



# Assessing the Existing Performance Measures & Measurement Systems in Developing Countries: An Ethiopian Study

By Fasika Bete Georgise, Klaus-Dieter Thoben & Marcus Seifert

*University of Bremen*

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**Keywords** : *performance measurement system; key performance indicators; developing country, industrial analysis.*

**GJRE-G Classification** : *FOR Code: 290502p*



ASSESSING THE EXISTING PERFORMANCE MEASURES MEASURE-MENT SYSTEMS IN DEVELOPING COUNTRIES AN ETHIOPIAN STUDY

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Fasika Bete Georgise <sup>α σ ρ</sup>, Klaus-DieterThoben <sup>σ</sup> & Marcus Seifert <sup>σ</sup>

**Abstract** - The global integration and rapid applicability of supply chain concepts in manufacturing industries creates both opportunities and challenges for developing countries. The developing countries are becoming more open to adapting and accepting Western business practices. One of the important issues in this context is the use of the standard performance measurement systems. In the current literature, the capability to measure the performance of manufacturing industry operations can be seen as an important prerequisite for improvement. Companies have increased the capabilities of their performance measurement systems. The manufacturing industries in developed countries have been developed and implemented successfully multi-dimensional performance measures, and measurement systems for their business success. Whereas research results and data related to developing country's state of performance measures are very minimal. With the recent global integration and economic relevance of developing countries, we investigated the level of performance measurement systems in Ethiopian. The paper presents the existing practices in performance measures, and measurement systems based on case studies on twelve companies and questionnaire survey on thirty two companies'. A survey and case study results show that manufacturing industries still largely use financial and productivity performance measures. Despite the powerful advantages of performance measurement, it has not been widely implemented in the manufacturing industry in developing countries. The current performance measurement systems have faced different challenges what they did not encounter in developed nations companies. Especially, the existing infrastructures as enablers were much below the required standard. Further research and analysis could be done to adapt the performance measurement systems to the developing countries scenarios.

**Keywords** : performance measurement system; key performance indicators; developing country, industrial analysis.

## I. INTRODUCTION

Currently, businesses in developing countries have been challenged from fierce competition. Developing nations have been started to realize

their protectionism strategies at home land will not continue as best for their competitiveness. As a source of raw material for companies in developed countries, raw material preparation and semi-processed products are being produced in developing countries, sometimes thousands of miles away from the point of consumption – developed countries. During this period, the concept of supply chain management (SCM) has gained wide acceptance in the developed world. However, the benefits from supply chain (SC) concepts would be rather much better if the attempts included their developing country's counterpart. For improving the supply chain which both developed & developing countries as members, both developed and developing countries need to consider all supply chains members. There is a need for a consideration of improving supply chains from raw material sourcing process, which developing countries act as key players.

In order to gauge the effectiveness of supply chain management efforts, companies in developed countries utilize performance measurement systems. There have been many attempts to model, measure and improve the performance at the organizational and inter-organizational level in the developed countries (Chen and Paulraj, 2004; Sharma and Bhagwat, 2007; Kaplan and Norton, 1992; Keegan et al., 1989; Dixon et al., 1990; Globerson, 1985). The supply chain operations reference (SCOR) model is one of widely accepted quasi-industrial standard that proves to be extremely effective in supply chain modeling, performance measure and best practice. The SCOR model allows supply chain partners to "speak a common language" because it provides standard definitions for processes, process elements, and performance metrics. As the SCOR model offers standard definitions of performance measures for the supply chain processes, it is easier for managers and practitioners to identify relevant measures and use them. Companies in developed countries have implemented SCOR model as standard criteria for evaluating and improving their SC performance (Phelps, 2006; Galazzo, 2006; Magnusson, 2010).

In recent years, companies are cooperatively working to increase competitiveness, and gauging the performance of supply chains has become increasingly more important. In order for a supply chain to succeed,

*Author α:* International Graduate School for Dynamics in Logistics (IGS), University of Bremen.

*Author σ:* Bremer Institut für Produktion und Logistik GmbH - BIBA, Hochschulring 20, D-28359 Bremen, Germany.

*Author ρ:* School of Mechanical & Industrial Engineering, Hawassa University, Hawassa, Ethiopia.

E-mails :{geo, tho, sf}@biba.uni-bremen.de, br mailto:st%7d@biba.uni-bremen.de

companies in both developed and developing countries should measure the performance of the whole supply chain and identify areas of improvement for increased competitiveness. When looking at the textile and apparel

supply chain in figure 1, more of the upstream portion (closer to raw materials) is located in developing countries.

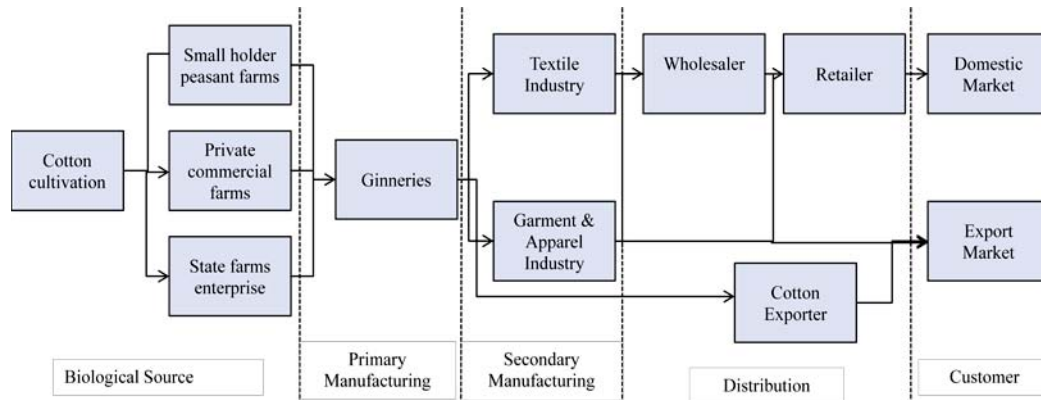


Figure 1 : Textile and garment supply chain

Efforts to improve supply chain performance by these upstream companies should be based on the expectations of their downstream supply chain members – apparel marketers and retailers. As an example, the Sri Lankan textile and garment industry is currently trying to improve productivity (Joint Apparel, 2007). Neely (1999) and Burgess, Ong and Shaw (2007) support the view that increasing competition necessitates an improved performance measurement system. Companies in developed countries are obtaining best advantages by implementing supply chain (SC) as strategies. Nevertheless, there is still a lack of significant literature on study of supply chain practices and performance measurement in developing countries (Austin, 1990; Saad et al., 2006; Georgise et al., 2011). Practitioners and managers has heard cliché “what gets measured, get done!” If the effectiveness and efficiency of an activity cannot be measured, it could not be properly controlled. For this effect, performance measurements are crucial to the manufacturing industries in developing countries also. In our research paper, we attempt to find if the key performance indicators and performance measurement systems used in Ethiopia are in line with relevant literature. To achieve this, we review the current literature on the performance measurements system and examined the key performance indicators and performance measurements systems are used in developing nations based on the experiences of the Ethiopian Manufacturing Industries. It also attempts to highlight the main enablers, barriers and challenges of performance measurement systems in Ethiopian context. We have used exploratory approach in order to gain deeper knowledge about what the problem really consists of, and further understand the phenomenon. The research question includes “what”, “how” and “why”.

- What are the problems of performance measurement systems in developing countries?
- How do Ethiopian manufacturing industries measure performance today? Are they inclined to use financial measures or non-financial ones?
- What type of performance measurement approaches used by Ethiopian manufacturers?
- What are the types of information and communication technologies enablers available in the practices?
- What are the main challenges and barriers faced for implementation of the new performance measurement approaches?

This paper seeks to answer the above research questions. The real practices in Ethiopian context were collected with help of survey questionnaire and semi-structured interview. More specifically, manufacturer asked to what extent they use various key performance indicators, whether they have a performance measurement system in place and if so, what type of system, and whether or not they had any information system to support PMS.

The remainder of the paper is divided into seven main sections. In the first, the relevant literature is reviewed on performance measurement systems. In the second, the main problems raised in the performance measurement systems in the developing countries are discussed from the literature. The research methodology is presented in section four. In the five, analyses the fieldwork data to assess the status of the performance measurements with respect to the Ethiopian manufacturing industry. The studies demonstrate how the Ethiopian manufacturing companies measures their performance; what are the available enablers to facilitate performance measurement systems; and identify the challenges and barriers for past performance measurement systems shortfalls have occurred. The last

two sections summarize the key findings and draw some conclusions related to the performance measurement in the developing countries.

## II. PERFORMANCE MEASUREMENT SYSTEMS

In recent published papers and literature, it became apparent that the terms, frameworks, models and systems, were often used interchangeably with performance measurement. For the purpose of this paper, we consider performance measurement system to be useful ways of thinking about modeling, evaluating and improving supply chain. Lee and Bilington (1992) suggested SC performance measurement systems (PMSs) are necessary for firms to successfully implement SCM. According to Neely et al. (2002) "A Performance Measurement System is the set of metrics used to quantify the efficiency and effectiveness of past actions" and "it enables informed decisions to be made and actions to be taken because it quantifies the efficiency and effectiveness of past actions through the acquisition, gathering, sorting, analysis and interpretation of appropriate data". PMSs are considered as a tool to gain competitive advantages and continuously react and adapt to external changes (Cocca, 2010).

Love and Holt (2000) and Mbugua et al. (1999) make a distinction between performance indicators, performance measures and performance measurement. As Mbugua et al. (1999) state, performance indicators determine the required measurable evidence to prove that a planned effort has achieved the expected result. Based on their definition, indicators are called measures when they can be measured without ambiguity and with some degree of precision. In other words, performance measures report clearly about the relationships between program activities, outputs and outcomes associated with them (Thomas, 2006). He also claims performance indicators are less precise than measures, as they usually provide only a proxy indication of the performance of a program or system. Thomas (2006) further continues: "whereas measures might be likened to numbers on a gauge, performance indicators might be compared to alarm bells". However, when it is not possible to find a precise performance measure, it is better to refer to performance indicators. However, performance measures and targets are key elements of performance measurement.

Research on performance measurement systems (PMS) have mostly been focused on a single company. However in the last few years focus has shifted to incorporate a supply chain perspective, with several PMS proposed (Holmberg, 2000; Van Hoek 1998; Lapide, 2000; and Chan and Qi, 2003). An important step to transform the individual business units into a fully operational integrated supply chain member is to design and implement supply chain

performance measures and performance measurement systems. From such design each business enterprise will be take a responsibility not only for its own business performance but also for the overall performance of the supply chain (Gunasekaran, Patel, Tirtiroglu, 2001). Hence there is now an increasing focus on supply chain measures and the overall performance. The organizational dependency and supply chain relationship are growing increasingly complex from linear to multi-echelon, outward-facing network. With increasing integration of global supply chain and involvement of developing countries, the manufacturing companies have faced more challenges and barriers to model, measure, and improve their supply chain. Most companies lack the tools that can quickly shift through and present data coming from supply chain partners and systems. We can observe four important questions "How to model?", "what to measure?", "what type of enablers required?" and "how to improve it?" to be tackled in order to have successful PMS. Therefore, an effective supply chain performance measurement process should be able to directly address performance areas that create sustainable profitability and financial strength. In order to accomplish this requirement, the SCOR Model, which has been developed by more than thousand member organizations and partners and which is broadly disseminated both among scientists and practitioners, is mainly used to facilitate the current challenges of supply chain modeling, evaluating and improving.

In operational supply chain, a bigger challenge is to collect, sort and analyze the data generated by each processes. The challenge for many companies lies in determining what information is necessary to drive improvements and efficiencies at each process in the supply chain, and designing an information management environment to turn the raw data into meaningful metrics and key performance indicators (KPI). Key performance indicators are measurements that directly relate to key business requirements. Information from supply chain management (SCM) processes must be collected, measured, analyzed and continuously monitored. This requires integration of data coming out of ERP (Enterprise Resource Planning), SCM and all other systems supporting these business processes. Supply chain integration software enables companies to work in partnership with other links both in upstream and downstream supply chains.

## III. PROBLEMS OF PERFORMANCE MEASUREMENT SYSTEMS IN DEVELOPING COUNTRIES

Recent years, manufacturing businesses are becoming more integrated in global businesses has forced companies re-examine their supply chain processes in order to remain in their competitive



position. Companies in developed and developing countries have realized the importance of integrating their supply chains in their improvement activities. These improvement goal set by both developed and developing countries to supply chain improvements can only realized if a sound system is established and agreed upon to measure the performance. Performance measurement systems will afford the crucial adjustment reason for effecting improvements in supply chain (Gunasekaran, 2004). Hence, most economies are moving towards organizational improvement to compete favourably in the current dynamic environment by focusing on key elements of modern management (Ohemeng, 2009; Waal 2007; Karuhanga, 2010). Lack of literature, lack of professional expertise, different cultural context, and low level of infrastructure are the main challenges for performance measurement systems in developing countries.

#### a) *Lack of research & literature*

One of relevant challenge to the concepts of performance measurement is the limited availability of literature and research on the application of these concepts in the context of developing nations. Company in developed countries has given more attention on supply chain performance with their competitors. They have less emphasis to their counterpart companies in the developing countries. Although literature on the global literature on the global supply chain integration is growing, the issue of problem in developing countries has received little attention. Much of the discussion has concentrated on global supply chain which includes developed and emerging countries supply chains and less emphasis for supply chains that developing countries participating especially Africa. Much as there is limited research on performance measurement in developing countries with 95 percent of empirical research focused on "institutional theory" in the developed world compared to only 5 percent in the developing country in the past 2 decades (Elzinga et al., 2009; Waal, 2007).

#### b) *Low level of integration*

With a variable involvement of almost all functions of an organization, and those of the other members of a supply chain, the design of a supply chain performance measurement system will require extensive involvement among supply chain members (Lee & Billington, 1992; Beamon, 1999). The key performance indicators (KPI) will need to be established carefully, considering strengths and limitations of all members, the cultural contexts and other environmental factors. Due to the complexities involved in measuring supply chain performance, very few companies actually succeed in performance measurement system of their supply chains as a whole in developed countries (Gunasekaran, Patel, & Tirtiroglu, 2001; Hudson, Lean, & Smart, 2001). The performance measurement

systems, however, must be designed at both the supply chain and companies basis (Lambert and Pohlen, 1999).

#### c) *Lack of professional expertise*

The overall lack of skills and expertise often makes it not viable for developing countries to develop complex system such as performance measurement systems. The major challenge is to identify, evaluate and select the key performance indicators, which are appropriate to assess performance. Even if the existing performance measurement frameworks are highly helpful, their adoption and implementation in the developing nation's scenarios are often constrained by different business operation environment. However, they can be used as guidance how the appropriate measures can be identified, introduced and ultimately used to manage the business. As the issues of global integration and collaboration include developing countries are becoming one of the point of research agenda, the supply chain members and strategies vary from one country to another, and the KPI are bound to reflect from differences (Karuhanga, 2010).

#### d) *Low level of infrastructure*

The other important challenge is the existing information and communication technologies, infrastructure, enablers and supply chain integration software. Lack of basic information technologies infrastructure creates tremendous barriers for smooth information flow. While the benefits of having supply chain integration software are tremendous, the costs associated with purchasing, operating and maintenance such a system can be prohibitive. In association with low enablers facilities, the performance measures data collection, analysis and decision becomes difficult one (Andersen et al., 2006).

#### e) *Cultural Context*

The new innovative performance measurement systems are created in the context of developed countries. When this new PMS are applied directly in the cultural context of developing, the systems are faced different types of challenges that did not happen in the developed nations. The PMS may not be designed to include all aspects of cultural that influence individual and organizational behaviour in the less developed countries. Because of these potential difficulties, the implementation of PMS in diverse environments is beginning to receive attention from researches (Karuhanga, 2010; Wall, 2007; Bititici, 1997). Rejc Buhovac & Slapnicar (2007) in their studies about performance measurement in Eastern Europe, they point out PMS should be designed for the context in which the company operates, implying that system arising from a developed country must be adapted in a developing country. The other most comprehensive research in PMS in developing countries is done by

Holmes, Pineres & Kiel (2006). They have argued that implementation of the PMS in developing countries is difficult due to lack of resources, politicization of public administration and corruption.

In a recent article, Neely (2005) concludes that the performance measurement system domain is a relatively mature field of academic study. Although various research articles discuss the popularity of the performance measurement systems in the USA and Europe, and the growing interest in Asia (Neely & Najjar 2006), Africa is not even mentioned. This is confirmed by the lack of scientific literature on performance management in the African context. However, there are some developments on the researches by practitioners and academicians in developing countries that have shown interest in supply chain and performance measurement systems (Abdelsalam, 2009; Deloitte, 2009; Irfan, 2008; Magder, 2005). Some of the studies like Sinkovic (2011) and Wall (2007) have researched the applicability modern performance measurement

systems in the developing countries context and proposed a research agenda (Sinkovic, 2011; Waal, 2007). Other's research results have discussed the state and challenges of supply chain and performance measurement system (Naude, 2011; Msimangira et al., 2009; Khalifa et al., 2008; Msimangira, 2003).

In certain developing countries, such as India, performance improvement efforts are being concentrated on improving productivity (Bheda, 2002; Bheda, 2003). However, instead of simply improving productivity, companies should understand the basis of performance measurement in their supply chain and improve their operations to meet the terms of performance of their suppliers and customers. This idea is illustrated by the Triple P-model (Figure 2). Here one can see that performance is constructed of profitability and productivity, and includes attributes of quality, delivery, speed, flexibility (Tangen, 2005).

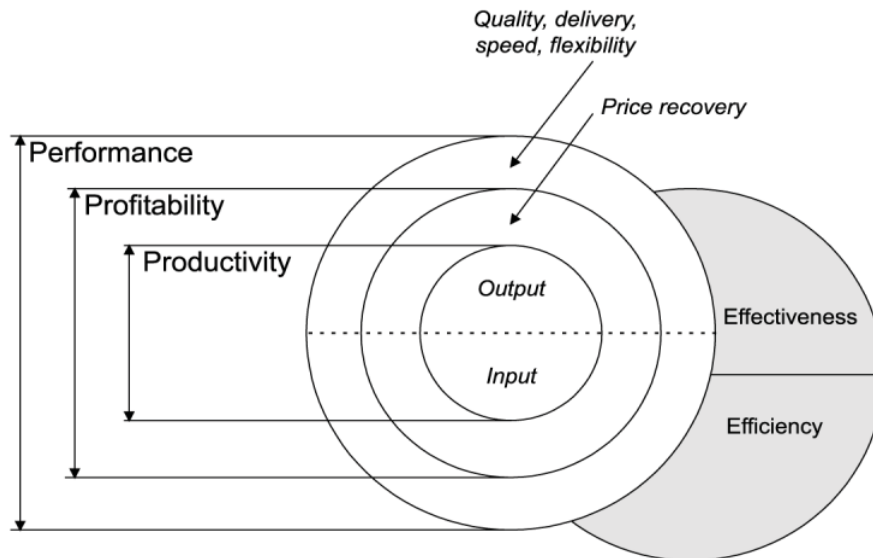


Figure 2 : Triple P-model (Tangen 2005)

However, Waal (2007) cites a number of studies, which show that of recent, there is an increasing interest in performance measurement in most organizations in some Africa countries such as Burkina Faso, Egypt, South Africa, Kenya, Ghana, Uganda, Ethiopia (Waal and Augustin, 2005; Abdel Aziz et al., 2005; Motswiane, 2004; Malinga, 2004; Tessema, 2005; Ohemeng, 2009; Kagaari et al., 2010). Despite such efforts, the consensus is that performance measurement has not made tremendous contribution to organisational efficiency and effectiveness in Africa (Ohemeng, 2009). Despite the increasing interest in performance management the failure rate of 56 percent (Waal and Counet, 2009) in the implementation process is still relatively high. Developing countries should therefore concentrate more on introducing and copying such tools and system from western world which are not

always the best suited to their local environments. There is no question that is theory adopting management practice which have proven-to be effective is a better alternative for an organization than investing limited and scare resources in efforts which do not amount to much more than `reinvesting the wheel`. And also the poor management practice, bureaucratic inefficiencies and low productivity levels in many organizations of developing countries create considerable pressure for managers to adapt speedy, ready-to implement strategies. Hence, we can observe the need for companies in developing countries such as Ethiopia to adapt frameworks suitable to their needs and context taking into account, national issue, infrastructure and organizational culture. From the literature analysis, we derive the following conclusions:

Implementation a PMS in developing countries faces challenges due to the environmental factors and contexts which did not encountered into developed countries scenarios.

- Lack of expertise and practical research in the area of performance measurement systems in context of developing countries.
- Lack of infrastructure and resources constraints creates a different challenge for the existing PMS implementation.
- Lack of experience in the selection, evaluation of KPI and PMS.

#### IV. RESEARCH METHODOLOGY

The research methodology is based on empirical data collected through a survey with help of a questionnaire and unstructured interview questions. The objective of this survey is to examine the status performance measurement systems, performance measures, information and communication technologies, and barriers and challenges for modern performance measurement systems. The objective of the study is to make more familiar through a survey, and information is collected at one point in time. The methodology was based on a survey through a questionnaire and personal interviews. Final version of the questionnaire was sent to the 200 Ethiopian companies. 32 filled responses have been received, which gives a response rate of 17%.

##### a) Research Design

Both qualitative and quantitative methodology is essentially motivated by the need to gain an insight into the level of implementation and the challenges of successful the performance measurement in the Ethiopian manufacturing industry. The methods to

collect data include literature review, semi-structured interview and questionnaire survey. A random sample 200 Ethiopian manufacturing was selected for the survey from the population of 1737 medium- and large-sized Ethiopian manufacturing companies. This contains name of the Organization, their location, main products, type of industry, and their postal addresses. Selection criterion was based on ownership structures: private & public sectors, producers for local and export markets, industry's sizes and industry groups. A random sample of 200 companies was drawn from the list of large and medium manufacturing industries. The manufacturing industry in developing countries is composed of many different sectors. In Ethiopian perspective, major manufacturing sectors are food, textile and garment, leather and leather products, beverages, chemicals, construction material and forest industries (Ethiopian Statistical authority, 2002). We have selected also 12 companies, which have volunteered for the close industrial case studies from the 200 manufacturing industries.

Figure 3 shows general research methodology for the paper. The industrial analysis and fieldwork were carried out in two stages. The first stage of the fieldwork was based on an exploratory questionnaire survey and was divided into two main parts. The first part was focused on issues related to the situations of performance measurement and type of performance measures used in Ethiopia. The second part focused on the barriers, challenges and enables for implementation of concept of performance measurement, which includes performance frameworks, performance measures/metrics and issues of application and adaptability of the SCOR model.

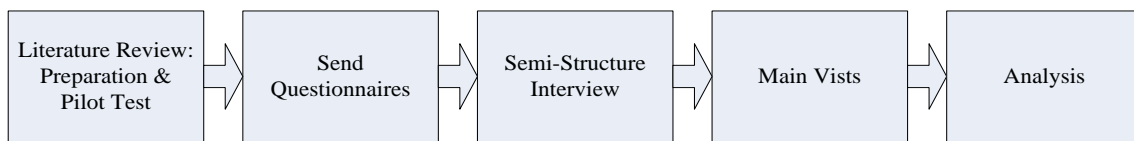


Figure 3 : Research Methodology Overview

The second stage was carried through semi-structured interviews with senior managers of Ethiopian manufacturing industries. The main objectives of the second stage were to ascertain the issues pertaining to practices of performance measurement and measures in the Ethiopian manufacturing industry and to investigate the main challenges and barriers associated with its implementation. A total of 12 top managers responsible for production operations and supply chain were interviewed. The interviewees were drawn from companies selected for questionnaire survey, which mainly respond to the survey questionnaires and three companies which did not respond to the survey questionnaires but prefer to participate in interview

activities. The duration of the interviews varied from 90 to 120 minutes. The composition of samples for both the interviews and the questionnaires were selected from Ethiopian medium and large manufacturing industries. In both cases, the respondents were decided by top managers in command of operations and supply chain.

##### b) Survey Questionnaires and interview questions development

The survey questionnaires and interview questions was developed from critical review of the literature on performance measurement system, supply chain, SCOR model (SCC, 2010; Gosselin, 2005; & Hasan, 2008). The results of literature review were used

for developing better questionnaires. This paper assessment is the part of the large empirical results. The questionnaire has been developed on a four-point Likert scale. Scale various issues of Supply Chain modeling, measurement and improvement have been incorporated relevant to Ethiopian context. The questionnaire contained 3 sections. Section 'A' contains two questions related to performance measures and measurement issues. Section 'B' contained questions related to status of information and communications technologies for information exchange and data collection such as the use of Enterprise Resource planning systems (ERP) system and Electronic data interchange (EDI) technique for data exchange. The third section 'C' contains question dealt with the main challenges and barriers for performance measures and performance measurement systems. The questionnaires was first pretested using two researchers from research institutes and two university instructors and then pretested using 10 industrial practitioners from five industrial organization from research population. Based on the feedback, revisions were required. Major adjustments were done on the number of questions per sections and scale used in the questionnaires. Furthermore, the reconstructions and minor re-wordings to questions were required to remove ambiguities and slight changes to the layout of the questionnaires to improve readability. Annexure was given in the end of the questionnaire, which contained key for the responses and explained in brief the terminology used in the questionnaire to avoid unknown bias.

On the other hand, the protocol of semi-structured interview questions was divided also into three sections. The first section was designed to collect information on the background and size of the respondent's organization. Section B: solicited information regarding the importance placed on different performance measures by Ethiopian manufacturing companies by asking them to indicate to what extent, they used performance measures. In the last section, Section C: participants were asked questions about their enables used such as organizations' information and communications technologies system and barriers and challenges existing for smooth implementation of these technologies. In particular, the respondents were requested to respond the type of a specialized software or system to support their PMS. We tried to interview persons rather high up in the company hierarchies that were involved in the strategic decision-making process, so that they could provide us with in-depth answers regarding how the company deals with performance measurement, and we were given the possibility to interview people who worked directly with matters related to performance measurement daily.

## V. RESULTS AND ANALYSIS

### a) Survey Results

#### i. Response Rate

Two questionnaires mailed to the director of manufacturing were returned as a result of having incorrect addresses. A total of 42 responses was received, 36 of which were usable, giving a response rate of 16%. The sample population was fairly evenly distributed between that who was a producer for export market firms (30%) and those who were a producer for local market firms (70%). The respondents' participation as an exporter or local markets the firms provided an opportunity to examine whether world-class performance measurement systems are only prevalent in organizations. Non-response bias can result from a low response rate and/or missing responses affecting the conclusions about the variables being examined in the study.

#### ii. Respondent Organization Profiles

The respondents were spread over a range of industry groupings with the majority being, beverages, chemicals and food industries 22%, 19% and 19% respectively. The next largest industry was leather and leather products & building materials industries with 11.3% each, closely followed by metal and metal products industry (9%). On the other hand, p industries (3%), textile and apparel (3%) were in the tail end. Figure 6 shows, the detail respondent composition and their respective percentage share. The size of the companies varied greatly, from less than 50 to 2000 employees, with annual revenue varying just as much, between 5,000 and 50 billion US dollars.

#### iii. Performance Measurement Approach

One of the aims of this research was to determine what approaches to performance measurement are used by Ethiopian manufacturers. Table 1 show that twenty-five percent of the respondents use Balanced Scorecard method of measuring performance, with 21.9% of these also employing an activity based costing approach. 9.4% of the respondents use an integrated performance measurement system; 6.2% used ISO 9000 based performance measurement system. These other approaches were specified as being only 3.1% was economic value analysis. The other, 34.4% did not state what approach they used.

Based on the answers, it is possible to observe that the most common answer was that the company did not use any performance measurement system. The most commonly used approaches are the Balanced Scorecard in original versions and Activity Based Costing. The third most common used approach is the Integrated Performance Management System. No one company is responded about the SCOR model application in the survey.



iv. *Performance Measures*

When listing the performance measures to be rated on frequency of use were composed of fifteen performance measures. Respondents were asked to state the frequency of use of each measure using a likert scale from one to four, one being never and four being always used. The mean results from this section were then tabulated. The performance measures to rate

were categories into three: financial, production, sales and customer satisfaction. The mean results from this section were then tabulated. Table 1 takes a preliminary look at the extent to which organizations used the fifteen selected performance measures. They are dominated by production measures and followed by financial measures.

*Table 1* : Types of performance measures used in Practice

Rank	Performance Measure	Mean	Standard Deviation
1	Cost of goods sold	3.67	0.75
2	Gross profit margin	3.47	0.76
3	Number of units produced	3.37	0.91
4	Amount of finished goods inventory	3.33	0.98
5	Total sales revenue	3.27	1.06
6	Amount of material inventory	3.27	0.96
7	Rate of incidence of production defects	3.10	0.87
8	Number of customer orders completed	3.10	0.98
9	Order accuracy / fill-rate	2.80	0.98
10	In-stock rates / stock-outs	2.75	1.06
11	Number of worker injuries	2.67	0.94
12	Compliance	2.60	1.02
13	Damages	2.46	1.05
14	Backlog in the delivery schedule	2.41	1.16
15	On-time delivery	2.37	0.91

v. *Organization's Information and communication technologies*

The third part of the questionnaire's survey was designed to gather information about the companies' information and communication technologies (ICT) system. In particular, whether they use a specialized software or system such as an enterprise resource planning (ERP) system, methods of information exchange and/or specialized software or systems, it was also to determine how well their information &

communication technologies system support different performance measurement. It was determined that 100 % of the respondents' do not have a specialized system. It was determined that 92% of the respondents' either do not, in fact, have an ERP system and uses for intended purposes. The supporting software/systems were, for the most part, of an in-house nature. E-mail is widely used information exchange tools extensively in foreign purchases. Table 2 shows the level of ICT implementation.

*Table 2* : Level of information & communication technology implementation

<i>Type of information and communication technologies</i>	Level of Information communication technology implementation			
	Poor	Fair	Good	Excellent
Advanced planning and scheduling software	26%/8	26%/8	26%/8	23%/7
Automated material handling system (hardware)	16%/5	148%/5	23%/7	13%/4
Bar coding/automatic identification system	15%/4	46%/12	27%/7	12%/3
Electronic mail system	10%/3	65%/20	13%/4	13%/4
Electronic data interchange (EDI) capability	31%/10	34%/11	22%/7	13%/4
Enterprise Resource Planning systems (ERP) system	46%/13	46%/13	0%/0	7%/2
E-procurement system	83%/15	11%/2	6%/1	0%/0

vi. *Main challenge & barriers for new performance measurement approach*

Some of challenges & barriers highlighted by the research include:

- The excising model specificity to the developed countries operating environment;

- Quality of skilled and cost effective workforce;
- Lack of ICT infrastructure;
- Difficulty to implement the models & handle for practical operations;
- Non systematic approach to measuring customer requirements; and

- Management practices and organizational working culture. Table 3 shows the different challenges and barriers with their respective mean value and standard deviation.

*Table 3* : Challenges & barriers of performance measurement system implementation

Rank	Challenges & barriers for performance measurement and supply chain	Mean	Standard Deviation
1	The excising model specificity to the developed countries operating environment	2.97	0.76
2	Quality of skilled and cost effective workforce	2.94	0.84
3	Lack of ICT infrastructure	2.93	0.78
4	Difficulty to implement the models & handle for practical operations	2.79	0.89
5	Non systematic approach to measuring customer requirements	2.78	0.74
6	Management practices and organizational working culture	2.77	0.91
7	Difficult to establish relationships based on shared risks & rewards	2.68	0.86
8	Lack of employee loyalty/motivation/empowerment	2.57	0.88
9	Lack of physical infrastructure	2.45	0.91
10	A lack of willingness to share needed information	2.45	0.91

*b) Interview Results*

*i. Interviewed Companies*

In-depth interview has been conducted in twelve manufacturing industries in Ethiopia. The organizations were systematically sampled from the initial list of survey respondents and volunteers who send feedback for the e-mail requests. The twelve organizations in this case study were selected because of their experience in export market and integration with global supply chains. The data collection was conducted via semi-structured interviews along with the industrial visit with top managers in the their respective organizations.

*ii. Findings from the case studies*

Based on the interview it was possible to analyze the current situation regarding to performance measurement systems and performance metrics used in manufacturing industries. The current state within the defined areas are summarized in the following table 4. Table 4 shows the summary of the current state of performance measures, and measurement implementation.

*Table 4* : Summary of the current state of performance measurement

Area	Current State
Performance measurement systems/approach/model	<ul style="list-style-type: none"> <li>- Most performance measurement systems have adopted and copied by government initiatives, no initial investigation to adopt and copy about the appropriateness at the company level, there were frequent changes after few challenges, to the new one,</li> <li>- The performance measurement efforts are limited to measuring production operations on the working floor,</li> <li>- The result of measurement are mostly used for control purpose and not actively used for improvement,</li> </ul>
Key Performance Indicators (KPI)	<ul style="list-style-type: none"> <li>- The key performance indicators are mainly focusing on cost, finance and efficiency of the production operations, and do not provide a comprehensive overview of all important areas of the company especially KPI related to customer services,</li> <li>- In most companies key performance indicators focus on productivity and cost,</li> <li>- Generally, most companies key performance indicators have not yet defined company wide perspectives and in relation with supplier and customers,</li> </ul>
Enabling Technologies	<ul style="list-style-type: none"> <li>- The performance measures data are to a large extent manually gathered,</li> <li>- E-mail and telephone are frequent used tools for information exchange within company and outside,</li> <li>- All companies did not have enterprise resource planning (ERP) software. However, some companies have started some activities to develop local software that can be applicable in different departments,</li> </ul>
Challenges & Barriers	<ul style="list-style-type: none"> <li>- Lack of updated sales information from fragmented customers like developed countries such as point of sales &amp; operation information,</li> </ul>

	<ul style="list-style-type: none"> <li>- Wrong perception about performance measurement by employees that makes the companies to focus on financial measures,</li> <li>- No serious evaluation for adopting the different performance measurement models, no follow up and evaluation to find the reason for failure from practices and challenges for implementation.</li> </ul>
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## VI. DISCUSSION

This paper presents a survey that is part of a wider study aiming adapting a performance measurement system for developing countries scenario. The purpose of this study was to collect some empirical evidence on the level of performance measurement experience in manufacturing industries. The usable sample size in the research was small. The low response rate does not support statistical analysis nor can make any generalization of the findings, certain observations be made. The findings of this study with regard to performance measures used regularly by the Ethiopian manufacturing respondents contrast quite markedly in some aspects to those found by Gosselin and Hasan (Gosselin, 2005 & Hasan, 2008). Gosselin (2005) found that the ten most frequently used measures were dominated by financial measures. Whereas Hasan (2008) studies found that production measures are most regularly used by New Zealand manufacturers. However, Ethiopian manufacturing study

got the mixture of uses both financial and production measures.

The reviewed literature has suggested that firms should put more emphasis on non-financial measures in comparison to financial measures in their performance measurement system. In addition, recently there has been a shift in the new development of performance measures to include supply chain performance measures too. However, the findings from the interviews and questionnaires show the level of performance measures not only focus on financial measures but also restricted to the organizational boundaries. Even the performance measures used inside the companies were the focus in departmental performance measures. We can observe from figure 4 the summary of the existing performance measures and industrial practices in three levels: strategic, tactical and operational performance measures. The existing performance measures still lack the recent influential measures in current businesses such as time, customer satisfaction, flexibility and reliability measures.

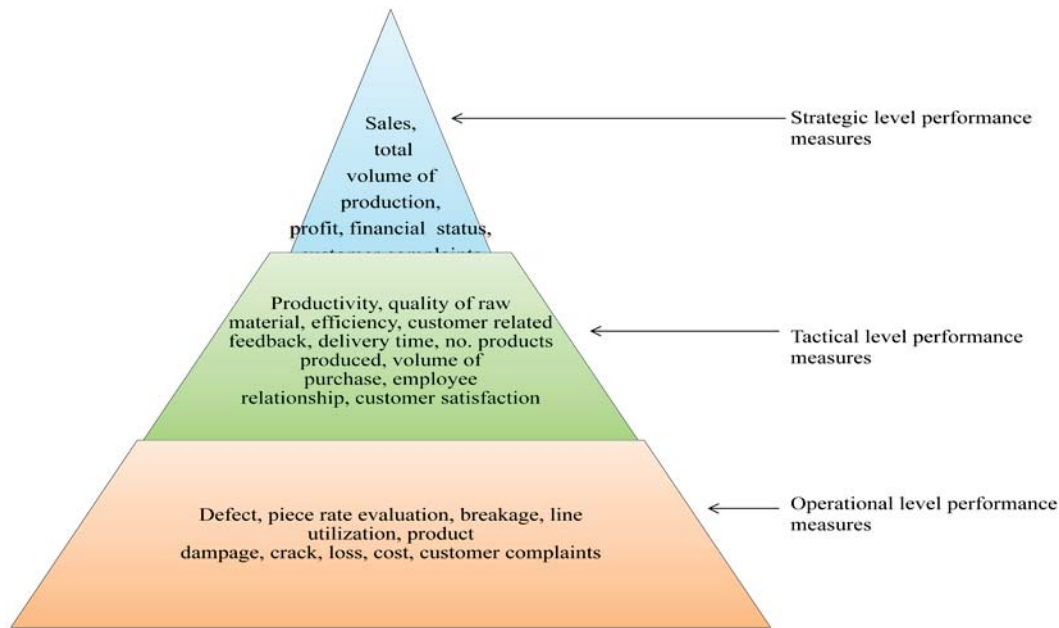


Figure 4 : Performance measures in three levels

The study also sought to find out what performance measurement approaches were commonly adopted by Ethiopian manufacturers. Over thirty percent of the manufacturing industries have not implemented any performance measurement systems. Next twenty-five and around twenty-two percent use contemporary systems, that is, the balanced scorecard and activity based costing. No clear trends were evident in the

results though, as to whether these modern PM approaches used non-financial measures to a greater extent than financial. The Balanced Scorecard literature implies that if this system is implemented correctly, non-financial measures should be foremost. Results from this study showed little or no difference between approaches. Interestingly, no organization that completed the survey was planning on adopting a new

performance approach in the foreseeable future. However, from case studies companies, only two out of twelve manufacturing industries have tried the balanced scorecard implementation. Eighty-four percent of the

respondents were not implemented any performance measurement system. Table 5 shows the summary of the performance measurement system and performance measures characteristics found in the research.

Table 5 : Performance measurement characteristics

PMS/Performance Measure	Key Characteristics
	There are some PMSs have initiatives by the government to adopt the modern performance measurement system. However, they have started without careful selection and after some trial for implementation; they have stopped & just jumped to another new one. Example government initiation to implement like Integrated Performance Measurement Systems after some trial they have jumped to Balanced Scorecard.
	Less attention has given for time and customer satisfaction.
	Recently productivity and financial have gained more attention.
	Employees are fear of performance evaluation & feel insecure.
	Only functional based measures leads reinforced functional silos fostering arms-length transactions among departments.
	Manual data collection.
	Mangers think that it was additional challenge and work burden to implement the performance evaluation & keep records.
	People are not open to discuss each other and feedback directly about performance.

The other outcomes of the research were gathered data on the organization's information and communication technologies level. Most of the companies have practiced the manual type of data collection for the performance measures data. The PMS data collection was not supported by information and communication technologies; however, financial measures were collected with better accuracy ones. Financial data collection was well supported while operational performance data collection was poorly supported. These results indicate a deficiency in current

information systems. Most of the communications within the companies were done through paper works. Some companies have started to use computer and internet facilities to supported information sharing inside the organization boundaries. The uses of the internet supported company-wide activities were rare. Most companies use the internet for international purchases and communication with foreign suppliers. Table 6 lists the major enable for communications and data collection.

Table 6 : Type of enablers for communication and information collection

Communication	Key characteristics
Enabling technologies	E-mail used mostly in communicating with foreign suppliers.
	Mail, fax, mobile & fixed phone for local connection widely used communication techniques.
	Face to Face (F2F) communication for local purchases.
	No Electronic Data exchange (EDI), No Internet based B2B tools
	No planning & scheduling software such as MRP I & II used however some companies planning Enterprise Resource Planning (ERP)
	Some local made functional based software used such as Inventory (Warehouse) Management, Budget & Finance management software,

## VII. CONCLUSION

The manufacturing industry in developing countries performs supply chain functions in the upstream supply chain as the source of raw material, which has low barriers to entry, such as textile & garment, leather and leather products industries, food industries and other's basic commodities. However, recent advancements in manufacturing technologies and dynamic market competitiveness strategies, it is supply chains (SC) rather than companies that compete.

This new trend of competitiveness will be and has already affected developing countries at large. For the intended purpose of integration and collaboration, companies in the developing countries need to upgrade their manufacturing performance with the help of new manufacturing technologies such as supply chain and performance measurement systems. The manufacturing industry in the developing companies is less likely to have formal performance measurement system, and they are concerned, basically, with survival. The industries are fewer sophisticated companies, with little automation and few design/development capabilities.



It appears that Ethiopian manufacturers are not only aware of, but some industries have started to implement the modern performance measurement system. Furthermore, the respondents indicated that the financial measures are being used more frequently than the non financial measures. However, it is also important to note that irrespective of the type of performance measurement system approach adopted, the majority of the respondents' information systems are not giving good support to their performance measurement activities. It appears that the respondent's information systems are still very much attuned to the historical dominance of the financials. No companies have tried to implement the system such as an ERP; however, there was some initiation to build house-made local software for integration different functions of the department. World class performance measurement techniques are being used, and there are indications that financial as well as non-financial measures are being used.

There is an increasing awareness about the need to integrate and collaborate with world-class players and enhance performance through the use of supply chain concepts and performance measurement systems. Ethiopian manufacturing industries are increasingly attempting to improve the coordination and integration with their suppliers both within and outside the national boundaries, especially those who have already engaged in export activities with foreign companies. However, most measurement activities are influenced by improving the tangible factors which are easy to measure such as cost and productivity. Similarly, there is reluctance to adopt and adapt already tested and proved models for performance measures and improvement purpose. There is also a less an awareness and tendency to believe that key performance measures such as quality, delivery and lead time can be improved by selecting the suppliers and customers who possess significant technical experience and expertise. The existing performance measures should be tailored to include time, quality and other supply chain performance measures.

Although implementation of the performance measurement system has been highly recommended in literature for better integration and benefits from supply chain concepts, the majorities of organizations are not using this performance measurement innovative and is still lying on the traditional financial measures. The results show clearly that there is a need to better understand how an organization in the developing countries can adapt and implement performance measurement systems and how they can manage their supply chain to improve their competitiveness with better integration with their counterpart companies in developed countries.

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