

Towards Optimal Operational Decision-Making in Manufacturing Operations: an Integrated Cost Management System (ICMS)'S Approach

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Abstract

This study was carried out to investigate the relationship between Integrated Cost Management Systems (ICMS) and Operational Decision-Making (ODM). ICMS is a framework that emphasizes the relationship between information flows and decision-making at various levels of the organization by seeking to identify those essential data elements that must be shared between individuals, team, departments, processes and entities for effective coordinated decision-making and action to occur. The operationalized definition of the ICMS theoretical construct in this study is encapsulated in the concepts of Traditional (full) absorption costing (TAC), Throughput Accounting (TA), and Activity-Based Costing (ABC). While, Operational Decision Making (ODM) was operationalized via the factory floor measures of work –in-process inventory values, finished goods inventory values, cycle time and number of jobs in the shop. The result found that there is a positive and significant relationship between ICMS and ODM. A proper synergy of the strengths of the various cost management systems would lead to improved work in process inventory values, better finished goods inventory values, reduced cycle time and reduced number of jobs or orders in the shop, thus contributing positively to optimal system's performance.

Key words: Integrated Cost management system, operational decision making, traditional absorption costing, throughput accounting, activity-based costing.

1. Introduction

The ultimate strategy of any profit oriented business enterprise in this era of stiff global competition is to maximize profits in the present, while positioning for continued maximization of profits into the future. To maximize profits, the firm must produce the right product mix, with the lowest overall costs that assure product quality and customer satisfaction.

In the early part of the twentieth century, Cost Accounting was introduced as a method of product/service costs accumulation to improve management decision-making which was necessitated by the need to obtain accurate product costing for price and profitability decisions. Since then, cost accountants have focused more and more of their efforts on improving the profitability of individual products and product lines, especially in large organizations. The consensus was that a localized improvement in product profitability improved the profitability of the firm as a whole. But today a growing number of scholars like Goldratt (1983), Johnson and Kaplan (1987), Demarco (2001) have indicated that localized improvement do not necessarily mean global improvement and in many cases have exactly the opposite effect.

Johnson and Kaplan (1987) noted that almost all of the Cost Accounting Systems in use today were in place by 1925. Since that time, cost accounting innovation has not kept pace with the evolution of product and process technologies. They concluded that cost accounting information resulting from procedures and timing of the organization's financial reporting system, is not timely, is excessively aggregated and is too distorted to be relevant for managers' tactical decision-making. One result is that management has made decisions, largely based on cost accounting information, to re-engineer their organizations to drive out costs to the point that middle level management, administrative assistants and other support positions have largely disappeared from corporate organizations. In this regard, Demarco (2001) concluded that in retrospect, many of these positions provided the slack needed in the organizations to facilitate change and to absorb the negative effects of unforeseen requirements. Without these structural support positions, most organizations have lost much of their flexibility and their ability to manage change and to cushion unforeseen market fluctuations. Demarco (2001) echoes Goldratt's (1983) warning to management about inappropriately cutting apparent excess capacity. Goldratt (1983) posited that an industrial firm facility must be somewhat unbalanced to survive. It must have excess capacity or slack to enable it to meet surges and emergencies that routinely occur in manufacturing

operations. These criticisms of early cost accounting methodological information generation frameworks led to a paradigm shift in models of information generation frameworks for internal reporting purposes.

These developments did not foreclose the general understanding that accounting, in all its ramifications, is an information science designed to provide decision-useful information. This underscores the various methodological paradigm shifts that have been advocated in the field of Cost and Management Accounting to generate decision-useful information, geared towards satisfying information needs of internal reporting for planning and controlling operations, for making special decisions and long range plans. These methodological nuances range from the old Traditional Absorption Costing model to the more recent typologies of Throughput costing, down to Activity-Based Costing (ABC)/Balanced scorecard (BSC), Kaizen costing systems etc. Proponents of each methodological paradigm emphasized the superiority of their models by underscoring the shortcomings of other models.

Studies by Atkinson et al (1997), Hoque and James (2000), Ittner, Larker, and Randall (1997), Ittner and Larker (1998), Kennedy and Affleck Graves (2001) noted that ABC information system provides more accurate cost information for long-term (strategic) decisions, but is not so helpful in the short-term (tactical). Cooper and Kaplan (1992) in defence of ABC systems argued that it was never intended to be models for short-term (operational) decision-making. But what they fail to realize is that in the long run, every long term takes on a short term component. In fact, the long term is nothing more than an aggregation of short terms. Furthermore, Kaplan and Atkinson (1998) posited that traditional method of allocation of fixed factory overhead presents a false picture of true product costs, encourages growth in inventory levels, and often leads to inappropriate decisions. For instance, the absorption costing model can lead firms to turn away business because it appears to be unprofitable. But where excess capacity exists, additional manufacturing jobs where the sales price is sufficient to cover all variable cost, with some margin contribute positively to overall firm profitability. Thus, operational (tactical) decision-making is dependent on the quality of information on which the decisions are based. In this regard, Goldratt (1990) proposed a simple methodological paradigm, Throughput Accounting (TA) for providing information for tactical decision-making.

In keeping with the tenet of methodological divides, critics of TA argued that it is short-term focused and does not provide adequate product costing information for long-term decision-making. To their criticisms, Goldratt (1990) retorted that the long-term is nothing more sophisticated than a series of short terms. Drawing inspiration from these methodological divides, our supposition is that integrating the strengths of each methodological paradigm would create a better synergy that would enhance the information science function of the Cost/Management Accounting Information System. In this regard, several methodological dimensions exist in the literature, but the focus here is on integrating Traditional Absorption Costing (TAC), with Throughput Accounting (TA) and Activity-Based Costing (ABC) systems and measuring its impact on tactical decision-making. Where tactical decision-making is operationalized via the factory floor measures of work in process inventory values, finished goods inventory values, work order cycle time and number of jobs in the shop premised on the submission of Boyd (1999) and Whittenberg, (2004)

2. Literature Review

Until 1997, Management Accounting Decision-making Information discussion in the literature was primarily conceptual. Thereafter, several empirical studies (Hoque and James, 2000; Ittner, Larker and Randall, 1997; Ittner and Larker, 1998; Kennedy and Affleck-Graves, 2001) were conducted concerning Activity-Based Costing (ABC). This research stream supports the use of ABC-based ICMS for strategic decision-making but does not support ABC for operational decision-making. There remains no empirical based research related to Throughput Accounting (TA). Several conceptual articles discuss the virtues of integrating ABC and TA (Campbell, 1995; Campbell, Brewer, & Mills, 1997; Hall, Galambos and Karlsson, 1997). All conclude that ABC is more strategically orientated while TA is more tactically oriented. None provides empirical support for this conclusion. The natural tendency, given the capabilities of the modern microprocessor, is to define the cost elements with greater granularity to gain greater "precision" in costing. However, does that generate better decision-making information? Does it make the firm more profitable? This study proposes that the answer to both questions is, "Not necessarily". In support of this statement, Briers, Chow, Hwang, and Lockett (1999) found that the solution to an inaccurate product costing system might not be a more refined system. Their finding extends Bruns and McKinnon (1993) and Gupta and King (1997) assertion that a more cost effective approach may be to provide an array of systems level information rather than expending resources on perfecting the ICMS design. Atkinson et al. (1997) found three topic areas for which they recommended empirical research. The third topic, the role of management accounting information in supporting both tactical and strategic decision-making, is clearly related to the present study. Atkinson et al. (1997) conclude that operational strategies raise several

questions about the interaction between management accounting systems and the way resources are organized, but have been subject to relatively little empirical work. They suggest that this neglect exists because there is not a specific theory concerning such interactions. As discussed earlier, several studies [Hoque and James, 2000; Ittner, Larker and Randall 1997; Ittner and Larker, 1998; Kennedy and Affleck-Graves, 2001] have been conducted since Atkinson et al. concerning ABC. Atkinson et al. (1997) concluded that because of the considerable appeal of Goldratt (1983)'s message to operating managers, research was needed to scrutinize accounting's approach to tactical decision-making and how variances focus and affect decision-making within the organization.

Foster and Young [1997] found that much of the management accounting literature concerned proposals for new costing systems, new performance measurement tools, and new budgeting systems. Each of these studies argued that the proposed system was better than existing systems. What was missing from the literature was empirical analysis of what an improvement means, how an improvement was measured, and the challenges presented by the new system. According to Hilton [1999] there are listed five major objectives for management accounting activity, and thus ICMS, within business organization: To provide information, both strategic and tactical for decision – making and planning; To assist managers in directing and controlling operational activities; To motivate employees and their managers towards the goals of the organization; To measure the performance of operational activities, sub-units, managers and employees; To assess competitive position in the short-term and to ensure long-term competitiveness in the industry.

Lea [1998] concluded that ABC costing led to better product mix decisions, higher profits, higher service levels, and lower WIP inventory than either absorption or TA in a JIT environment. She concluded that absorption costing led to better product mix decisions and better overall performance than either ABC or TA in a TOC environment and that both absorption costing and ABC provide better overall performance than TA in a MRP environment. From these conclusions, the results indicate that ABC and traditional costing provide better costing performance than TA (Lea, 1998). Sale, (1999) explored implementing three TOC factors of Logistics, Thinking processes, and TA into organizational management incrementally, and their impact on outcome and business performance. Outcomes that were measured include decrease inventory levels, shorter product cycle times, smaller production runs, improved due date performance, improved production flow, increased product diversity, pricing flexibility, and improved manufacturing flexibility. Sale (1999) found that implementing DBR alone resulted in a statistically significant negative consequence in business performance. This finding derives from the respondents in the survey reporting that when they implemented DBR without TA, they experienced negative results in performance. He did not find a relationship between thinking processes and performance. However, using TA measures alone had positive effect on business performance. The study concluded that implementing all three TOC factors synergistically (DBR, Thinking processes, and TA measures) resulted in the largest improvement in outcomes, which then led to improved firm performance. Hence Shields (1997) emphasized the need for more empirical research in Management Accounting. This forgoing background necessitated the determination of the impact of ICMS on tactical decision-making.

2.1 Hypotheses Development

Several researchers including Cooper (1996), Johnson and Kaplan (1987) Johnson (1992), Kaplan (1990), Kaplan and Norton (1996), Atkinson et al (1997) concluded that management must have better decision-making information from the volumes of data they have available to them. However, there is no agreement on how to coalesce that data, how to present it, or how to use it beneficially. Hence, Fritzsich (1997), Kee (1997) and Spoede (1996) opined that integrating the strength of all minimizes the weaknesses of each management accounting systems. Thus, H_1 to H_3 are derived as follows:

- H_1 : *There is a significant relationship between traditional (full) absorption costing information-based ICMS and operational decision making.*
- H_2 : *There is a significant relationship between throughput accounting information based ICMS and operational decision-making.*
- H_3 : *There is a significant relationship between activity-based costing information ICMS and operational decision-making.*

3. Methodology

The sampling frame is based on the official list of manufacturing firms listed on the Nigerian Stock Exchange. From this sampling frame a total 82 manufacturing firms were obtained using simple random sampling. A structured questionnaires was used to obtained data on all dimensions of (ICMS) operationalized in the study and measurable outcomes of operational decision making (ODM) resulting in a response rate of 77 percent. The data collected was then analyzed using the statistical package for social science (SPSS 14.0). Furthermore, the

Cronhach's Alpha score was 0.9 exceeding the threshold of 0.7 suggested by Nunnally (1978). The resultant hypotheses were tested using the regression model.

3.1 Test Results

H ₁ :	MultR	Rsq	AdjRsq	F(Eqn)	SigF	RsqCh	FCh	SigCh	Variable	BetaIn	Correl
	.7877	.6204	.6174	204.328	.000	.6204	204.328	.000	In: I	.7877	.7877
H ₂ :	MultR	Rsq	AdjRsq	F(Eqn)	SigF	RsqCh	FCh	SigCh	Variable	BetaIn	Correl
	.7689	.5912	.5879	180.765	.000	.5912	180.765	.000	In: T	.7689	.7689
H ₃ :	MultR	Rsq	AdjRsq	F(Eqn)	SigF	RsqCh	FCh	SigCh	Variable	BetaIn	Correl
	.7558	.5712	.5678	166.510	.000	.5712	166.510	.000	In: AB	-.7558	-.7558

The result from H₁, H₂ and H₃ indicated that all three hypotheses under consideration showed a positive and significant relationship between the predictor and criterion variables espoused in the study. In specific terms, the regression test results were 0.79, 0.77, and 0.76 for the three hypotheses respectively as indicated above. All three hypotheses panned out from the results of the multiple regression analysis presented above. They were statistically significant, which formed the basis for the conclusion reached below.

4 Conclusion

Examining the impact of ICMS on ODM revealed very informative results. Previous studies by Cooper and Kaplan (1999), Kaplan and Atkinson (1998) Hoque and James (2000), Ittner, Larker and Randall (1998) Kennedy and Affleck-Graves (2001) Goldratt (1990), Srikanth and Umble (1997) have all argued on the usefulness of various management accounting systems – now integrated costing systems- for decision-making. There is no agreement among the various researchers as to which system best satisfies the information needs of management decision-makers. Traditional Absorption Costing (TAC) information was criticized by Cooper and Kaplan (1988), Goldratt (1983), Goetz (1949) etc. Despite these criticisms, as noted above, traditional absorption costing (TAC) systems are the predominant systems in use in manufacturing firms today (Zimmerman, 1997; Braide, 2000). The predominance of TAC is not unconnected with the fact that it is the only system that meets the requirements for legal reporting and Generally Accepted Accounting Principles (GAAP). Further, the proponents for the outright discarding of TAC through the application of their alternative paradigms were soon to realize that, their systems were not defect free. Obvious limitations were soon discovered when tested empirically. Strictly speaking, Activity-Based Costing (ABC) is not an alternative to absorption costing. ABC, like absorption costing, ultimately traces all overhead to cost objects. The difference between traditional absorption costing and ABC, involves the complexity of the allocations and how the cost allocation bases are chosen. Thus, ABC also comes with its own limitations (Zimmerman, 1997, and Goldratt, 1997). ABC has also been criticized for been too expensive to operate and that its strategic focus limits its usefulness. On the other end, criticisms leveled against Goldratt's TA range from complete disregard for capturing true product cost to over simplicity.

What is clear from the foregoing is that no single system has the capacity to satisfy all information needs of decision makers, thus, lending credence to the need for integration or harmonization. Hence, the finding in this study is quite informative and considered very relevant. Achieving an effective enterprise-wide approach to cost management requires critical changes in the way that managers think about cost management. In particular, they must cease to view cost management as an accounting or finance issue and instead see it as a managerial one. Drawing from a combination of all enhances decision-making at all levels of management. Integrating the strength of each minimizes the weakness of all (Spoede, 1996:45; Kee, 1997:48; Fritsch, 1997:83). The inference that there exist a strong and positive relationship between ICMS and ODM as averred by this study is quite significant. This is because in this current information age and the wherewithal provided by the ICT world, which takes the steam of out of individual models emphasizes the need for an integrated cost management model which has greater capacity for providing more decision useful information to support management decision.

It is informative to note that tactical decisions are made within the context of strategic decisions. Operational managers draw their decision making leverage from the general policy framework provided by top management – that is at the strategic level. There is a common thread that links tactical decisions to strategic decisions. As derivatives of strategic decisions, they are building blocs towards achieving strategic goals. Strategic decisions are the global – the systems decisions. While tactical decisions are the subsystems (SBU) decisions. Therefore, outcomes of tactical decisions must gravitate towards the entire system's goals as required by the teleological characteristics of systems theory. Newman (1991) and Thompson and Strickland (1998) also pointed out the fact that tactical decisions must be made within the policy framework provided by top management.

The above scenario underscores the need for operational managers to draw from all sources of cost information available to them. This is why all components of ICMS operationalized in this study were found to be necessary

for ODM, though in varying measures of significance. No single system often is operated in isolation. At the base of every costing system lies absorption costing, which is the only one that satisfies both legal and GAAP requirements for external reporting. This makes its existence inevitable in every costing system. Thus, an integrated system that seeks to minimize the weaknesses of each and optimizes through a synergetic effort the strengths of all, would serve better the decision-making information requirements of operational managers.

As derivatives of tactical decisions, the factory floor efficiency measures of WIP and finished goods inventory values, cycle time and number of jobs in the shop, are indicative of the quality of tactical decisions. Excessively high WIP inventory values, distorted or poorly determined finished goods inventory values, high cycle time and concentration or accumulation of jobs in the shop are evidences of poor and ineffective tactical operations resulting from poor tactical decisions. Thus, giving the information capacity of an integrated cost management model that harnesses operational decision support information from the trio of TAC, TA and ABC will not only lead to effective and efficient tactical decisions but ultimately lead to improved WIP inventory values, better Finished goods inventory values, Reduced cycle time and Reduced number of jobs in the shop. Through operational efficiency arising from effective and efficient tactical decision, the operational definitions of tactical decision-making are positively impacted upon.

The primary conclusion drawn from the empirical evidence collated is that there is a significant and positive relationship between Integrated Cost Management System (ICMS) and Operational decision-making (ODM) as conceptualized in the study. The place of this conclusion is anchored on the fact that none of the operational measures of ICMS encapsulated in the current study showed a non-functional relationship with the measures of ODM. Hence, integrating a synergy amongst them holds a high hope for satisfying not only the information needs of operational managers but a positive step towards attaining the decision-usefulness of the accounting information science.

Further, overcoming the limitation of absorption costing with respect to optimal pricing decisions can only be achieved via better and improved or more accurate product costing. With the capacity of throughput costing and activity-based costing information systems to generate better and more accurate cost data, collocated with the indispensable place of full costing (as the only system that satisfies GAAP requirements and therefore acceptable for external reporting) better finished goods inventory costing can be achieved through the application of an integrated cost management framework.

The conclusions arising from the findings of this study in conjuncture with the body of existing knowledge anchored the model of the influence of integrated cost management systems on tactical decision making depicted as *figure 1* below. The model showcases how a synergy of traditional absorption costing system, throughput accounting system and activity-based costing system, influences tactical decision making. This underscores the fact that the model showcases a robust information framework for tactical decision support, in line with the global trend towards efficient information management. This model holds much for both theorists and practitioners. Enhancing the capacity of decision-makers through quality, adequate and timely information is the prime focus of this model.

Insert Figure 1

The attempts by protagonists of various methodological paradigm shifts in accounting systems have only succeeded in polarizing academics on different extremes on the one hand, and further widened the gap between theory and practice. But it should be recalled by all accounting researchers and practitioners that the accounting system is an interrelated web, which is not self-serving, but rather constitutes an information science that seeks to communicate economic information to all classes of decision makers. This much is anchored by the uniformity in the definitions of accounting science in all its ramifications by all who have attempted to proffer a definition. Thus, achieving the optimal goal of an efficient decision usefulness function should be the propelling force behind every accounting research effort.

The concepts of reengineering which focuses on revolutionizing key organizational systems and processes towards satisfying customers' vision and time-based competition (TBC) are well designed to ensure corporate survival, given that time is emerging as the key competitive advantage that can separate market leaders from *also-rans* (Blackburn, 1991; Kessler and Chakrabarti, 1996; Wagner and Digman, 1997). Thus, the idea of an integrated cost management system synergized with operating information can lead to gaining time-based competitive advantage through reduction in cycle time.

With improved information for operational decision making, job orders would no longer be accumulated in the factory floor. This is because proper quality and cost information would lead to improved production scheduling through enhanced job order prioritization. The enhanced and robust operation decision support base, not only provides factory managers with improved information for decision making, but gives them an understanding of which job order best contributes towards enhancing corporate profitability. This way, job orders can be properly

assessed to determine which ones should be giving priority without necessarily dumping the others. The foregoing places an integrated cost management system way above the isolated methodological paradigm shifts been advocated in certain quarters.

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Figure 1: The Influence Of Integrated Cost Management Systems On Operational Decision Making

