

# Momentum Accounting in Public Management: A Case Study in a Brazilian Navy's Services Provider Military Organization

Rodrigo Barreiros Leal and Aracéli Cristina de Sousa Ferreira

**Abstract**—This study examines the possibility to apply the theory of multidimensional accounting (momentum accounting) in a Brazilian Navy's Services Provider Military Organization (*Organização Militar Prestadora de Serviços - OMPS*). In general, the core of the said theory is the fact that Accounting does not recognize the inertia of transactions occurring in an entity, and that occur repeatedly in some cases, regardless of the implementation of new actions by its managers. The study evaluates the possibility of greater use of information recorded in the financial statements of the unit of analysis, within the strategic decisions of the organization. As a research strategy, we adopted the case study. The results infer that it is possible to use the theory in the context of a multidimensional OMPS, promoting useful information for decision-making and thereby contributing to the strengthening of the necessary alignment of its administration with the current desires of the Brazilian society.

**Keywords**—Multidimensional Accounting; Public Management; Decision Making.

## I. INTRODUCTION

TODAY'S fast changing business environment since globalization has required that the organizations use rapid and effective means for improving products and services estimating costs techniques, earnings management and decision support [1].

The Brazilian state apparatus have long been the target in the search for administrative improvement. In recent years, the issue of efficiency of the state is assuming an increasingly important role in our society.

Inserted in this context, the Naval Senior Management was, for years, concerned to find a solution to the inability to measure the military industrial organizations and service providers [3].

Thus, in 1994, the Navy created the Services Provider Military Organizations (OMPSs) and the OMPS System, focusing on the pursuit for improvement of internal controls and more efficient cost determination of industrial and

services provider military organizations. Such organizations provide industrial and hospital services, research in science and technology to military organizations and eventually to civil authorities, among others. They have adopted, since 1994, the registration and control of their costs through financial statements, and management buoyed by strategic planning [2].

Several authors in the last three decades have spread doctrines aimed at exploiting the strategic potential of accounting; assisting, therefore, the process of decision making by the user. In this vein, in 1989, the researcher Yuji Ijiri proposed an expansion of traditional accounting to a dynamic structure, called momentum accounting, which would subsidize the managers of an organization in decision making.

In general, the core of his theory is the fact that accounting does not recognize the inertia of transactions occurring in an entity, and that occur repeatedly in some cases regardless of the implementation of new actions by its managers. This thus creates an accounting measurement structure that extends the conventional structure of double entries to one of triple entries - it provides information for administration through separate statements: balance sheet, income statement for the period and balance of shares.

That said, and especially focusing on the search for a methodology/alternative tool to support accounting information extraction of an strategic nature, useful for decision making, this research envisions the possibility of applying the multidimensional theory within a Brazilian Navy's services provider military organization.

Besides better utilization of the strategic potential of the accounting structure prevailing in the OMPS system, it also tries to simplify the presentation of accounting information from the Statements in order to facilitate interpretation by the managers of the organization.

The problem to be answered by this research is: how can the momentum accounting be applied in a Brazilian Navy's Services Provider Military Organization? As an ultimate goal, this study examines how one can apply the multidimensional theory in the context of the Repair and Special Supplies Center of the Marine Corps (Centro de Reparos e Suprimentos Especiais do Corpo de Fuzileiros Navais - Cresumar), a Navy's military organization providing industrial services.

Therefore, the study essentially seeks to explore the statements of earnings, the performance evaluation reports, the

Rodrigo Barreiros Leal is with the Brazilian Navy, PAPEM, Rua da Ponte, Ed. 23 do AMRJ, Ilha das Cobras, Centro – CEP 20.091-000, Rio de Janeiro-RJ, Brasil. He is Lieutenant-Commander and MSc. in Accounting. (corresponding author to provide phone: 55-21-9290-6165; fax: 55-21-2253-5635; e-mail: rodrigobl77@hotmail.com).

Aracéli Cristina de Sousa Ferreira is with the Federal University of Rio de Janeiro-UFRJ, Av. Pedro Calmon, 550, Edifício da Reitoria, 8 andar, sala 818, Cidade Universitária, Campus do Fundão – CEP 21.941-901, Rio de Janeiro-RJ, Brasil. She is a Dean of Management and Governance of UFRJ and PhD in Accounting. (corresponding author to provide phone: 55-21-2598-1604; email: araceli@ufrj.br).

strategic management plan, the management autonomy contracts, among other documents, so to verify the possible use of the accounting dynamic structure in the production of information useful for decision making.

In fact, what is expected of a structure of accounting measurement is closely related to the needs of its users. To Ijiri [7], while a structure of accounting measurement must rely on the requirements of completeness and coherence, this structure is also expected to provide improved flexibility and adaptability to the constantly evolving needs of the users.

Given the above, this study finds justification under the current demands of the Brazilian society, with regard to efficiency and quality in public affairs. With this fulcrum, it evaluates the possibility of greater use of information recorded in the financial statements of the OMPSs, within the strategic decisions of the organization. It thus seeks to minimize the occurrence of unscientifically structured decisions or decisions based on paradigms that do not match the reality, which may cause undesirable side effects that threaten the continuity of the entity.

This research is organized into six sections. The first, introductory, seeks to contextualize the issue and to present the main goal. The second and third sections intend to present the theoretical construct used, which grounds the study through a literature review. The fourth section addresses the methodological aspects; and the fifth one, the development and information concerning the analysis and resulting outcomes. Finally, section six is dedicated to presenting the conclusions and recommendations of the research.

## II. MULTIDIMENSIONAL ACCOUNTING

Through his studies, Yuji Ijiri intends to reformulate the vision of conventional accounting that the facts and phenomena occurring in patrimony have only two types of observations: source and application. Conventional accounting is defined by Ijiri [7] as the branch of accounting that records transactions and reports on the financial statements of an entity. Conventional accounting includes financial, management and government accounting.

In this sense, the foundations of this paradigm are towards greater attention to the concept of accumulated net income. With the passage of time, the net income accumulates to a certain rate, called momentum, being exposed to the influence of "forces" responsible for this accumulation change over time, called the "boost", causing the "action" triggered by administration.

One can perceive, in this brief explanation of the multidimensional theory, employment of the terms momentum, impulse and force from Physics. This analogy is best understood as the theory is described in the following sections of this chapter.

### A. The Basics of Double-Entry Bookkeeping

The structure used in conventional accounting (double-entry) is very useful for the development of the multidimensional structure. Yuji Ijiri emphasizes that this construction does not mean a break with that. Instead, it is an

improvement of a structure long recognized and praised by scholars like Goethe [7], who argues that this is one of the greatest inventions of the human spirit, and Sombart [7], who underscores the power of double entries by comparing them with the systems developed by Galileo and Newton.

To the author of the multidimensional theory, the duality of transactions (debit accounts and credit accounts) together with the accounts of income (profits and losses) have been accepted as the true foundations of double-entry bookkeeping. Finally, the transition from single-entry bookkeeping, in which the wealth of the entity is the only measure to be recorded, to the double-entry bookkeeping is checked. At this time, the entity begins to consider the accounting records not only from the perspective of wealth, but also of income, honoring the relationship between them.

According to Ijiri [7], the income accounts explain what happens in the accounts of wealth. In this reasoning, income figures as explanans and wealth as explanandum. This words used by Hempel and Oppenheim, so that explanandum refers to the phenomenon to be explained and explanans refers to the phenomenon itself.

### B. The Dynamic Structure

In exploring the relationship between wealth and income, it seems to be clear that changes in the balance of wealth in a given period are explained by income accounts in the same period. According to Ijiri [6], wealth accounting is used for accounts that represent the financial status of the entity and are called inventory accounts. In turn, flow accounts (include income accounts - revenues and expenditures) are capital accounts that indicate recurrent changes on that wealth.

$$\Delta \text{ Stocks}_n = \text{Fluxes}_n$$

\*Where n represents the period examined.

In theoretical and practical basis, this equality explains the changes in wealth. However, one sees the need for an explanation for the changes that may occur in the accounts flow. In this context, the temporal rate of change that permits measuring the rate at which income is acquired at a given instant, called the momentum rate, is suggested.

Ijiri's vision [7] differs from that of conventional accounting regarding the occurrence of accounting facts or phenomena. For him, the vast majority of these facts or phenomena occurs in a continuous way, from its inception (e.g., depreciation, interest, salaries etc.), contradicting the snapshot characteristic adopted as a rule by conventional accounting.

As a feature, conventional accounting through the double-entry method shows changes in capital from historical data, without considering the projection of the future.

$$\begin{aligned} \text{ASSETS} - \text{LIABILITIES} &= \text{CAPITAL} \\ \text{WEALTH} &= \text{CAPITAL} \\ \text{PRESENT} &= \text{PAST} \end{aligned}$$

However, according to Ijiri [5], the structure of accounting measurements should consider a third dimension, more forward-looking and that deals with issues such as budget, plans and projects of the organization.

$$\begin{aligned} \text{FUTURE} &= \text{PRESENT} = \text{PAST} \\ \text{FORECAST} &= \text{WEALTH} = \text{CAPITAL} \end{aligned}$$

Inspired by the Mechanics [14], the multidimensional accounting, displaying its dynamic bias, includes quantities such as momentum, force and impulse. The heart of this issue is the idea that many of the revenues and expenses incurred in the business of the entity remain occurring in "automatic" mode, unlike the static character inherent to two-dimensional accounting.

Therefore, in brief, it is possible to verify the mathematical relations between the quantities exploited, mainly in respect to the derivation (force is the derivative of the linear momentum in time), integration (momentum is the integral of the force over time) and difference (impulse is the change in momentum). Exposed in this manner, the concepts help in understanding the development of the multidimensional theory called Momentum Accounting.

### C. The Momentum Accounting

The triple-entry bookkeeping is developed in the wake of the same logic that the evolution from single-entry bookkeeping to double-entry is based. As already seen, the rate called momentum corresponds to the change in which the income of an entity changes over a certain period. Moreover, while varying the income, wealth is also changed in the same proportion (stock-flow relationship). We can thus consider that momentum is closely related to wealth and income, since any change in its value simultaneously influences them.

$$\text{Income} = \text{Momentum} \times \text{Time}$$

The multidimensional theory correlates the term momentum with the mechanical magnitude "speed", while preferring to use distinct names. On this, the author of the theory justifies his position by momentum conveying the idea of "inertia", combined with the fact that the sum of the momenta of two objects has significance, unlike what occurs when the speed of these objects are added. The third dimension then begins to emerge, since there is "something" that modifies the change in intensity of this flow (income) [7].

According to Ijiri [7], there is an essential difference between momentum accounting and conventional accounting: the status quo. In a conventional basis, the status quo is the state with zero income, with no change in gain of wealth, while in the perspective of momentum, it is the state of zero change in the rate at which the income has been gained. This point seems to reflect more clearly the idea of inertia associated with the momentum.

### 1. Force, Impulse and Action in the Three-dimensional Perspective

In the journey towards the improvement of the two-dimensional perspective, the concept of momentum is highlighted and the reasons for changing its amounts begin to be discussed. In this context, what would lead to a change in the rate of momentum measured in \$/month? The answer lies in the concept of "force" that justifies such changes.

Measured under the unit \$/Month<sup>2</sup>, force is primarily responsible for the change in the rate at which wealth is being acquired by an entity. This dynamic change implies the characterization of another concept called "impulse", measured in units of \$/month, responsible for the changes in net income in the month since it directly influences the rate of momentum.

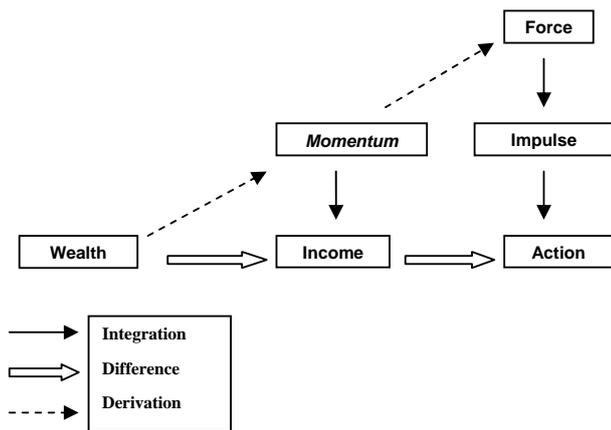
$$\text{Impulse} = \text{Force} \times \text{Time}$$

In order to achieve the full balance of the three-dimensional perspective, the magnitude is multiplied by the periods in which it remains constant, reflecting the magnitude called "action." Consequently, the same foundation that justifies the understanding of the relationship between wealth and income (explanandum and explanans), in which the variation of wealth in a period is explained by the income stream in that same period, is found in the relationship between action and income.

$$\Delta \text{Wealth} = \text{Income} \text{ if and only if } \Delta \text{Income} = \frac{\text{Action}}{\text{Time}}$$

Given the view of the proposed balance, Ijiri [7] incorporates to the double-entry bookkeeping based on the axes of debit and credit a third component called trebit, due to the influence of the magnitude "action." Thus, wealth accounting may be understood as the wealth-income-action ratio (triple-entry measured in \$), the momentum accounting, the momentum-impulse ratio (double-entry measured in \$/month). And force accounting may be understood as the set of the magnitude "force" (single-entry measured in \$/month<sup>2</sup>).

In short, the mathematical relationships involving all these magnitudes focus on three: derivation, integration and difference (Fig. 1).



Source: [11] (adapted)

Fig. 1 Mathematical Relationships

According to Ijiri [7], the results of an entity in a given period of time are not necessarily obtained from the ratio of the rates of momentum perhaps applied. However, if done this way, it allows the user to visualize the real financial state of the organization at that moment.

In general, it is possible to visualize an infinitely expandable structure based on the vertical derivative relationship and the horizontal relationship of reasons. In this joint structure, the wealth management focuses on the recording of input and output basic data (active and passive). At the heart of its responsibility, momentum management monitors that wealth's rates of variation, complemented by the force management which, in turn, focuses the internal and external forces that change the momentum, occupying themselves with issues related to strategic planning [7].

2. A Use of Wealth

The theory developed by Ijiri proposed the analysis of the derivative relationships between the magnitudes, in order to achieve an idea of convergence. The question now posed is: what are the results of an expansive analysis of the structure, especially in the integration relationships between magnitudes? The core lies in the perception that wealth itself (stocks), from the simple fact that it exists, has the potential to influence the calculation of the profitability of the entity, when considered its "level" of use.

The sector of use of wealth (\$/month) created from the integration of wealth in time lacks a side interrelationship, so that an explanatory relationship is established similar to that occurred between the wealth and income sectors. Ijiri calls this new sector "benefits". The contents reflect the benefits from the wealth used. The theory designates as financial benefits those that aim at the financial result for the entity (finance, cash etc.), and as economic benefits those that aim at achieving business results (stocks) [7].

This context shows the establishment of a multidimensional structure of accounting measurements, in which the benefits are explained by the use of wealth. It thus forms a statement

supported by an axis of four principal components (benefits, wealth, momentum and strength), with its own units and based on a single concept: the wealth acquired. Hence, the combination of these components culminates in building a 4 x 4 table (Table I) from which data useful for the management of an organization can be extracted. Of these 4 sectors, it is clear that only wealth and income are used by the conventional accounting [7].

TABLE I  
MULTIDIMENSIONAL PERSPECTIVE

Benefits (3rd derivative)	Wealth (2nd derivative)	Momentum (1st derivative)	<b>FORCE</b>
Benefits (2nd derivative)	Wealth (1st derivative)	<b>MOMENTUM</b>	Impulse
Benefits (1st derivative)	<b>WEALTH</b>	Income	Action
<b>BENEFITS</b>	Use of Wealth	Use of Wealth	Use of Action

III. THE REPAIR AND SPECIAL SUPPLIES CENTER OF THE MARINE CORPS (CRESUMAR)

The Repair and Special Supplies Center of the Marine Corps (Cresumar) originated from a material warehouse of the General Command Marine Corps (Comando-Geral Corpo de Fuzileiros Navais - CGCFN), linked to the then Logistics Section of the General Staff of the Marine Corps (Corpo de Fuzileiros Navais - CFN) and arranged for receipt and distribution of the material coming from the Military Assistance Program (MAP). The latter used dependencies of the then CFN Instruction Center, located on Ilha do Governador, Rio de Janeiro, Brazil, in the early '60s.

In 1994, with the activation of the OMPS system in the Navy of Brazil, Cresumar was elevated to the status of Industrial OMPS, starting to count the operational costs of its services and the administrative expenses for its maintenance by means of the method of absorption costing and a business-type management.

According to the regulations in force, it is highlighted that OMPSs must monthly confront the real values of their indirect costs and administrative expenses, appropriated in accordance with the procedures, with the respective budgeted/billed amounts for the period. This is done so as to verify the correctness of the indexes and fees applied in their billing for the recovery of indirect costs and administrative expenses incurred in the period [12].

A. The Strategic Management Plan (SMP) and Autonomy Management

The adoption of the management philosophy called "Strategic Management" by Cresumar aims to equip the MO of the conditions necessary to keep pace with rapid advances in technology, information and management, facing the growing challenges of the complex environment experienced by an Industrial Services Provider Military Organization [8].

As a result of a consolidated Strategic Management Plan (SMP), Cresumar adopted the management autonomy, disseminated by the Reform Plan of the State Apparatus. It consists of a management model characterized by managerial decisions and actions results-oriented and that focuses on customer demands and is based on strategic planning. This model is based on entrepreneurial management, aiming at achieving results through management contracts [12].

Even though Cresumar signed in 1999 its first management autonomy contract with the Navy of Brazil, represented by the Secretary General of the Navy, only the contracts No. 70000/2005-001/00 (2005-2006) [8], No. 70000 / 2007-002-00 (2007-2008) [9] and No. 70000/2009-001-00 (2009-2010) [10] are considered for this study, because of the timeline that includes the SMP discussed here. Accordingly, the object of these contracts is the pact of targets to be achieved by OMPSs, extracted from the Strategic Management Plan. In turn, the indicators, the formulas for calculating and the evaluation system used in the performance evaluation reports under the contract are the ones set out in the SMP, effective upon signature.

#### IV. METHODOLOGICAL ASPECTS

This study adopted the research strategy of the case study that entails a thorough and deep dive into a bounded object (research problem), enabling thereby the penetration into the social reality of Cresumar, not fully achieved, in theory, by quantitative evaluation.

According to Yin [15], by nature, the case study involves issues that are composed of propositions such as "how" and "why", in addition to the focus on contemporary phenomenon in real-life context in which the investigator has little control over events.

Given the concepts exposed, and in view of the objectives proposed in this study, the case study was chosen as research strategy because it presents itself as the most appropriate technique. It allows for greater depth on the subject and enhances the power of analysis. Added to this, the fact that the main issue of the survey is formulated with the proposition "how", and that it sticks to a current phenomenon, on which low level of control on the part of the researcher is found.

This research is considered exploratory and descriptive. Descriptive because it exposes characteristics of Ijiri's multidimensional theory, of the OMPS system adopted in the Navy of Brazil and in Cresumar, with its strategic and autonomic management model. And it is exploratory when it applies the theory in reference to the financial statements produced by these organizations, looking for patterns, ideas or hypotheses, rather than testing or confirming a hypothesis. Furthermore, it seeks the enhancement of ideas and discovering insights about the use of a dynamic accounting structure in a public organization.

As for the technical procedures adopted, although Gil [4] states that it is possible to treat literature as a kind of documentary research, that relies on printed material mainly for reading purposes, there was both a literature and documental search. Literature search due to part of the studies

having been developed based on material already prepared, such as books, dissertations and scientific articles. Classification as a documentary results from the adoption of material that has not yet received analytical treatment from internal or external files regarding the military organization, such as reports, regulations, memos, letters, tables, statistics, among others.

The analysis structure of this research was inspired by the methodology employed by Ijiri [7] in developing his theory applied to a computer leasing virtual company. For construction of the theoretical platform literature and documental sources contained in the reference document were used, in order to provide the necessary support for the development of the analysis of the case.

The limitations of this study stem from two sources. The first, typical of the case studies, is supported by a concern with the difficult scientific generalization from bases related to a single experiment/case, as highlighted by Yin [15].

Minimizing this concern, the said author asserts that "[...] case studies, like experiments, can be generalized to theoretical propositions and not to populations or universes." In accordance with the peculiarities of the accounting aspects of OMPSs, the results are paved with organizations with characteristics similar to the study unit, subject to the theoretical propositions of the research.

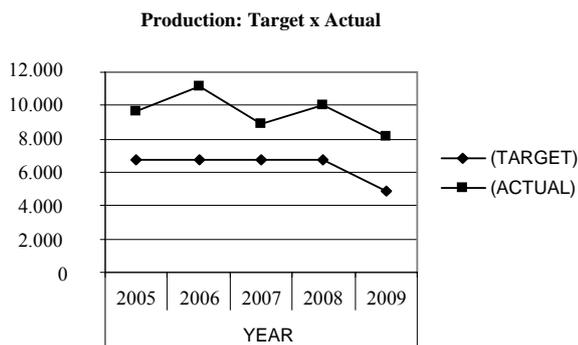
The second limitation, in turn, finds support in studies involving the human component: the phenomenon of unpredictability. In fact, the result recorded by the survey is influenced by the status quo of the behavioral environment that surrounds it. Thus, the behavior and conviction elements that influenced the progress of this work may suffer changes with the passage of time.

#### V. ANALYSIS AND RESULTS

##### A. Planning and Execution in Production Sectors

In light of the performance evaluation reports that are prepared quarterly and for the monitoring and evaluation of the goals agreed in the contract of management autonomy. There are four main Cresumar's centers of consumption, namely: Moto-mechanization, Armament, Optics and Electronics, and Industrial Support.

According to Fig. 2, the curve representing the total number of planned services approaches a straight line, between 2005 and 2008, showing certain constancy. However, the exception is noted in the planning done for the year 2009, when there was a reduction of approximately 27% over the average of previous years' planned services, calculated on 6,748 items.



Source: own elaboration

Fig. 2 Planned and Executed Production

### B. Prospects of Production and Economic Circumstances

Since June 2004 Brazil commands the military force of the UN peacekeeping mission in Haiti, called Minustah. Brazil's involvement has demanded of its armed forces preparation and training of its men and means. Concurrently with this, there is the gradual renewal of operating means in use by the Navy. The purchase of new light and armored vehicles in the period studied, to make up the collection of the Marine Corps, requires special attention of the management of Cresumar.

Given this context, together with new perspectives brought about by the enactment of the National Defense Strategy, monitoring of this scenario by Cresumar management becomes imperative in order to enhance its capacities to cope with the likely increase in its activities, given the aforementioned processes of modernization and restructuring already underway and ahead.

According to data obtained from the Union General Controlling Office [13], the Ministry of Defense had an annual growth rate of sustained budgetary transfers from the Federal Government in the period between 2005 and 2009. This scenario is reflected in the resources allocated to the Navy Command which, in turn, pass it on to their subordinate military organizations. Meanwhile, the growth of transfers made to the Navy Command had the average annual rate of 13%.

As announced by the Federal Government through the Brazil Portal available on the internet, inflation represents the increasing and continuous generalized prices of goods and services traded in a country, allowing for a reduction in the purchasing power of money. In a sense, inflation rates recorded in each year affect the price of products and services and should be considered in the planning of spending by the Repair Center. According to the data obtained from the Brazilian Institute of Geography and Statistics, the average rate of inflation, based on the national large index of consumer price, calculated at 5% for the period between the years 2005 and 2009.

### C. Application of the Multidimensional Perspective

#### 1. Periodic Financial Statements

The Accounting Department at the OMPS monthly monitors the outcome of the industrial production. In this context, the Statement of Comprehensive Income for the Period (SCI) issued at the end of each financial year represents the cumulative result of the year. Table II shows the income streams of the SCI relating to the period between 2005 and 2009.

TABLE II  
STATEMENTS OF INCOME PERIODS

x1000	YEAR				
	2005	2006	2007	2008	2009
Revenue	12,784	13,572	15,417	15,294	17,188
Costs	-10,765	-11,916	-13,719	-13,652	-16,011
Adm. Exp.	-1,085	-958	-985	-930	-904
Losses	-391	-49	-89	-39	-100
Net Result	542	647	622	672	170

#### 2. Structuring the Perspective of Momentum

Continuing with the construction of three-dimensional structure of the financial statements of Cresumar, the second step of determining the rate of momentum becomes the focus. Armed with the data from the SCI, we calculate the rate of change that is changing income streams.

Once the rates of momentum have been determined, the next step is to disclose the possible reasons that changed the pace of growth of the organization. The focus now becomes the determination of the components that make up the pace of income growth, called three-dimensional impulse in accounting. For the development of this stage, revenues, costs, administrative expenses and losses have been dismembered in centers of consumption, where the values that make up the accounts in question are accumulated.

Table III helps to visualize the impulses that influence the momentum rates and further evidences the sectors responsible for the losses raised.

TABLE III  
CRESUMAR'S STATEMENT OF *MOMENTUM*

	<i>MOMENTUM</i> (R\$/month)				<i>IMPULSE</i> (R\$/month)		
	31-Dec 2007	31-Dec 2008	Change 2008		31-Dec 2007	31-Dec 2008	Change 2008
<b>Rev.</b>	1,284,782	1,274,582	-10,201	<b>1</b>	805,916	823,162	17,246
				<b>2</b>	150,566	133,239	-17,327
				<b>3</b>	148,992	101,976	-47,016
				<b>4</b>	179,309	216,205	36,896
<b>Costs</b>	-1,143,301	-1,137,721	5,581	<b>1</b>	-656,897	-741,696	-84,799
				<b>2</b>	-83,381	-81,713	1,668
				<b>3</b>	-72,831	-80,889	-8,058
				<b>4</b>	-330,193	-233,423	96,770
<b>Adm. Expens.</b>	-82,156	-77,528	4,628	<b>5</b>	-10,359	-8,088	2,271
				<b>6</b>	-40,048	-36,075	3,973
				<b>7</b>	-31,749	-33,366	-1,617
<b>Losses</b>	-7,484	-3,274	4,210	<b>1</b>	-2,659	-1,073	1,586
				<b>2</b>	-869	-390	479
				<b>3</b>	-565	-195	370
				<b>4</b>	-3,390	-1,616	1,774
<b>Net Moment</b>	51,841	56,059	4,218	<b>Ac. Imp.</b>	51,841	56,059	4,218

Where:

1 = Moto-mechanization; 2 = Optics and Electronics; 5 = Department of Command; 6 = Administration Department.

### 3. Construction of the Force Accounting (Future)

Having completed the first two steps of the three-dimensional structure, where the wealth management focused on the basic input/output data (active and passive) and the momentum management monitored the rates of change of that wealth, then the analysis focuses on force management, responsible for changing the momentum.

As seen on Ijiri's approach, forces can be external and internal in nature. In this research, the criteria used to determine the forces were based on the possibility of translating them into numbers and in the clarity and relevance judged by the investigator. This does not exhaust the possibility of disclosing any other forces that lead to greater calculation difficulty.

In order to elucidate the above, Table IV summarizes the external and internal forces considered in dynamic accounting, as well as the sectors where the respective forces incur with their bases of calculations. Corroborating Ijiri's understandings, there are several forces that may incur in the rate at which the organization receives income. At this point, good ability of perception and sensibility on the part of the professional responsible for determining them is required. Obviously, this study does not exhaust the possible forces acting on the income stream of the entity, so the scope of forces considered was based on easily accessible data and information.

TABLE IV  
OMPS' EXTERNAL AND INTERNAL FORCES

EXTERNAL FORCES		INTERNAL FORCES	
<b>Allocation Force</b>	1.8% per month (invoiced revenue)	<b>Force of the Plan</b>	0,3% per month (invoiced revenue, costs, administrative expenses and losses)
<b>Inflation Force</b>	0,4% per month (15% costs and 14% administrative expenses)	<b>Wages Force</b>	0,3% per month (85% costs, 86% administrative expenses and losses)

### 4. Dynamic Translated into Numbers

Given the above, it is then possible to complete the formation of the multidimensional structure alluding to the Repair Center data of the period being analyzed. In this context, the three accounting levels were sized: wealth, momentum and force. Collaborating for a better understanding of the components involved,

To optimize space, the Centers of Consumption (CECO) were grouped into two accounts, according to their characteristics. The "Production" account with the values of the Divisions Moto-mechanization, Armament, Optics and Electronics and Industrial Support, and the "Support" account with those of the Department of Command, Department of Administration and Quartermaster Department. Note that in the three-dimensional structure the breaking into CECO allows for better visualization of implicit information, facilitating thereby the evaluation by the user.

The three levels of the three-dimensional structure - wealth, momentum and force - form a portrait that synthesizes the aspects related to the past, present and future of the public entity, organized so as to facilitate the perception of the results obtained in the triggered analysis.

TABLE V  
PROJECTED AND ACTUAL RESULTS 2009

Income Statement for the Period (R\$)				
	Actual 2008	(1) Projected 2009	(2) Actual 2009	Difference (2)-(1)
<b>Revenues</b>	15,294,978	15,493,766	17,188,161	1,694,395
<b>Costs</b>	13,652,647	13,635,652	16,011,732	2,376,080
<b>Adm. Expenses</b>	930,341	980,159	904,709	-75,450
<b>Losses</b>	39,284	89,567	100,909	11,342
<b>Net Result</b>	672,705	788,387	170,809	-617,578

Sensitivity and knowledge on the part of the executor and the facts and circumstances surrounding it are valuable for forecasting exercises. The theory of momentum accounting corroborates this view by highlighting the importance of sensitivity of the user in handling the component "impulse", responsible for identifying the forces acting on the dynamics of accounts (postulate of assignment). Moreover, Ijiri emphasizes that the income on a given period does not necessarily grow at the rates stipulated by the momentum accounting; however, when adopted, they allow for better visualization of the real financial state of the organization.

Therefore, the inconsistencies observed in terms of costs and administrative expenses, that influence the net result, seem to come from the absence of forces not considered in the dynamics of the accounts analyzed. Certainly, this fact should not discourage continuity in identifying these forces, as well as improvement in their measurements (Table V).

##### 5. Traditional Evaluation versus Momentum Model

With the increase of data from the perspective of momentum in the traditional SCI, two of the primary benefits sought by the multidimensional theory seem to be noticeable, namely: a) immediate disclosure by CECO of the loss of ability to produce income; b) consideration of "forces" independent of other sectors (Wealth, Momentum and Benefit) that cause changes in the income of the momentum, by CECO.

From the new model of SCI developed (Table VI), the intention is to further facilitate and simplify viewing of information by the decision maker, added to the traditional SCI by the dimensional accounting.

The analysis of information from the perspective of momentum brought by the Statement of Table VI must necessarily be carried out considering the fields "inertia" and "forces" together. The first, inertia, represents the rate at which the income accounts of the organization have been changing, based on the history of previous accounting records (past) reflecting its current situation (present). The second field is of predictive character and represents the internal and external components that change rates inherent to the inertia fields.

TABLE VI  
SCI THREE-DIMENSIONAL MODEL

TITLE	SUBITEM TOTAL (R\$)	ITEM TOTAL (R\$)						
<b>1-REVENUE OF THE PERIOD</b>		<b>15,294,978.22</b>						
1.1-Billing	14,758,974.76							
1.2-Reduction of Advances	566,051.76							
1.3-Discouts	(30,048.30)							
<b>2-COSTS OF SOLD SERVICES</b>		<b>(13,652,647.41)</b>						
<b>3-GROSS RESULT</b>		<b>1,642,330.81</b>						
<b>4- ADMINISTRATIVE EXPENSES</b>		<b>(930,341.22)</b>						
4.1-Personnel	(799,031.16)							
4.2-Third Party Services	(108,518.38)							
4.3-Material	(22,791.68)							
<b>5-OPERATING RESULT</b>		<b>711,989.59</b>						
<b>6-LOSSES</b>		<b>(39,284.40)</b>						
6.1-Material	0							
6.2- Personnel	(39,284.40)							
<b>7-NET RESULT</b>		<b>672,705.19</b>						
<b>PERSPECTIVE OF MOMENTUM</b>								
<b>CECO</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>INERTIA</b>	<b>Revenue</b>	↑	↓	↓	↑			
	<b>Costs</b>	↑	↓	↑	↓			
	<b>Adm. Expenses</b>					↓	↓	↑
	<b>Losses</b>	↓	↓	↓	↓			
<b>FORCES</b>	<b>Revenue</b>	↑	↑	↑	↑			
	<b>Costs</b>	↑	↑	↑	↑			
	<b>Adm. Expenses</b>					↑	↑	↑
	<b>Losses</b>	↑	↑	↑	↑			
Note: Arrow ↑ = increasing trend; Arrow ↓ = reduction trend; Shaded field = ALERT.								

Where:

1 = Moto-mechanization; 2 = Armament; 3 = Optics and Electronics; 4 = Industrial Support; 5 = Department of Command; 6 = Administration Department; 7 = Quartermaster Department; Adm. Expenses = Administrative Expenses.

Present in these fields, the arrow facing upward means a framework of increase of the relevant rate, in absolute values, while the down arrow means a decrease of that rate. Finally, the red shading in some fields, as a sign of "alert", intends to draw the attention of the manager to thoroughly verify the reasons for the situation presented here, so that any necessary corrective actions may be triggered, if deemed appropriate.

Finally, the conventional mechanism of analysis (SCI and Performance Evaluation Report), which is crucial for conducting management actions, seems to gain even more value when the prospect of momentum is added to it, since it

provides new information to the decision maker, allowing the timely adoption of corrective actions and also, in the strategic horizon, the creation/revision of objectives, targets and performance indicators.

## VI. FINAL CONSIDERATIONS

The present study aimed to investigate the possibility of applying the multidimensional theory of accounting, in the scope of a public agency, in the specific case of a Industrial Services Provider Military Organization owned by the Navy of Brazil, and which adopts the registration and control of its costs through financial statements since 1994 and also has its management buoyed by strategic planning.

Thus, in the wake of what has been set in its introduction, the ultimate goal of this research was to determine how it is possible to apply that theory in an OMPS. In this sense, the following question was asked: how can momentum accounting be applied in a military organization that provides industrial services?

From the results, it appears that it is possible to use the multidimensional theory in the context of the OMPS (Cresumar). Mutatis mutandis to the peculiarities of public accounting, the research allowed the confirmation that the momentum accounting promotes immediate visualization of the behavior of costs and expenses of each sector involved in the activities of the Repair Center. This facilitates the adoption of any punctual and timely corrections, so as to keep the organization "navigating" the desired course.

In their future dimension, the results indicate that the use of the concept of momentum includes hits and misses when comparing the designed scenario to that effectively performed. In fact, it seems to be necessary more knowledge of the circumstances surrounding the organization's environment in order to identify and ascertain more precisely the possible forces acting on the dynamics of the accounts.

Furthermore, supporting the author's multidimensional theory, the three-dimensional structure designed, although requiring improvements in their modus operandi in Cresumar, allowed to gather new information translated into numbers and thus not aired in this structural way, previously. In this manner, perception of the state closest to the actual financial organization was allowed to the user of the structure. Hence, taken the first step towards an eventual implementation of a multidimensional structure, it is expected of the OMPS managers gradual familiarization and improvement of the new Table of Accounts hypothesized, therefore causing greater sensitivity in dealing with momentum and impulse.

The legal and operational bases that seek to facilitate disclosure of depreciation of property under custody of the Public Administration are recent. Cresumar still lacks a consolidated accounting mechanism that enables the registration and monitoring of expenses involved with the use of these assets. Thus, the benefit accounting designed to measure the income arising from the ownership and use of assets could not be analyzed in this study. It was, however, a recommendation for future research related to the theme.

The strategic management plan, together with the management autonomy, gives Cresumar high level in the monitoring and evaluation of the activities, contributing to higher quality in the use of the public funds involved. The requirements addressed by legislation, in particular those brought about by the Fiscal Responsibility Law when imposing planned and transparent actions to public management, are perceived in the strategic management adopted by the OMPS. The momentum theory seems to complement this scenario by optimizing the extraction of data and providing accounting information useful for decision-making on the part of public officials. Therefore, regarding the issue of efficiency, the use of the momentum theory within a public organization with consolidated strategic planning entails a strengthening of the existing alignment of its administration with the current desires of our society.

The accounting information obtained through the dynamic structure can be useful in subsidizing data for establishing targets and objectives agreed upon in management autonomy biennial contracts. Also, the number of performance indicators monitored periodically can be targets of possible improvements in light of the new horizons opened by this strategic accounting tool.

Finally, replication of this study in subsequent periods is also recommended, including other public organizations that adopt or not the strategic management in their planning, in order to compare the results found herein and to deepen knowledge on the subject.

## REFERENCES

- [1] BRAGA, E. C. *Gestão de Custos através do Custeio Baseado em Atividades (ABC): um estudo de caso em um projeto de desenvolvimento de software*. 2009. 124 f. (Master's thesis in accounting). Faculdade de Administração e Finanças, Universidade Estadual do Rio de Janeiro, Rio de Janeiro, 2009.
- [2] Brazilian Navy. Navy General Secretary. *SGM-304 – Normas sobre Contabilidade das Organizações Militares Prestadoras de Serviços*. Brasília, DF, 2008.
- [3] NATIONAL SCHOOL OF PUBLIC ADMINISTRATION – ENAP. *Ações premiadas no 4o Concurso de Inovações na Gestão Pública Federal* — 1999. Vera Lúcia Petrucci, Licia Maria Umbelino (Orgs.). 251p. — Brasília: ENAP, 2000.
- [4] GIL, A. C. *Como Elaborar Projetos de Pesquisa*. São Paulo: Atlas, 1996.
- [5] IJIRI, Y. *Triple-Entry Bookkeeping and Income Momentum*. Studies in Accounting Research, n.18. Florida: American Accounting Association, 1982.
- [6] A Framework for Triple-Entry Bookkeeping. *The Accounting Review*, Vol. 61, no. 4. 1986.
- [7] *Momentum Accounting and Triple-Entry Bookkeeping: Exploring the Dynamic Structure of Accounting Measurements*. Florida: American Accounting Association, 1989.
- [8] REPAIR AND SPECIAL SUPPLIES CENTER OF THE MARINE CORPS - CRepSupEspCFN. *Management Autonomy Agreement no. 70000/2005-001/00*. Rio de Janeiro - RJ, 2005.
- [9] *Management Autonomy Agreement Nbr. 70000/2007-002-00*. Rio de Janeiro – RJ, 2007.
- [10] *Management Autonomy Agreement Nbr. 70000/2009-001-00*. Rio de Janeiro - RJ, 2009.
- [11] ROCHA, A. *...Até à Contabilidade Multidimensional de Yuji Ijiri*. Lisboa: Universidade Lusíada Editora, 2007.
- [12] SILVA, A. S., LEAL, R. B., BAPTISTA, A. N., *Avaliação de Desempenho sob as Perspectivas Financeira e Não-Financeira: A Gestão Estratégica de uma Organização Militar Prestadora de Serviços da Marinha*. Paper presented at the "XV Prêmio Tesouro Nacional – 2010: Homenagem a Joaquim Nabuco". Brasília – DF: Secretaria do

- Tesouro Nacional, 2010. [Online]. (URL [http://www.tesouro.fazenda.gov.br/Premio\\_TN/XVPremio/catalogo15.htm](http://www.tesouro.fazenda.gov.br/Premio_TN/XVPremio/catalogo15.htm)). (Accessed 15 January 2011).
- [13] UNION GENERAL CONTROLLING OFFICE. Portal da Transparência do Governo Federal. [Online]. (URL <http://www.portaltransparencia.gov.br/>). (Accessed 19 January 2011).
- [14] WALKER, J., RESNICK, R., HALLIDAY, D. Fundamentos de Física 1 - Mecânica – Vol. 1, 8th Ed. Rio de Janeiro: Ltc, 2008.
- [15] YIN, R. K. Estudo de Caso: Planejamento e Métodos. 4th Ed. Porto Alegre: Bookman, 2010.