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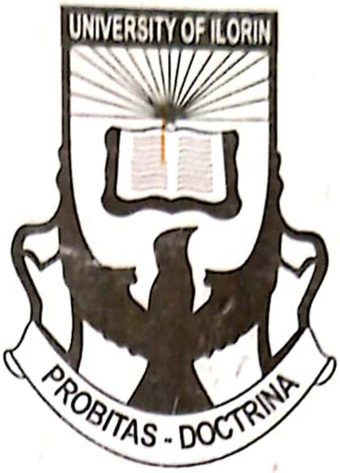
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R.T Salman

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EDITORIAL COMMENT (Vol. 13, No. 1)

This volume of Ilorin Journal of Business and Social Sciences (Volume 13, Number 1) covers a wide range of areas of research. Of the first impression left on the readers may be that it is a collection of articles scattered over multitude of themes. There are however, some structural unity and commonality in the diversity of themes covered by the articles. One common element is that they focus on contemporary problems of policy, environment, gender, health, banking and other business related issues. For instance, four of the twelve articles contained in this volume relate to one another in the area of environment; two in health; two in public policy; while the rest discusses banking and industry. It is hoped that readers will find the contents useful as well as interesting.

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VARIANCE ANALYSIS AS A TOOL FOR MANAGEMENT CONTROL: A CASE STUDY OF FIVE SELECTED FOAM INDUSTRIES IN NIGERIA.

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Abstract

The use of variance analysis as an accounting information is usually a problem confronted by management whether or not it serves as a control tool. This study therefore, examines variance and shows how it serves as accounting information as well as a tool for management control system based on output using five brands of 7 feet mattresses for the years (2001-2005). At a reference table value of F4, 4, = 6.39, the study revealed no significant difference in test of equality of the variances in all the brands for production unit: For Unifoam, 0.99; Okin, 1.16; Beta, 1.04; and Comfort, 1.0425. For sales too, there is no significance difference in the test of equality of variance for all the brands. At calculated F4, 4= 6.39, Unifoam, 1.01; Okin, 0.83; Beta, 1.01; and Comfort, 0.9. For test of difference in the means, T-test was employed. All the brands showed that there is no significant difference (1.86, 0.14, 0.19 and 0.18 respectively). Consequently, the study proposed among other things, that production departments of all brands should strive to achieve full utilization of capacity. Also, management should not rely solely on accounting target/numbers in evaluation of performance because a successful completion of operation comprises several components that interact together.

Introduction

Cost control entails that responsibility centers should be identified with the standard cost for the output achieved. Control can be achieved by comparing total actual cost with total standard costs for each operation or responsibility center for a period (Drury, 2000). The standard costs for the actual output for a particular period will be traced to managers of each responsibility center and be held responsible for the various operations.

Control over cost should be corrected through action at the point where cost is incurred. In performing an operation, standard should be set for the quantities of materials, labour and service to be consumed. Deviation from standard should be reported to management to show their causes and factors responsible for such deviation.

In variance analysis, the difference between actual cost and its budgeted or standard cost is segregated into price and quantity components. A favourable variance occurs when output exceeds input or when the price paid for a good or service is less than expected. An unfavourable variance arises when output is less than input or when the price for a good or service is greater than expected (Larry, 2003).

For accounting information to serve as a useful tool for control, it should provide an accurate representation of capability of a process. Hence, the process managers will have the ability and authority to control the components of the process (Harper, and Castellano 2000). The question that readily comes to mind is 'would variance analysis be able to provide this'? This study attempted to empirically assess the above statement and its relevance. It thus focused on the analysis of variances and how variance serves as accounting information for management control tool. The following specific objectives were pursued in order to achieve this broad aim:

i. Examination of variance based on pre-determined and actual production likewise sales.
ii. Assessment of the homogeneity of the variances of all the selected brands.
iii. Evaluation of the mean of all the selected brands for both production and sales (actual).
iv. Offering of recommendations based on the findings from the study.

The study is limited in scope, to the production and sales of five brands of 7 feet mattresses for five-years (2001-2005) and concentrated on process in relation to production capacity.

Hypotheses

In order to answer the research questions and achieve the purpose of the study, the following research propositions in form of hypotheses were formulated and tested empirically. Let H_0 be the null hypothesis and H_i be the alternative hypothesis.

Hypothesis 1

H_o: There is no under-utilization of capacity in the production of all brands.

H_i: There is under-utilization of capacity in the production of all brands.

Decision Rule: Reject H_o if there is no under utilization of capacity in the production of all brands. This is reflected in tables 1 and 2. Accept H_i if otherwise.

Hypothesis 2

H_o: There is no significant difference in the variances of all brands for production and sales.

H_i: There is significant difference in the variances of all brands for production and sale.

Decision Rule: Reject H_o if F calculated is greater than F tabulated, at 0.05 degree of freedom. Accept H_i if otherwise.

Hypothesis 3

H_o: There is no significant difference between the mean of pre-determined and actual for both production and sales of all brands.

H_i: There is significant difference between the mean of pre-determined and actual for both production and sales of all brands.

Decision Rule: Reject H^o if T calculated is greater than T tabulated at 0.05 degree of freedom. Accept H_l if otherwise.

Conceptual Clarrifications and Literature Review

Typically, management establishes accounting standards and budgets to provide some indications of what they expect from those individuals operating the system and to motivate people; management compares accounting results with the predetermined standards and budgets. Hence, where significant variance results, an appropriate action is taken depending on the direction of the variance (Eccles, 1999). Standards, which can be used for control purposes rest on foundation of properly organized, standardized method and procedures and a comprehensive information system (Lucey, 2003).

Cooper (2002) simply defines variance as the difference between what is expected and what is really received. According to Spafford (2003:2), "variance analysis is the process whereby the difference between standard cost and actual cost is sub-analyzed into their constituent parts". This means that evaluation or performance by means of variances, with timely reporting should maximize the opportunity for managerial action.

Variance can be analysed in process capability by the use of statistical process control. Deming (1993) states that statistical process control was developed by W. A. Shewart in the period between 1400 and 1600, to establish steps for the achievement of quality control in production; and to curb wastes in the use of material and labour. An Iwarere (2000) state that the extent to which actual result deviates from the planned figures is the level of positive or negative efficiency attained. Noah (2007) submits that performance evaluation is the process by which the managers at all levels gain information about performance against predetermined or pre-established criteria as set out in the budgets, plans or goals.

As a matter of facts, every firm, be it manufacturing or service, will usually set goals to be achieved and further put in place some mechanisms in ensuring that the set goals are achieved as planned. Hilton (1999) views that any good control system must contain the following three basic parts: a predetermined or standard performance level; a measure of actual performance; and a comparison between standard and actual performance. Without doubt, variance analysis is capable of detecting the level of deviation if any.

Variance

The prominent among the variance relevant in this study are direct material variance, direct labour variance, variable overhead variance, fixed overhead and idle variance. Castellano (2000) highlights likely variances that occur in production process. They include the following:

Material Variance: This comprises of material price variance and material usage variance. These measure the difference among the standard production material cost of the actual production volume and the actual cost of materials. Drury (2000) defines material variance as a measurement of the difference between the standard material cost and the quantities of material purchased and used, the total variance should be calculated as the sum of usage and price variances.
Direct Price Variance: Drury (2000) defines direct price variance as the difference between the standard price and the actual purchase price for the actual quantity of material. Direct material usage variance measures efficiency in the use of material, by comparing the standard cost of

material used with the standard material cost of what has been produced (actual production multiply by standard material cost per unit) minus (actual material used multiply by standard cost per unit). Lucey, (2003) outlines the following as likely causes of material variance.

- Paying higher or lower prices than planned. This means the processing manager do not have direct control on the price of materials to be used for production of a certain product. It is the demand and supply forces that can determine the price of a given material at any point in time.
- Losing or gaining quantity discounts by buying in smaller or larger quantities than planned. The quantity of material purchased determines the price which the purchasing manager will pay for a material. The higher the quantity produced the lower the price because a discount is sometimes given to a purchaser as an incentive to buy more.
- Efficiency / inefficiency of purchasing department. This shows the bargaining power of purchasing manager in pricing a certain material in the market.
- Buying lower or higher quantity than planned. This depends on the availability of fund with the purchasing manager as budgeted. If the price of material budgeted for is higher than what was budgeted for, the purchasing manager may decide to buy a lower quality material than planned and if the price is lower than budgeted he can decide to buy higher quality material than planned.
- Buying substitute material due to unavailability of planned material. The purchasing manager can decide to buy a substitute material when the planned material is not available in the market so that the production will not stop.
- Careless handling; pilferage: During production process, some labourers especially, if cheap labour was employed, do handle the materials carelessly.
- Purchase of inferior quality, changes in quality control. If materials of inferior qualities were purchased, the purchasing manager is very likely to use more material than expected in the production. By so doing, the quantity of product produced will be reduced. Moreso, if there is a change in the quality control of a product, this also can lead to shortage/ increase in the quantity of the product produced. This depends on quality control if it is upward or downward.

Direct Labour Variances: Blocher (1999) defines direct labour variances as the difference between the standard direct labour cost of the output, which has been produced and the actual direct labour cost incurred (standard hours produced multiply by standard direct labour rate per hour) minus (actual hour paid multiply by actual direct labour rate per hour). These comprise direct labour rate / wage variance and direct labour efficiency variance.

- ***Direct labour rate/wage variance:-*** Direct labour rate/wage variance is defined by Drury (2000) as "the difference between the standard and actual direct labour hour rate per hour for the total hours worked". Drury (2000) and Lucey (2003) opined the following as possible causes of wages/rate variance.

- Higher rates being paid than planned due to wage award. This usually happens when a company uses casual workers who do not have fix salary. The labourers do sometimes dictate amount they would collect for a specific job or work.Sometimes, the company pays more than what was budgeted for.

- Higher or lower grade of workers being used than planned. If the company eventually used higher or lower grade of workers than what was planned for, this affects the amount to be paid to the workers. It could be upward or downward.
- Payment of unplanned overtime or bonus. If the company paid the workers for overtime or bonus for the extra hours used in the production of the product produced, this eventually affects the purse of the company.

- *Direct Labour Efficiency Variance:-* Direct Labour Efficiency Variance indicates the standard labour cost of any change from the standard level of labour efficiency (actual production in standard hours multiply by standard direct labour rate per hour) minus (actual direct labour hours worked multiply by standard direct labour rate per hour) (Hilton1999). According to him, the causes of labour efficiency variance are as follows.

- Use of incorrect grade of labour: if correct grade of labourers are not employed, this can affect the efficiency of labour.
- Poor supervision: if the labourers employed were not given close supervision, efficiency of labour tends to be low..
- Incorrect materials and / or machine problem: if the materials purchased are of lower grade or the machine has fault during the production, these can affect the efficiency of labour.

Variable Overhead Total Variance: This is the difference between the actual variable overheads incurred and the variable overheads absorbed. This variance is simply the over or under absorption of overhead expenditure variance and variable overhead efficiency variance. Variable overhead expenditure variance is the difference between the actual variable overheads incurred and the allowed variable overheads based on the actual hours worked. Variable overhead efficiency variance is the difference between the allowed variable overheads and the absorbed variable overhead (Blocher, 1999; Lucey, 2003).

Fixed Overhead Total Variance: This is the difference between the standard cost of fixed overhead absorbed in the production and achieved whether completed or not, and the fixed overhead attributed and charged to the period. Total fixed overhead variance comprises of overhead expenditure and volume variance (ICAN Pack, 2006).

- *Fixed overhead expenditure variance:-* This is the difference between the budget cost allowance for production for a specified control period and the actual fixed expenditure attributed and charged to that period.

- *Fixed overhead volume variance:-* This is that portion of the fixed production overhead variance which is the difference between the standard cost absorbed in the production achieved, whether completed or not, and the budget cost allowance for a specified control period. The volume variance arises from the actual volume of production differing from the planned volume, and can be sub-divided into fixed overhead efficiency variance and fixed overhead capacity variance. Fixed overhead capacity variance is the potion of the fixed production overhead volume variance which is due to working at higher or lower capacity than standard. Capacity is often expressed in terms of average direct labour hours per day while the variance is the difference between the budget cost allowance and the actual direct labour hours worked (valued at the standard hourly absorption rate).

Idle Time Variance:- This is the non-productive hours recorded in a costing system. Idle time is usually caused by machine breakdown and bottlenecks in production, shortage of orders from customers or for any reason, the company cannot productively engage its labour force. Unproductive hours paid for is inefficiency and therefore, idle time is always an adverse efficiency variance (Harper and Castellano, 2000).

Control

Control is the process of ensuring that a firm's activities conform to its plan and that its objectives are achieved. Ducker (1964) distinguishes between 'controls' and 'control'. Controls are measurement and information, whereas control means direction. 'Controls' are purely a means to an end; the end is control. 'Control' is the function that makes sure that actual work is done to fulfill the original intention, and 'Controls' are used to provide information to assist in determining the control action to be taken.

'Control' will indicate that costs exceed budget and that this may be because the purchase of inferior quality materials causes excessive wastage. 'Control' is the action that is taken to purchase the correct quality materials in the future to reduce excessive wastage.

The difference between strategic control and management control is that strategic control has an external focus. The emphasis is on how a firm, given its strengths, weakness and limitations, can compete with other firms in the same industry. On the other hand, management control systems consist of a collection of control mechanisms that primarily have an internal focus. The aim of management control systems is to influence employees' behaviour in desirable ways in order to increase the probability that an organisation's objectives will be achieved.

Merchant emphasized that senior managers do not have to be knowledgeable about the means required to achieve the desired results or be involved in directly observing the action of subordinates. They merely rely on output reports to ascertain whether or not the desired outcomes have been achieved. Accounting control system can be described as a form of output controls. They are mostly defined in monetary terms such as revenues, costs, profits and ratios, e.g. return on investment.

Result controls resemble the thermostat control model. Standards of performance are determined, measurement systems monitor performance; comparisons are made between the standard and actual performance and feedback provides information on the variances.

Management Control

Management control in an accounting context, is defined by Asaolu.and Nassr (1997) as: "a process whereby expectation and actual performance are compared and the comparison will serve as basis for determining the appropriate reaction to the operating result". Management control system is a system designed to ensure that organizational strategies are implemented. The accounting information system provides the information necessary to make the management control system work. Employees at each level must understand what they are expected to do, and then they need feedback indicating whether or not they are doing it. Managerial decision-making is usually based on relevant and related information, which will affect the organization as a whole. This is with the aim of attaining the goals and objectives of the organization. It has also been argued that sound management involves sound decision-making, which is scientific information dependent (Owolabi, 2000).

Any control should have three parts: a predetermined or standard performance level; a measure of actual performance; and a comparison between standard and actual performance. Budgeting, standard costing and variance analysis have all these three. Apart from the three basic parts, variance analysis has above the two others, the means of analyzing operation in process capability with the use of statistical process (SPC). Rius, et. al. (1997) on their part postulate multivariate statistical process control. This model was accessed by comparing the prediction of the model with actual performance to ascertain the level of deviation from plan.

The need for accounting information in any organization especially, in manufacturing industries cannot be over-emphasized. This will not only assist the management in the planning but also the control of the future events.

Apart from the control of the future events, the information provided through the variance analysis, helps the manager to segregate this variance into price and quantity component. Another effect of the variance is that, it helps to determine the measurement system, monitor performance and comparisons are made between the standard and actual performance.

Methodology

Source and Method of Data Collection

Data used for this study were mainly secondary. These include production and sales figures for 7 feet mattress from both production and sales departments of five brands of mattresses studied. The data were subjected to statistical techniques such as F distribution and student T distribution.

Testing of the significance of difference between the variance of two different variables can be done using F-test depending on the sample size. Two different samples (i.e. variables) must be present before F-test can be conducted. Here, from the data obtained there are two variables that are predetermined and actual figures for both productions and sales hence, F-test was then used to analyse and test the significance of difference that exists between the variances of production and sales as proposed in our hypotheses.

The significance of the difference between the mean of two different samples can be tested using either paired t-test or Z-test depending on the sample size. If the sample size is less than 30, t-test is used; otherwise, Z-test is to be used. For this study therefore, t-test was adopted since the assumptions underlying its use were present in our data.

The Model

The test of the significance of difference between the variances can be obtained by:

$$F = \frac{S^2 \text{ actual}}{S^2 \text{ predetermined}} \quad fv_1, v^2 \alpha$$

For production and sales Decision: Reject Ho if F-calculated > $F_{v_1, v_2}\ \alpha$ and accept it if otherwise.

Where: S^2 = Standard deviation
α = Alpha,
v_1 = verse α of actual,
v_2 = variance of predetermined test of difference in means.
v_1 and v_2 = degrees of freedom of actual and predetermined units respectively.

$$t = \frac{/x_1 - x_2/}{\sqrt{\frac{2S^2}{N}}} \quad tN_1 + N_2 - 2\ \alpha$$

$\alpha = 0.05$

$$S^2 = \frac{N_1 S_1^2 + N_2 S_2^2}{N_1 + N_2 - 2}$$

$N_1 + N_2 - 2$ = the degree of freedom

Decision: Reject H_o if $t > tN_1 + N_2 - 2, \alpha$ and accept other wise for both productions and sales means in all the brands.

Where:

X_1 = mean of actual
X_2 = mean of predetermined
S^2 = variance
N = Number of observation
N_1 = Samples of production
N_2 = Samples of sales
S_1^2 = Variance in actual
S_2^2 = Variance in predetermined

Results and Discussions

The secondary data obtained are presented in Tables 1 and 2, comparing predetermined and actual production units, likewise sales figures revealing the level of variance.

Table 1 Production in '000 Unit

Types of foam	1	2	3	4	5
Unifoam: Predetermined	599.67	679.86	719.73	963.80	986.38
Actual	595.01	669.84	720.00	942.01	993.85
Okin: Predetermined	425.82	442.14	469.51	506.46	567.42
Actual	423.98	404.50	471.01	508.22	571.39
Standard: Predetermined	586.79	597.29	772.94	828.72	934.35
Actual	497.87	582.32	800.49	803.23	923.57
Beta: Predetermined	725.81	891.27	990.20	856.03	901.73
Actual	714.15	885.20	990.21	870.00	903.31
Comfort: Predetermined	634.72	728.65	572.00	603.14	650.21
Actual	609.75	742.83	558.92	610.41	625.90

Source: Records of case study firms.

Table 1 shows figures for production in thousand (1000) units for predetermined and actual figures of the five brands of mattresses studied.

In periods one (1), two (2), and four (4), there were under utilization of capacity in production because actual figures were less than the predetermined figures in all the mattresses studied. For *Unifoam* the actual figures were less than the predetermined figures with the following 4.66, and 10.02; *Okin*, 1.84, 37.64, 3.97; *Standard*, 89, 149 and 28; *Beta*, 12, 6.07, and 1.6; *Comfort*, 14 and 7.29 respectively. This may have been so because the standard set might have been too high for the available resources on ground for all the brands of the mattress studied. It could also be as a result of mismanagement of material and labour used for production.

Periods four (4) and five (5) show evidence of over- utilization of capacity. That is, the actual figures were higher than the predetermined figures for most of the brands. This could be a result of low standard compared to the available resources. It could also be that the purchasing manager has good purchasing power. That is, buying more quantities than expected, because of low pricing than was planned for.

Table 2: Sales in '000 Units

Types of foam	1	2	3	4	5
Unifoam: Predetermined	595.01	669.84	720.00	942.01	993.84
Actual	593.00	670.83	642.82	947.21	959.38
Okin: Predetermined	423.98	404.50	471.01	508.22	571.39
Actual	419.52	406.94	377.56	501.15	497.46
Standard: Predetermined	497.87	582.32	800.49	803.23	923.53
Actual	495.75	584.20	759.78	800.35	917.39
Beta: Predetermined	714.15	885.20	990.21	870.00	903.31
Actual	700.27	889.48	972.00	865.52	798.57
Comfort: Predetermined	609.75	742.83	558.92	610.41	625.90
Actual	548.38	699.75	551.03	600.84	621.87

Source: Records of the case study firms.

Table 2 shows the figures for sales in thousand (1000) units for predetermined and actual figures of the five brands of mattresses studied. From the table, one can see that the actual sales figures in periods 1, 3, 4 and 5 were less than the predetermined sales figures in all the brands of mattresses studied. For *Unifoam*, 0.99, 77.18 and 34.46; *Okin*, 4.46, 93.45, 7.07 and 74; *Standard*, 2.12, 40.71, and 6.14; *Beta*, 13.88, 18.21, 4.48, 104.74; and *Comfort*, 61.37, 43.08, 37.89, and 9.57. This could be as a result of setting high price for their products compared with other products of the same standard.

It is only in period two (2) that actual sales was greater than the predetermined in all the brands studied, except for *Unifoam* brand, which exhibits the same trend in period four. This could be caused by giving out their products at lower prices than other products of the same standard. Despite the fact that these variances were insignificant in the most cases, there are still deviations, which serve as pointer to the management in taking decision in their future production and sales figures.

Hypothesis One

The study reveals that there was under-utilization of capacity or capability. A comparison of Table 1and 2 in periods 1, 2 and 3 for all brands reveals that ,the targets were not met in these periods. This can be synchronized to some extent with Deming`s (1993) study which stated that:

> *It would be inappropriate to use accounting target to control people, processes, and to motivate employee behaviour. The quality of the components and their*

> *interactions determine the process capability not just the people operating the system.*

In the same vein, Harper and Castellano (1999) equally say:

> *It is impossible to effectively measure an individual contribution to a system because his or her contribution cannot be separated from the system's.*

Hypothesis two

Table 3: Test of equality of variance production & sales (F – distribution)

Types of foam	N	DF	F-Calculated		F-Tabulated
			Production	Sales	
Unifoam	5	4	0.99	1.01	6.39
Okin	5	4	1.17	0.83	6.39
Standard	5	4	1.17	0.99	6.39
Beta	5	4	1.04	1.02	6.39
Comfort	5	4	1.15	0.91	6.39

Source: Computed by researcher.

Table 3 shows the equality of variance in productions and sales of all the brands of mattresses studied with the use of F-distribution statistical technique. The F-calculated in all the brands of mattresses for both productions and sales were very low and of the same range. F-calculated 0.99 to 1.17, less than F-tabulated. This result confirmed our Null hypothesis; hence, Null hypothesis is accepted.

Hypothesis Three

In table 4, the difference in mean was examined using T-distribution as our statistical tool. The T-test calculated in testing the mean in productions and sales of al the brands were less than T-tabulated at 5 percent significant level.

Table 4: Test of Difference in Means (T test)

Types of foam	T-Calculated		T-Tabulated
	Production	Sales	
Unifoam	0.05	0.31	1.86
Okin	0.15	0.81	1.86
Standard	0.20	0.08	1.86
Beta	0.01	0.38	1.86
Comfort	0.18	0.55	1.86

Source: Computed by researcher

T-calculated for *Unifoam* is 0.0587 less than T-tabulated at 0.05, which is 1.86. The same thing happened in all the brands. Hence Ho is accepted. Sequel to the findings from hypothesis 2 and 3 results, which show that there is variability between the predetermined, actual production and average (mean), is in line with Harper and Castellano (1999) who affirm that:

> *For accounting information to serve as a useful tool for control, it should provide an accurate representation of capability of a process.*

Hence, the studied establishments can use predetermined figures to represent the actual figure since the variance between them is so insignificant.

Conclusions and Recommendations

Based on the findings it could be concluded that variance analysis is a useful tool for management control system, with the use of F-distribution and T-test. F-distribution shows that there is no significant difference between the variances of all the brands of mattresses studied. The study observed that the variances in both predetermined and actual figures were so small hence, the management of the establishment studied could use either predetermined production figures – to project their future productions likewise the same thing for sales. Furthermore, where there were under-utilizations of capacity, it is suggested that establishment studied should make use of the resource judiciously to maximize profit.

T-test shows that there is no significant difference in means of all the brands of mattresses studied. This shows that one can pick the result of one of the brands studied to estimate or project the performance of the other.

On the whole, the issue of what really brings about the variances was not known. It is not known whether prices set by all the brands studied were at fault or other factors are responsible for the variances. These and other issues may be taken upon in subsequent research.

The following recommendations are proffered based on the findings of the study.

(i) Production departments of all the brands studied should strive to achieve full utilization of capacity in their operation since the organizations have the potentials;

(ii) Since there is variability between the predetermined and actual, the establishments can use either predetermined or actual figures of productions to make estimate of sales and turnover;

(iii) Management should not rely solely on accounting target/numbers in evaluation of performance because a successful completion of operation comprises several components that interact together.

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