed and suggested criteria that performance measures should meet in the literature. Drawing upon these insights, a Likert scale consisting of 22 items was used to inquire about the current design requirements employed by the companies. The objective of this inquiry was to investigate and gain an understanding of the existing

practices within the companies concerning the empirically established criteria.

The Likert scale questionnaire consisted of 22 questions, as shown in Table 5. The success of strategy implementation is influenced by the agreement on measures among senior managers. According to the responses from the sampled companies' managers, there is a degree of agreement among managers from different companies regarding the measuring criteria. More than 54% (59 respondents) expressed a neutral stance, while over 26% (29 respondents) agreed that their company had reached an agreement on measuring criteria among senior management members. However, the responses also indicated a problem in terms of developing and maintaining procedures or systems for setting targets to achieve their strategies. More than 24% (26 respondents) disagreed, and nearly 25% (27 respondents) strongly disagreed with the existence of target-setting procedures within their company. Although targets are set at various hierarchical levels (operational, functional, and company level), the alignment of these targets with strategies poses another significant challenge. More than 81% (90 respondents) acknowledged that their companies have a practice of target setting, but over 49% (54 respondents) either disagreed or strongly disagreed that there is alignment between targets and strategies.

The design process of existing performance measures also showed weaknesses in terms of the link and consistency between measures (business, functional, or operational), alignment with strategies, absence of conflicts among measures, and the speed and accuracy of measures. More than 71% (79 respondents) disagreed and/or strongly disagreed that these criteria were not taken into consideration when designing their performance measures or that the existing measures did not adhere to these criteria. However, it was noted that the companies believed they were using traditional performance measures to quantify the efficiency and effectiveness of various areas within their organizations. Approximately 18.3% (20 respondents) strongly disagreed, and 38.5% (42 respondents) disagreed that their company uses hierarchical performance measures. In terms of measure types, 54.1% (59 respondents) strongly agreed, and 43.1% (47 respondents) disagreed that the measures were traditional financial and productivity-based. There was also a lack of agreement that these measures guard against sub-optimization. Additionally, 40.4% strongly disagreed with the use of balanced measures for quantifying their company's activities both internally and externally. Furthermore, over 41% (45 respondents) disagreed, and 34.9% (38 respondents) strongly disagreed that the measures considered the perspectives of all stakeholders within their companies.

The existing performance measures primarily focus on short-term outcomes, with approximately 59% (65 respondents) agreeing and about 35% (38 respondents) strongly disagreeing that these measures are predominantly short-term oriented.

Table 5
Respondents' response frequency table on the existing use of PM Design criteria

Items	Scale (frequency/percent)				
	SD	D	N	A	SA
Strategic Performance measures and operational measures are linked and consistent	39/36.1	40/37.0	23/21.3	5/4.6	1/0.9
Performance measures are derived from strategies	19/17.6	58/53.7	22/20.4	8/7.4	1/0.9
Existence of measures conflict with one another	20/18.5	60/55.6	21/19.4	7/6.4	0/0
Existing Performance Measurement System Provide accurate information/feedback	38/35.2	41/38.0	23/21.3	6/5.5	0/0
Existing Performance Measurement System Provide fast and timely information/feedback	38/35.2	42/38.9	22/20.4	6/5.5	0/0
Measures at multi-hierarchical levels are considered and Supports objectives	0/0	3/2.8	44/40.4	42/38.5	20/18.3
The Measures guard against sub-optimization	20/18.3	77/70.6	4/3.7	7/6.4	1/.9
The company uses limited number of measures	76/69.7	23/21.1	6/5.5	4/3.7	0/0
Traditional performance measures are used	0/0	1/0.9	2/1.8	47/43.1	59/54.1
Balanced –both traditional financial and non-financial measures	0/0	44/40.4	41/37.6	22/20.2	2/1.8
Measures for all stakeholders are considered in performance measurement	38/34.9	45/41.3	21/19.3	4/3.7	1/0.9
Measures for long term targets are considered	38/34.9	60/55.0	6/5.5	4/3.7	1/0.9
Measures for intermediate targets are considered	38/34.9	41/37.6	24/22.0	5/4.6	1/0.9
Measures for short term targets are considered	0/0	0/0	6/5.5	65/59.6	38/34.9
There exists adequate Performance Measurement System revision/update at regular intervals	39/35.8	60/55.0	5/4.6	5/4.6	0/0
When using Performance measures, cost of performance measures/measurement systems is considered	95/87.2	8/7.3	5/4.6	0/0	1/0.9
Conducting Performance Measurement System efficiency evaluation every quarter	57/52.3	45/41.3	0/0	5/4.6	1/0.9
Conducting Performance Measurement System efficiency evaluation every half year	38/34.9	41/37.6	22/20.2	5/4.6	3/2.8
Conducting Performance Measurement System efficiency evaluation every year	1/0.9	23/21.1	21/19.3	44/40.4	19/17.4
Conducting Performance Measurement System efficiency evaluation every two years or more	95/87.2	8/7.3	6/5.5	0/0	0/0
The value and quality of the data which are used as information for measuring performance and assessing Performance Measurement System	58/53.2	21/19.3	5/4.6	25/22.9	0/0
Existence of the link between performance measures and rewards or incentives or compensation	0/0	25/22.9	20/18.3	44/40.4	20/18.3
SD= Strongly disagree; D=Disagree; N= Neutral, A=Agree and SA= Strongly Agree					

As a result, long-term and intermediate measures are significantly understated. Another significant issue observed in the design process of performance measures is that companies do not use a limited number of measures. More than 69% (76 respondents) strongly disagreed, and 21% (23 respondents) disagreed that their companies utilize a limited number of measures. Academics and practitioners suggest that the cost of implementing a performance measurement system should be taken into account during the design phase. However, almost all of the respondents, 87.2% (95 respondents), either strongly disagreed or disagreed that the

cost of a performance measurement system is considered when evaluating the system in their company.

On the other hand, companies have a practice of evaluating overall company performance on an annual basis, separate from evaluating the performance measures themselves. When asked about the frequency of evaluating their measurement systems, 17.4% (19 respondents) strongly agreed, 40.4% (44 respondents) agreed, and 19.3% (21 respondents) were neutral, indicating that they conduct such evaluations regularly on an annual basis. However, a critical element for the sustainability and effectiveness of a performance measurement system, which is rewards based on actual performance, is lacking in the company's performance measurement and implementation processes. Over 53% (58 respondents) strongly disagreed, and 19.3% (21 respondents) disagreed that their company utilizes a performance-based reward system within their organization.

4.4. Identification of factors affecting existing performance measures and measurement systems implementation and maintenance

In literature, several authors identified various factors affecting the design and implementation of performance measurement systems **Invalid source specified.**. Accordingly, preliminarily 14 variables were identified. The opinion of the managers on the identified factors was collected so as to understand and test whether these are practical barriers for performance measurement implementation and use process in the selected manufacturing industries context. Five variables were eliminated in the process association between each factor.

Table 6
Spearman's PMS implementation factors correlation test result

Factors	Correlations	Correlations (ρ)								
		PMF1	PMF2	PMF3	PMF4	PMF6	PMF8	PMF9	PMF11	PMF 12
Organization culture (PMF1)	Correlation Coefficient	1.000								
	Sig. (2-tailed)	-.								
Alignment (PMF2)	Correlation Coefficient	.256**	1.000							
	Sig. (2-tailed)	.007	-.							
Communication and reporting (PMF3)	Correlation Coefficient	0.015	.358**	1.000						
	Sig. (2-tailed)	.881	.000	-.						
Review and update (PMF4)	Correlation Coefficient	.707**	.008	-.122	1.000					
	Sig. (2-tailed)	.000	.936	.208	-.					
Management understanding (PMF6)	Correlation Coefficient	.355**	.329**	.259**	.316**	1.000				
	Sig. (2-tailed)	.000	.001	.007	.001	-.				
Management commitment and leadership (PMF8)	Correlation Coefficient	.312**	.291**	-.092	.706**	.416**	1.000			
	Sig. (2-tailed)	.001	.002	.345	.000	.000	-.			
Clear and balanced framework (PMF9)	Correlation Coefficient	.283**	-.351**	0.011	.041	.378**	-.329**	1.000		
	Sig. (2-tailed)	.003	.000	.913	.673	.000	.001	-.		
Data process and IT support (PMF11)	Correlation Coefficient	.657**	.032	-.063	.937**	.312**	.695**	.0.190 *	1.000	
	Sig. (2-tailed)	.000	.743	.519	.000	.001	.000	0.049	-.	
Target setting (PMF12)	Correlation Coefficient	.671**	-.015	-.115	.959**	.284**	.704**	.083	.944**	1.00
	Sig. (2-tailed)	.000	.874	.235	.000	.003	.000	.394	.000	-.
**. Correlation is significant at the 0.01 level (2-tailed); *. Correlation is significant at the 0.05 level (2-tailed).										

Bivariate Correlation test

There are a number of statistical techniques that can be applied to measure relationships of variables. For this specific data, the appropriate correlation measuring technique was selected to be Spearman correlation coefficient, rho. This is because the data is ordinal measure and not assumed to be normally distributed data violating parametric assumptions. For such data characteristic a relatively more suitable correlation technique is suggested to be non parametric correlation coefficients. Moreover, Spearman's correlation coefficient, rho, was selected over Kendall's correlation coefficient, tau, in that the sample size is relatively large.

Table 6 shows the degree of association between the variables. Almost all of the variables have some kind of associations to one another. Some are strongly correlated to each other and some are weakly or moderately correlated and a little are not associated to one other with acceptable level.

The analysis has shown, at $P < 0.01$, organization culture is strongly and positively correlated with performance measurement systems review and update (ρ=0.707), data process and IT support (ρ=0.657), and target setting (ρ=0.671) and vice versa. It is also positively but weakly associated to variables alignment (ρ=0.256), management understanding (ρ=0.355) and management commitment and leadership (ρ=0.312) and vice versa. Whereas, there is insignificant relationship between organization culture and communication and reporting.

Moreover, the Spearman correlation analysis finds that strategy alignment is weakly but positively correlated with communication and reporting (ρ=0.358). It is also positively but weakly related to variable management understanding (ρ=0.259). The analysis has also shown that there is weak negative relationship between strategy alignment and clear and balanced framework (ρ=-0.351). Whereas there is insignificant relationship with review and update, IT support and target setting.

The communication and reporting of Performance measures and measurement systems is weakly but positively

correlated with management understanding (ρ=0.387) and data process and IT support (ρ= 0.258). However, there is no significant relationship between communication and reporting and the rest measurement implementation factors namely culture (ρ=0.015) review and update (ρ=-0.125), management commitment and leadership (ρ=-0.092) , clear and balanced framework (ρ=0.011), data process and IT support (ρ=-0.063) and target setting (ρ=-0.115).

Reviewing and updating of performance measures and measurement systems is strongly and positively correlated with management commitment and leadership (ρ=0.706) data process and IT support (ρ=0.937), and target setting (ρ=0.959). It has weak but positive relationship and insignificant relationship with management understanding (ρ=0.316) and existence of clear and balanced framework (ρ=0.041) respectively. The analysis has shown that management understanding has a moderate and positive relationship with management commitment and leadership ((ρ=0.416). It has also positive but weak relationship with clear and balanced framework (ρ=0.378) data process and IT support (ρ=0.312), and target setting (ρ=0.384).

5. Development of Performance Measurement Framework

The proposed solution includes the development of a framework by which Ethiopian manufacturing industries performance can be measured, analyzed and interpreted so that their performance can be improved continuously and sustainably for better competitiveness. The framework was based on phased approach by which performance measurement can be practiced in a continuous process.

The performance measurement framework developed is comprehensive and it includes the strength of various performance measurement frameworks so far developed. It is designed in such a way that a performance practitioner can easily be guided to empirically implement and use it. The newly proposed performance measurement framework encompasses four distinct but interrelated phases as discussed below:

5.1. Performance Measures Design Phase

Before discussing the design phase of the performance measurement system, it is important to note the preliminary assumption at this point. Performance measures and measurement systems are designed to implement the chosen strategy or objectives (Bourne, et al., 2002). Therefore, the design process for this framework is founded on the assumption that the organization's goals, objectives and strategies are already defined and in place. The measures and measurement systems are then designed based on the goals and strategies, which are predefined.

Design of a performance measurement system is not an easy task. It requires a consideration of multiple criteria from different perspectives and addressing variety of issues that could affect the performance and competitiveness of the company. If the company fails to properly design its performance measurement systems, it will not thrive to succeed in the subsequent performance system implementation and use phases.

A careful understanding of the design phase will prevent the company from making wrong decisions, loss of resources and bad image towards performance measurement.

The major sub-activities required to consider at this phase are identified to be:

- ✓ Identifications of stakeholders
- ✓ Identification of goals and strategies
- ✓ Identification of performance measures
- ✓ Prioritization and selection of measures

a. Identification of stakeholders and their relationship with the organization

One of the strengths of this framework is believed to be its foundation on theories, which explains the phenomena that exist in the design and implementation process of PMS. The framework is founded on three theories; namely stakeholder theory, corporate social responsibility and network theory. These theories underpin the identification of 'what to measure,' which is the critical and pertinent question in performance measurement systems. They answer questions, which could arise in the process of PMS design and implementations.

According to Atkinson, et al., (1997), a stakeholder is "An individual or a group, inside or outside the company that has a stake or can influence the organization performance." The definition implies that the company performance is affected by the influence of its stakeholders. Identification of their interests based on the relationship that exists between the organization and the stakeholders is a prerequisite before going for performance measurement process.

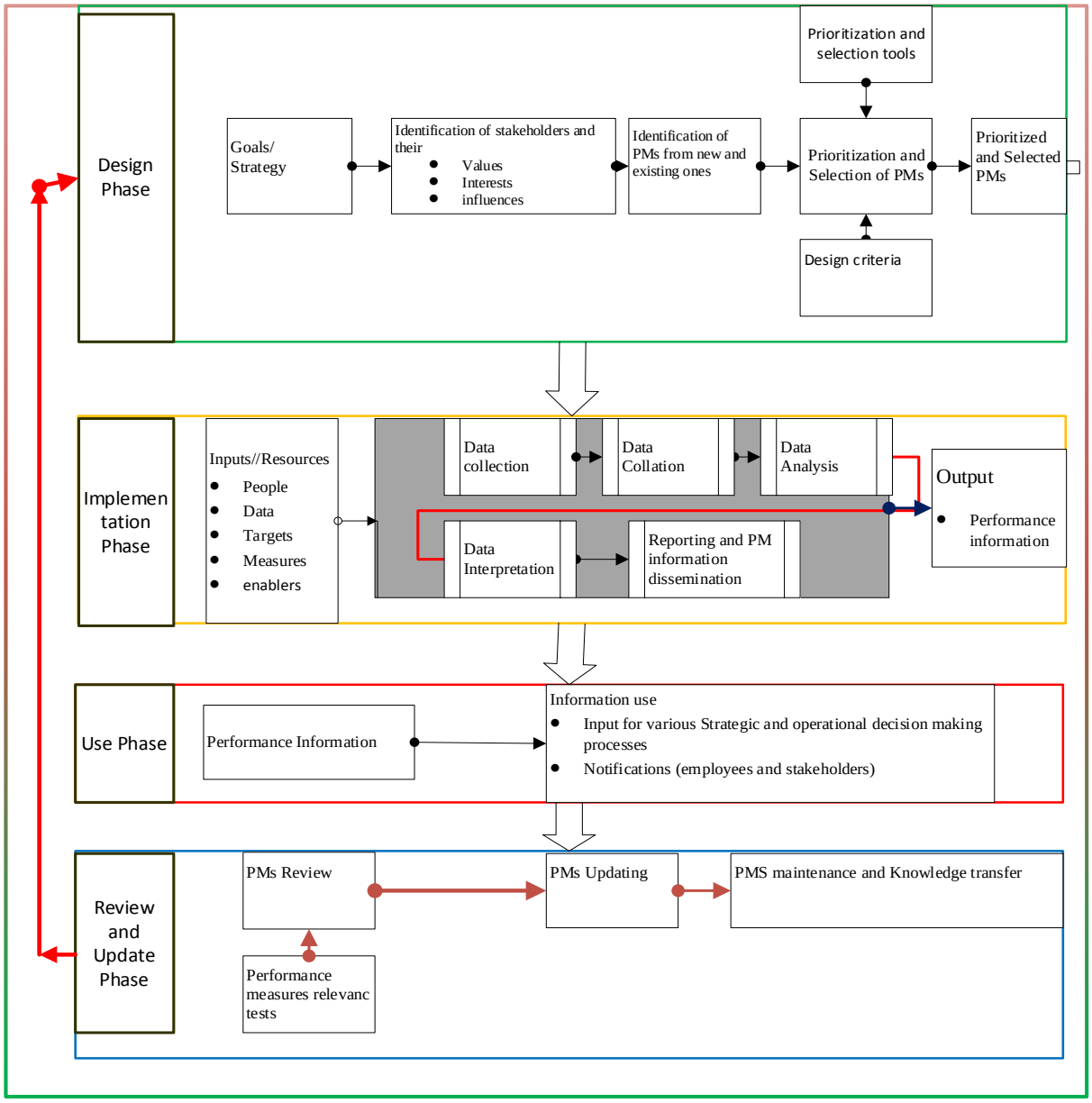

Fig. 2. Newly Developed Performance Measurement System Framework

In performance measurement literature, there is an argument on the inexistence of stakeholders' theory in the context of performance measurement (Choong, 2014). This, however, can be viewed from the existing stakeholder theory in that there are values, needs and interests expected to be fulfilled by the organization; i.e., it can be legally or voluntarily. There is a reciprocal interaction between the organization and its environment containing its main stakeholder. Therefore, the company needs to identify its stakeholders, understand and prioritizes their needs and interests and include in its strategies which are to be measured by appropriate performance measures against the targets set to assure its existence, sustain its continuity and growth (Silva, et al., 2019). That means, the organization will get contract agreement internally to meet these interests through planning containing suitable and diversified measures.

Consequently, the various questions literally known in performance measurement design process can be answered by making use of stakeholder theory, corporate social responsibility theory and network theory in combination.

- Who are the different stakeholders for whom the company performs well? this is explained by the stakeholder theory
- What are the obligations and responsibilities of the company to meet the needs and requirements (values) of these stakeholders? this is explained by theory of corporate social responsibility
- How these values are identified and mapped? this is explained by network theory

Combining the concept of stakeholder theory and corporate social responsibility helps to understand and explain 'What to measure?' question, which is, obviously, the main question that challenges company performance measurement literatures. Even if there are a number of performance measurement frameworks, they focus on the perspectives by which performance measures should be viewed from and on the content of performance

measurement systems whether to include measures such as, financial, non-financial, internal and external, business and operational, or short and long-term, etc. Integrating and basing these two theories, however, help to explain the various stakeholders' values which should be expected to be fulfilled or responded by the organization in question. They help to describe and understand what should be the performance of the company with respect to its shareholder and stakeholders' value. The purpose of an organization is to maximize the value of its stockholders while maximizing its stakeholders value. The role of the performance measures is, therefore, quantifying and gauging the actions of the companies to maximize these values among others.

The type of stakeholder requirements identified could be legal or informational (Choong, 2014) associated with material, product, finance or by-product which should be delivered, received or notified timely at the required place.

The rationale for specifically discussing about the stakeholder concept of an organization for which its performance is measured stems from the purpose of a typical organization and how it is thought as a group of stakeholders. Teddy Wivel, argues "It will not be possible to create shareholder value without creating stakeholder value" (Neely, 2007). This suggestion highlights there is a causal relationship between the shareholders' value and stakeholders' values. It is a pre requisite to satisfy the stakeholders' value to meet the shareholders' value sustainably and maintain the organizational growth and continuity. In addition, Friedman and Miles state that an organization should be thought of as a group of stakeholders and the purpose of the organization should be to manage their interests, needs, influences and viewpoints (Friedman & Miles, 2006). This is the basic foundation that dignifies the consideration of stakeholders to satisfy the shareholders of the firm.

The stakeholders of the company need to be identified and their interests and needs should also be understood before designing of a performance measure or measurement systems. This is because the performance of the organization is viewed from the needs and interests of the stakeholders as well as the shareholder value for its survival. The performance measures then quantify these needs and interests and enable to plan activities, control actions, communicate strategies and reward employees. The management of the organization is the agent for the stockholders and has responsibility to fulfill the need and interest of its stakeholders. Andy Neely also considers the stakeholder approach to conceptualize and model a performance measurement framework, the performance pyramid. However, it is not clear how the values can be identified and analyzed apart from discussing the need of stakeholder perspective for performance measurement framework design.

The concept of Corporate Social Responsibility (CSR) has a long and varied evolution and there are evidences about the concern of organization for society long in time too; however, formal writing on social responsibility is largely the result of the 20th century researches, especially the past 50 years (Carroll, 1999). It has evolved a number of definitions. The definition of CSR by Sethi, (1975) has been considered for this research. This is because Prakash Sethi did not forward the definition of CSR only, but he also discussed its dimensions from performance perspectives. According to Prakash Sethi, CSR is a corporate behaviour which is defined as social obligation, social responsibility, or social responsiveness. Social obligation is corporate behaviour in response to market forces or legal constraints. The criteria here are economic and legal only. Social responsibility, by contrast, goes beyond social obligation. He stated social responsibility implies bringing corporate behaviour up to a level where it is congruent with the prevailing social norms, values, and expectations of performance. The third stage in Sethi's model is social responsiveness. He regarded this as the adaptation of corporate behaviour to social needs.

From Sethi's explanation, organizations have legal obligation, responsibility and they need to be responsive to market force, social norms, values and societal needs. The European Union (EU) has also added to the concept of CSR that it is a paradigm by which companies decide voluntarily to contribute to a better society and a cleaner environment. Corporations are an integral part of a society and must depend on it for their existence, continuity, and growth. They continually attempt to outline their activities, the nature of inputs they utilize, the type of outputs they produce, and the way in which outputs are distributed so that they are in line with the goals of the overall social and environmental system (Sethi, 1975; Carroll, 1999).

Therefore, firms are encouraged to consider their responsibilities toward several stakeholders with the goal of integrating economic, social, and environmental concerns into their strategies, their management tools, and their activities, going beyond simple compliance.

Consequently, in this newly developed framework, identification of stakeholders and their corresponding needs and interests is supported by the two theories, corporate social responsibility (CSR) paradigm and stakeholder theory. From the above discussion, organizations are expected to measure what is expected from them by their stakeholders which include legal, economical, cultural, societal and environmental performances for their existence, continuity and growth. Tangibly, stakeholders could need product, service, notification, report, incentive, or finance from the organization.

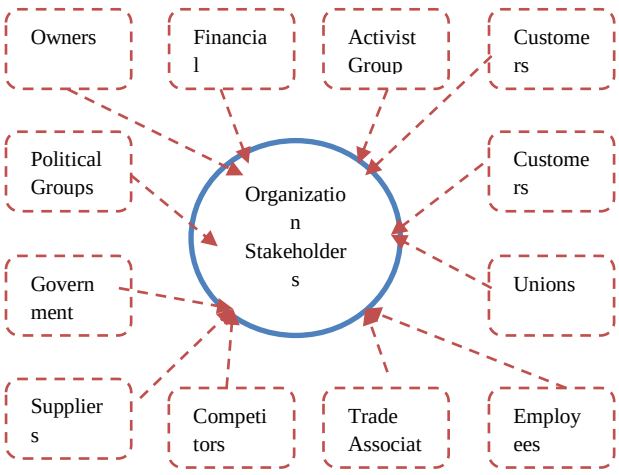

Fig. 3. A stakeholder map of a very large organization source: (Freeman, 2010)

The number and type of stakeholders are variably suggested by different authors. Atkinson, et al., (1997), for example, identified five types of stakeholders for a profit-making organization. These are owners, customers, suppliers, employees and the community. They further grouped these stakeholders into two, namely the environment stakeholders comprising owners, customers and community; and the process stakeholders comprising employees and suppliers.

According to Freeman, the various stakeholders (Fig. 3) of a very large organization are identified to be owners, financial community, activist groups, customers, customers advocate groups, unions, trade associations, employees, competitors, suppliers, government and political groups (Freeman, 2010). This does not mean that all these bodies can be stakeholders of an organization. The number of stakeholders could vary depending upon the size of the firm and Freeman identified and mapped these stakeholders for a very large organization.

The relationship between the organization and its stakeholders can be mapped and analyzed by making use of Network theory. Complex systems network theory provides techniques for analyzing structure in a system of interacting agents, represented as a network.

The graphical representation of the various stakeholders interacting with the organizations can better be visualized and the binding or linking element can explicitly be identified, defined and represented. Unlike, for example, social friendship network in the context of performance measurement process, the network is assumed to be simple as it is aimed at mapping and represent the relationship between organization and its stakeholders or groups which have demonstrated interest or influence on the company and vice versa.

The essential issue here is to know what binds the company and its stakeholder so that these can be measured as a performance of the company thereby ensuring the existence, continuity and growth of the firm.

Network theory helps to identify the pattern of the various forms (social, formal, informal or affiliated) of relationships and the network provides analytical mechanisms for resource and information channels, status signaling and certification and social influence network (Owen-Smith, 1961; Marcon Nora, et al., 2023). The relationship that can bind the company and its stakeholders could be manifested through exchange of goods and materials, resource and money flow, status notification and contractual agreement among others (Mio & Panfilo, 2022).

b. Identification of goals and strategies

Strategically, an important reference for managers is their goal or aspiration (Neely, 2007). The main mechanisms by which goals affect performance include directing attention, mobilizing effort, increasing persistence and motivating strategy development (Locke & Latham, 1989). Performance measures, on the other hand, translate goals and strategies to organization actions and activities. They help the execution and communication of strategies among others. In this framework, the assumption is, there are valid goals and strategies already developed. Formulation and development of goals and strategies is out of the scope of this framework. The framework begins with identification of strategies and development of measures for each strategies considering the various design criteria. Therefore, the question what are the strategies or goals or objectives of the company is answered at this sublevel.

c. Identification and definition of performance measures

Performance measures are metrics that quantify the efficiency and effectiveness of actions. The actions are done to meet the goals and objectives of the company. The objectives and strategies are assumed to constitute the various stakeholders' interests, influences, needs and requirements. These requirements are quantified by making use of relevant measures. The criteria for a performance measure or measurement systems are well defined and compiled by several authors including Akyuz & Erkan, (2010); Maskell, (1989); Najmi, et al., (2005); Tangen, (2005); Yitagesu & Daniel, (2017); Franco & Bourne, (2003); Neely, et al., (1995) and the performance measurement literature is rich of these criteria

Performance measures of a company can be of various types depending on the span of time they are considered to be used; the perspectives, which the measures refer to; the level or scope the measures cover the organizations activities; and the destination of measurement information that is used for (Fig 4). Based on the span of time, they can be classified as long-term, intermediate and short-term measurements. On the basis of the perspectives they can be classified as measures of customers, employees, suppliers, financial, learning and growth, internal process, competitors, environmental, etc (Fig. 3). The number of perspectives depends on the various stakeholders the company is linked with. They can also be classified as environmental, system or individual level on the basis of the company's activities they cover. Similarly, measures could be internal or external depending on the destination of the measurement information. That means within the company environment or outside the company environment (Atkinson, et al., 1997). The external measures are designed based on the organization's stakeholders who define the external environment and, in turn, define the decisive components of its competitive strategy.

A performance measure characteristic that a measure and measurement system should fulfill can be summarized in Table 7. When designing a performance measure, be it at individual or system level, internal or external, long or short-term, they are supposed to fulfill these characteristics.

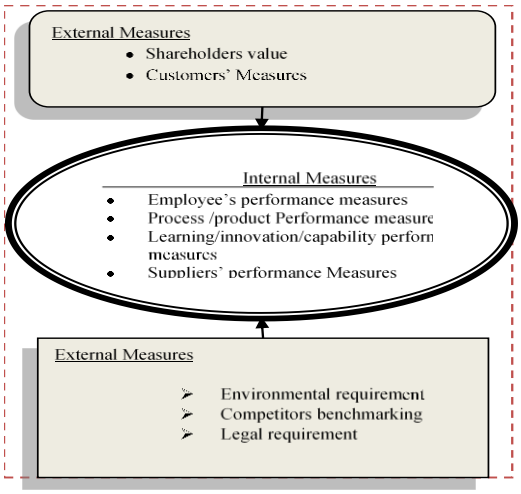

Fig. 4. Internal and External classifications of Performance measures for a company

d. Architecture of performance measurement system in the frame work

In this newly developed PM framework, goals and strategies cascading is attributed to the PM framework. Similarly, measures are designed being aligned to the goals and strategies of the company and there will be consistency among measures from the top (business or organizational level) to bottom (operational) hierarchically (Fig. 5).

Table 7
Characteristics of Performance Measures

➢ Designed to refer to specific period in time	➢ Aligned to strategies and objectives
➢ Basis on perspectives	➢ Are prioritized (key and relevant)
➢ Have defined output (information) destination	➢ Are Compatible and integrated with other systems of the organization
➢ **Have explicit purpose**	

e. Measures prioritization and selection

One major problem that is associated with the Ethiopian manufacturing industries has been found to be the large array of measures that the companies established. "Measuring everything that walks and moves" has multiple problems, blackens the role of performance measurement system and reduces organizational efficiency and effectiveness.

One major effect of having a large number of measurements is a marked lack of focus among executives and managers as to which of these are critical in a given strategic time period (Neely, 2007). Usually, there can be lack of alignment in their activities. There will be lengthy implementation times, reasonably high cost (Shahin & Mahbod, 2007), loss of momentum, and an overall inability to implement the strategic plan. This, in turn, will lead to conflict and confusion rather than alignment, clarity and efficiency. When there are critical few measurements, there will be a high degree of focus, a shared understanding around critical issues; this, in turn, results in integration and higher organizational performance. Paranjape B., Rossiter M. and Pantano V. discussed that there need to be further research in the design of performance measurement systems as the problems faced in selection and operationalization of performance measures are well documented in literature (Paranjape, et al., 2006).

Therefore, prioritization and selection of highly relevant and critically few measures that enables to measure the performance of the organization and guard against sub-optimization is the burning issue in the design of PMS and is still a major challenge in the PM literature.

Initially, the number and type of measures could be variably enormous. These measures can originate from various possible sources (Papalexandris, et al., 2005) including:

- ✓ Existing performance measures which are familiar and commonly understood by employees, and which also integrate existing performance measurement efforts,
- ✓ Case studies of similar implementations, which have proved to be a valuable source of information in many projects, and
- ✓ New measures proposed by the implementation team, consultants or stakeholders, using methods for creative thinking and idea generation such as brainstorming, alternatives from fixed points, etc.

This large array of measures usually result in information overload, measures sub-optimizations, the need of a relatively high cost and time for data collection, processing and result interpretation. This is one major reason why prioritization and selection of measures are so vital consideration in measures design process.

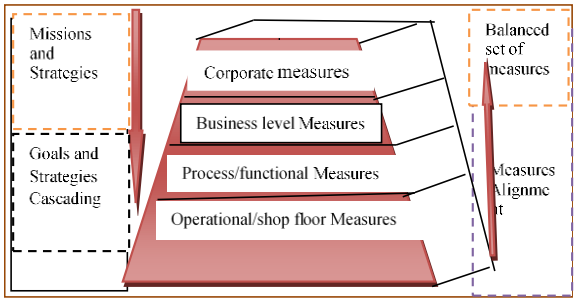

Fig. 5. Architecture of PMS in the Framework (Source: Authors)

Prioritization of the measures needs at least the criteria by which ranking or prioritizing of the measures is done. Therefore, the measurement design criteria discussed in the previous identification and defining performance measures are used to rate and prioritize the measures. The performance measures that could be once proposed in the process of measures design will be challenged by considering these criteria.

Table 8
Suggested performance Measures design criteria

No	Measure Criteria
1	Applicability of the measure in the particular organization
2	Communication potential
3	Improvement potential of the measure
4	Degree of correlation with the corresponding strategic objective
5	Measure clarity and simplicity
6	Measure Information Accuracy
7	Measure Cost Effectiveness
8	Degree of comparability potential with other performance measures used by similar organizations.
9	Degree of coherence and transparency
10	Degree of compatibility to organization culture

The type of performance measures can vary from organization to organization as the weight given for the performance measure can depend upon the criteria considered which is usually variable with business strategy and manufacturing processes of the company. For example, for tannery processing company's measures for liquid waste control is a critical issue as compared to footwear manufacturing. Similarly, performance measures related to hygiene and sanitation for food manufacturing companies is more critical than for automotive assembly companies.

The individual measures can be challenged by considering the criteria listed in Table 8.

However, challenging the individual measures only will not be sufficient (Neely, et al., 2005). The measures contained in the measurement systems further are challenged for measurement systems requirement. The PM system consists of a set of performance measures which in combination, measures the performance of the organization and enables to meet its strategic objectives. The set of measures should be checked against the PMS criteria which are suggested by various authors in literature both conceptually and empirically.

Table 9
Suggested PMS design criteria

No	Performance Measurement System Criteria
1	Guards against sub-optimization
2	Varies between locations
3	Includes measures for long and short-term
4	Avoids overlap
5	Reflect a balance between financial and non-financial measures

Source: compiled by: Author

Once the process of prioritization is done, then selection process follows. How much of the proposed and measures has to be selected so that the number of performance measures should be limited and suggested to be small in number (Kaplan & Norton, 2005; Neely, 2007; Tangen, 2005). Managers could propose a number of measures from different perspectives both from the existing and the newly introduced ones. The system designer could prioritize the measures based on relevant criteria. But what would be the cut point at the ranked or list of measures is one challenging question for managers. Kaplan and Norton suggested, for example, a total of 24 business performance measures for an Electronic Circuits Incorporated Company in a balanced manner (Kaplan & Norton, 2005). The company scorecard was designed to focus on its top executives on a short list of critical indicators of current and future performance subjectively. The executives first set 15 goals based on four perspectives of the balanced scorecard then they translate the goals into performance measures. On the other hand, a large array of performance measures is suggested by Shepherd & Gunter, (2006). Shephered and Gunter, for example, reported 132 measures, which were classified under three categories. According to Papalexandris, Ioannou, Prastacos and Soderquist, the process of selecting the measures should result in 15–25 measures, balanced between the four BSC perspectives (Papalexandris, et al., 2005). These Authors suggested this defined number of measures based on practical experience after implementation of performance measurement system. However, it has proved more effective to incorporate more measures in the leading perspectives than in the lagging measures. Here, care has to be taken not to entertain the bad side of measurements such as lack of focus among executives and alignment of their activities, requirement of lengthy implementation times, loss of momentum, and an overall inability to implement the strategic plan.

It is, therefore, the concept of 'vital few-trivial money' has to be introduced to limit the number of performance measures in a performance measurement system. After prioritization process, the critical few will be selected so that these measures optimally represent the key and critically important activities of the organization.

Similarly, selection of measures can be carried out by considering the priority weights of the measures, PMS design criteria at system level, managers or experts opinion and benchmark results of empirical studies.

Managers are usually troubled to prioritize and select their company performance measures because of the complex system of their companies, having less understanding of the companies' activities or less experience to manage and visualize their company's overall management setup. All conceptual frameworks have their relative benefits and limitations with the most common limitation being that little guidance is given for the actual selection and implementation of the measures selected (Medori & Steeple, 2000). Therefore, prioritization and selection tools, which are potentially to be used and empirically implemented, can be suggested to facilitate the decision process on how the measures should be and used. These prioritization and selection tools are simple and can easily be integrated in the design process of performance measurement system. In the performance measurement literature, the design process is restricted to list the various design criteria that a performance measure and measurement system should fulfill. The prioritization and selection of performance measures is given little attention and left for managers and executives' duty. Consequently, this reduces managers' motivation to design and use performance measures as part of their management system or result in a potential erroneous measurement system development. One of the strengths of this framework is, therefore, the consideration of prioritizing and selecting tools in the process of performance measurement system design and development process. The tools suggested are Pareto diagram, AHP decision tool (Shahin & Mahbod, 2007), Fuzzy-AHP tool (Sun, 2010), Multiple regression and Correlation analysis tools. One or the combination of the tools in prioritizing and selection of the measures can make easier and logical decision so that integration of efforts can be increased.

The output of the design sub-process in the performance measurement system development is the priotrized and selected set of measures (Fig 2). The set of measures are comprehensive addressing the issues of the various stakeholders and the efficiency and effectiveness of the organizations' internal processes. Information from the measurement systems are relevant, timely and destined at the respective individual, group or organization. They need to assure continuous improvement and growth of the organization and at the same time reflect the actual actions and results of the firm.

5.2. Implementation phase

The second phase in the newly developed performance measurement systems framework is the implementation phase. Implementation of measures does mean the process of establishment and practical introduction of the designed PM system in to the company's working systems. According to Bourne, Mills, Wilcox, Neely and Platts, implementation of PMS occurs when "systems and procedures are put in place to collect and process the data that enable the measurements to be made regularly" (Bourne, et al., 2000). It is said to be implemented when data collection starts (Romphol & Boon-itt, 2012) so that there will be integration of the performance measurement systems with the rest of the companies' working systems in a harmonized and reciprocal positive interactive manner.

In this framework, the implementation of PMS is considered as a data and information process which has its own inputs, processes, outputs and other enabling infrastructures and supporting procedures (Fig. 2). Acquiring, collating, sorting, analyzing, interpreting of performance data and disseminating of performance measurement information are the sub-processes done in the PMS implementation process (Kennerley & Neely, 2003). The sub-processes in the implementation of the system require PMS implementation components in place for effective and efficient actualization of the system and for getting the required output of the system. Different authors in the literature including Bourne, et al., (2000); Neely, (2007) and Papalexandris, et al., (2005) discuss the relevance of these components in the PMS implementation process. The components of PMS implementation are those associated with the inputs of the process (People, data, strategy/target and measure) and the PMS enablers (Supporting IT infrastructure and appropriate analytical and interpretive tools), which are discussed in the subsequent section in detail.

a. PMS implementation components

As discussed in the previous section, the implementation of PMS requires components put in place for effective and efficient Performance data measurement and information processing. The ultimate goal of PMS implementation is getting performance information which are timely, valuable and at the required destiny or point. The performance information is then used in the factual decision processes for organizational improvement and competitiveness. However, for performance measurement systems to be implemented, there are components to be acquired and put in place. The components are inputs or resources, enabling infrastructures and information processing tools and techniques. In performance measurement literatures, these components are discussed as well. Kueng, Meier, and Wettstein identified PMS components as People and IT system (Kueng, et al., 2001). Where the IT system incorporates the IT procedures, Data, Software and Hardware, their intention is to explain and make known that PMS should be engineered.

One of the inputs of the performance implementation processes are known to be the people in the manufacturing company. People in the company have different roles and responsibilities in the implementation processes. The major people types that should take part are those who

- plan and follow up the implementation project,
- give appropriate training and communicate the project and its values,
- acquire and make decision on the required resources,
- explain the project and its findings to the major stakeholders, thus, gaining approval, commitment and collaboration, and
- Rolling out of the implemented PMS to all hierarchical levels of strategy

These peoples who are responsible in the implementation process could be the management of the company, the project team, the performance measurement owner or champion. The management of the company should be committed to assign the required resources and establish the project team. The management should also have an extended responsibility in following up the proper implementation of the PMS as planned. The role of the project team will be wider as it starts creation of awareness to the employees and the major stakeholders about the value of the PMS. All project implementation activities will be conducted by the project team whereas the performance measurement owner will be responsible in supporting the technical consultation and implementation quality of the project. The study by Foroughi, et al., (2023) highlighted that there has to be a need to reevaluate the role of the operator and understanding the human on an individual level and actively design for the given individual when working with near-perfect automated systems. (Foroughi, et al., 2023).

The other input of the PMS implementation is the performance data. Performance data is required to be used in the measurement process. These are the output or outcome of the actions of the company at different level. Performance results from the activities, processes, systems or the organization as a whole that are and made relevant with relatively higher value will be collected, stored and processed to get the final performance information of the company. Performance data could generally be categorized as internal or external; qualitative or quantitative; financial or non-financial (Neely, 2007; Choong, 2014).

The internal performance data are those generated in the company by internal processes and consumed for internal measures (Neely, 2007). For example, internal performance data are from manufacturing process, research and development process, accounting process and finance processes. External performance data are those which are obtained from external actors such as customers and competitors. They are largely uncontrollable (Neely, 2007). Performance data from marketing process can be categorized in this group. Both the internal and external performance data could be qualitative or quantitative, and financial or non–financial in accordance with the performance measures designed. Thus, these data are identified, acquired, collated, analyzed and interpreted to communicate to the companies' stakeholders and used in the company's performance improvement decision process (Kamble, et al., 220).

The prioritized and selected performance measures in the performance measures design phase are now readily available to be used as input in this implementation phase. These measures are challenged for their relevance and value

as a measure of the organization actions effectiveness and efficiency while translating the strategies to actions. As the ultimate objective of performance measurement is to improve the company's performance from different perspectives, the performance of the actions of the company is compared with the corresponding target value set in the performance planning process. Therefore, targets are one of the inputs in the performance implementation process as they are used to define the relative performance level of a particular action performance.

b. Performance measurement implementation process enablers

For effective and efficient functioning of the performance management system, PMS plays a central and critical role at the heart of the performance management process (Bititci, et al., 1997). It is an important information processing system (Bititci, et al., 1997) in which performance information is generated for various purposes including for control of activities, improving performance and internal and external communications among others. This important role of PMS is enabled by IT infrastructure and the embedded analytical and interpretive tools and techniques. The efficiency and effectiveness of PMS is increased by the use of IT infrastructure (Bititci, et al., 1997; Kueng, et al., 2001; Papalexandris, et al., 2005; Neely, 2007). IT should not only be viewed as a way for automating other activities, but as a strategic enabler to efficiently use PMS and as a mechanism which enhances coordination and control abilities throughout the firm (Papalexandris, et al., 2005). In contemporary PMS, the definition of PMS assumes supporting infrastructure is part of PM. The frontline use of IT solutions in PMS is to enable easy viewing and monitoring of performance measures (Gupta, et al., 2021). It enables to have the possibility of collating all information and provide analysis possibilities for detecting patterns between the various performance measures (Papalexandris, et al., 2005). The level of support infrastructure is so wide that it can vary from being a simple method of data collection and analysis (using, for example, Excel) to a sophisticated information system facilitated by enterprise resource planning platforms or business intelligence solutions (Franco-Santos, et al., 2012). The use of flexible IT, which accommodates modification based on the organization context (Kennerley & Neely, 2003) is, therefore, an essential component of PMS implementation process.

The use of IT in PMS, however, cannot be a necessary condition (Kueng, et al., 2001). Some argue that it is imperative to select the most efficient and effective software solution for each organization (Papalexandris, et al., 2005). A PMS can exist without IT (Kueng, et al., 2001). Nonetheless, for large and medium organizations, it is highly recommended to use IT solutions, as there could be a large amount of performance data processed to increase the efficiency and effectiveness of a PMS implementation process.

Performance data analytical and interpretive tools are another essential part of PMS implementation process. Their role is to help analyze performance achievement trends, help understand problem or opportunities priorities, make cause and effect analysis and help understand degree of relationship among performance variables. These tools can be in-built system as part of the support infrastructure procedure as it is intended to collate, analyze, interpret and disseminate valuable and relevant performance data and information (Neely, 2007). The tools that are suggested include Pareto diagram, AHP decision tool (Shahin & Mahbod, 2007), Fuzzy-AHP tool (Sun, 2010), Multiple regression and Correlation analysis tools which are analytical and decision tools. One or the combination of the tools enable practitioners to make easier and logical analysis and decision process on performance information so that shared understanding, alignment, focus on critical areas and integration of efforts can be increased.

5.3. PMS use

Obviously, the output of the PMS implementation process is Performance information about the efficiency and effectiveness of the actions of the organization. The performance information is then actively used as:

- Feedback information for the management and employees accomplishments of the firm,
- Notification and reporting information for the various stakeholders of the company
- Input information for employees and management rewarding and compensation
- Company performance and competitiveness status information
- Input information for root cause analysis and continuous improvement
- Information to challenge strategies and goals

5.4. PMS review and update phase

Performance measurement literatures assert that the evolutionary path in the history of performance measurement suggests that PMS must reflect the contexts and objectives of the organization in question (Kennerley & Neely, 2003). The need to review a PMS has been suggested by various authors including Neely, (2007); Neely, et al., (1996); Medori & Steeple, (2000); Bititci, et al., (1997); Najmi, et al., (2005); Tangen, (2004); Kennerley & Neely, (2003); Papalexandris, et al., (2005) and Tangen, (2005). Missing this fact and failure not to consider the actual and current situation of the firm will result in further measurement crisis and subsequent need of investment on PMS design and implementation (Kennerley & Neely, 2003). The fact is an organization works in dynamic environment that changes over time. The dynamically changing factors are broadly categorized as changes in global, natural, business and technological trends (Bititci, et al., 2012; Goshu & Daniel, 2017). The business environment changes over time as these factors do, and this, in turn, changes the organization focus areas and strategies which call for change the PMS of the company for alignment.

In this newly developed PMS framework, reviewing the PMS as a whole and the specific measures in detail is suggested to be one critical duty of the organization implementing PMS. The PMS as a whole should be evaluated whether it has balanced set of measures, its results are aligned to goals and strategies, it is comprehensive and

consistent based on defined set of criteria (Table 9). The individual measures are to be evaluated and updated for their appropriateness. Accordingly, the PMS efficiency and effectiveness is evaluated and the associated problem and its root causes should be investigated. The problem could lie on different factors including the measures designed, the quality of the data measured, the relevance of the strategy or target set, the people manipulating the data, the IT infrastructure established, the analytical and interpretive tools used or the combination of these factors. Therefore, the investigation of all factors would be an important issue if the relevance and value of the performance measurement information is found to be lower or failed to reflect the reality of the existing condition.

Kennerley and Neely suggested nine tests for individual measures after implementation process (Kennerley & Neely, 2003). The reflection achieved from the performance implementation output to be challenged with the real situations of the firm and to be assured against for what has been designed.

After the existing performance measures are challenged and tested with these test criteria, those which will not cope are rejected or modified to go with the reality of the company. Depending upon the real situations of the firm, new measurements reflecting the actual condition will also be added and the PMS will be updated.

The frequency of measurement and reviewing the PMS are essential issues that should be decided. Several authors from both theoretical and empirical studies suggested the frequency needs to be decided (Neely, 2007; Papalexandris, et al., 2005; Tangen, 2005). Therefore, this phase involves the determination of the frequency of measurement and review for each measure. Review usually comes next to measurement. Hence the frequency of measurement and review are supposed to be equal as the phases in the PMS framework are all executed and as they are not optional. Neely has conducted a survey to determine the frequency of measuring performances of different activities. He categorized the performance measures as financial, competitive market, consumer (end user) behavior, consumer (end user) intermediate, direct trade user and innovativeness. Based on his survey result, financial measures are measured on monthly or more basis and the other measures were used to be measured on yearly or quarterly basis (Neely, 2007). Papalexandris, Ioannou, Prastacos and Soderquist have proposed the common practice in the implementation of a PMS for various measure types. According to the authors, it is common for financial measures to be collected quarterly, semi-annually or annually based on their inherent periodicity and data availability constraints.

The remaining measures, provided that they are not affected by seasonality and other factors that would make the results misleading, could be examined at shorter time-intervals (every 1 to 3 months) (Papalexandris, et al., 2005). Therefore, depending on the type of measures and their inherent characteristics of operational, strategic, long-time, short time, financial or none-financial, the frequency of measurement and review is decided and acted up on accordingly. The suggestion by Papalexandris, et al., (2005) can be worth following for initial design as it has been empirically ascertained.

Transfer of knowledge to the whole employees (Papalexandris, et al., 2005) and stakeholders is the indispensable activity to effectively and sustainably use the PMS. Proper communication media need to be designed and acted upon to transfer the knowledge and learning obtained through the design, implementation, use and review process of the PMS. The benefit of using the system for all parties, learning, the possible success and limiting factors of the PMS are communicated effectively through appropriate media including workshops, conferences, company knowledge-sharing portal, newsletters and meetings. This increases degree of focus, shared understanding and alignment and transfer of ownership, which, in turn, increases the efficiency and effectiveness of the PMS.

As indicated in the framework (Fig 2.), based on the learning from the design, implementation, use and review process of the PMS and feedback from the stakeholders, the current system will be updated to enhance the continuous improvement of the PMS and the cycle repeats.

6. Conclusion

The development of a Performance Measurement (PM) framework has provided manufacturing companies in Ethiopia with a solution to measure their performance in a simple and comprehensive manner. Unlike the existing practice, this framework encourages the use of contemporary performance measurement systems to ensure continuous growth, alignment, existence, and competitiveness. The characteristics of this framework are designed to address the specific needs of manufacturing companies in Ethiopia. The measures comprehensiveness characteristics of this framework allows for the design of measures that cater to various stakeholders, taking into account different perspectives and time lengths. The new performance measure is grounded in supporting theories that provide a deep understanding of the design, update, implementation, use, review, and evaluation sub-processes of performance measurement systems. By incorporating these theories, the framework offers an integrated and holistic approach to performance measurement. Another key advantage of the PM framework is its ability to reduce bias and simplify the design of performance measures and measurement systems. By providing clear guidelines and criteria, the framework helps companies create objective and meaningful performance measures. Unlike previous frameworks that only suggest areas where performance measures might be useful without providing much guidance, this framework offers a detailed guideline on how to identify, introduce, and utilize appropriate measures to effectively manage business performance. The framework has been developed to bridge the existing gaps empirically identified and it is, however, recommended to implement the framework for further ascertainment of its effectiveness.

The framework has been developed to address the empirically identified gaps and serves as a bridge to overcome them. However, it is strongly recommended to implement the framework further to ascertain its effectiveness. By putting the framework into practice,

companies can gather more evidence and validate its impact on performance measurement.

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