

## SEÇÃO INTERNACIONAL

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### BUDGETING IN AN OPEN SYSTEM\*

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#### RESUMO

O orçamento é amplamente utilizado como uma ferramenta de gestão organizacional. Este é um dos motivos pela busca permanente da essência do orçamento. Neste estudo, a abordagem sistêmica é aplicada à análise da natureza do orçamento. Foram considerados o aspecto sistêmico de uma organização e a abordagem sistêmica à gestão. O orçamento é entendido como o processo de previsão e comunicação de atributos sistêmico de uma organização. Parece que os resultados alcançados indicam a abordagem sistêmica como base de uma teoria geral de orçamento e contabilidade.

**Palavras-chave:** Orçamento, Gestão Organizacional, Previsão, Abordagem Sistêmica.

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#### ABSTRACT

*Budgeting is broadly used as a tool for organizational management. And this is a reason for continuous looking for budgeting essence. In the paper the systems approach is applied to investigating the nature of budgeting. The systemic aspect of an organization and the systems approach to management were taken into account. Budgeting is seen as the process of prediction and communication of systemic attributes of an organization. It seems that the results reached point to the systems approach as a basis for general theory of both budgeting and accounting.*

**Keywords:** Budgeting, Organization Management, Prediction, Systems Approach.

## 1. A GLANCE AT THE NATURE OF BUDGETING

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The continuance and development of economic entities require a certain degree of observability and manageability of their states and flows. Observability involves the need for description of past events, while manageability – the need to predict what may occur, including the predictions of the trajectories of changes.

The forecasting of future states of economic entities – and the ways of achieving them – are the domain of planning, which also embraces resources and commitments related to them. From the financial perspective, a main tool for the construction of plans from the perspective of resources is budgeting, understood ([Barfield, Raiborn, Kinley, p.620]) as a major instrument for the structuring of plans and translation of qualitative narrations into a quantitative written format, using a monetary unit as a measure. The outcome of the budgeting process is a set of budgets. A hierarchically arranged set of enterprise's budgets built in the context of value chain and functioning in the American setting is presented by [Horgren, Foster, Datar, p.183] (see **Appendix 1**). This set, called a master budget, is crowned by *pro forma* income statement (the prediction of surplus on entity's activity), *pro forma* balance-sheet (the prediction of resources and obligations related to them) and *pro forma* cash flow (the prediction of the flow of the medium of exchange). Such a set of the crowning budgets can be regarded as the recognition on the ground of accounting that the key abilities of an economic entity of crucial importance for its continuance and development are:

- the ability to shape resources and obligations related to them,
- the ability to generate resource surplus, and
- the ability to generate flows of the medium of exchange.

In this light, the crowning budgets are the predictions of the key abilities of an economic entity.

In the sphere of financial management, budgeting is called financial planning (see [Brealy, Myers, Marcus, p. 523]). The product of such a planning is a financial plan. Its components include [*ibidem*):

- description of the existing state of the key abilities of an economic entity and predictions regarding the future state of major contextual

variables (the latest financial statements and forecasts relating particularly to sales and interest rates);

- planning model, specifying fundamental relations of an economic entity;
- projections of the state of key abilities of an economic entity in the context of chief contextual variables (*pro forma* financial statements, financial indicators, sources and uses of funds).

From these specifications and the nature of financial planning and budgeting it follows that budgeting relates to fundamental attributes and relationships of an economic entity. The fundamental attributes and relationships of an economic entity have been identified in practice on the basis of hundreds and thousands of years of observing the regularities occurring in the economic sphere. However, they can be identified proceeding from the system aspect of an economic entity.

The objective of this paper is the interpretation of budgeting from the perspective of systems approach. An economic entity is seen as an open system. Such point of view is consistent with the systemic interpretation of organization and organization theories [Scott, 2003]. As an open system, the organization should have some general attributes that are independent of the place and the time. If it is so, the identification of such attributes will allow us to find a budgeting basis that is independent of budgeting. And the general algorithm of budgeting can be formulated and explained on the ground of theory. And why budgeting procedures have become – and have to be – similar all over the world can be explained as well.

We will also interpret a conceptual basis of accounting from the systemic point of view. Successful systemic interpretation of both budgeting and accounting will be the evidence for grounding accounting and budgeting theory and practice in the systems theory. This result is of great value for teaching and learning as well.

## 2. THE SYSTEMS APPROACH AS THE CONCEPTUAL BASIS OF BUDGETING

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From the management perspective, the economic entity created by its founders as an instrument intended to bring specific benefits is particularly

important. Such an economic entity is an organization. From here onwards, this paper will focus on organizations.

Organization theory and systems theory, including concepts of self-organizing (autopoietic) systems and complex adaptive systems<sup>1</sup>, regard economic entities, and thus also organizations, as open systems, that is, systems connected with the environment through various relationships<sup>2</sup>. The system approach to the organizations seems to have a potential that may provide deeper insights into the nature of budgeting and can be used for orientation, justification and development of management practices. This is important for the formulation of a clear conceptual basis for the interpretation of financial information, including prospective information.

### 3. THE NATURE OF AN OPEN SYSTEM

In order to understand the nature and functioning of an organization, theorists use, among others, the metaphoric approach (see [Morgan]). One of the most significant metaphors of an organization is the biological metaphor, being the metaphor of each economic entity. The basis of this metaphor is the perception of economic entities, including organizations, as open systems<sup>3</sup>. Although the system approach does not guarantee full understanding of the nature of an organization, it nevertheless provides the necessary conceptual framework and demonstrates the inter-relationships between everything having any connection with it.

In general, a system is a set of elements with circumscribed relationships of order, with influence as an element as well. Sets of this type constitute distinct objects, which can interact with the environment consisting of elements and relationships not belonging to the set. If such interaction exists, the object is an open system.

The chief attributes of each open system are:

*separateness, inputs, processes of transformation and outputs.* Apart from the main characteristics, open systems have a number of specific features. According to [Katz, Kahn p. 23 -30]<sup>4</sup>, in order to understand the nature of an organization, it is essential to consider not only the main attributes of open systems, but also their other characteristics, especially:

#### a) Limits.

The possibility of the existence of limits is a necessary condition for the formation of a system. From the viewpoint of the organization as an object comprising the human element, the boundary means the awareness of the environment and an awareness of the influence of changes in the environment on the attributes of the system as well as the impact of system (attributes) changes on the environment.

#### b) Feedback.

Feedback means the return of part of the output (or information on the output) to its input. The occurrence of such transfer is a necessary condition of output control, that is, attaining and maintaining the required level of output. Feedback is a specific form of interaction between the system and its environment.

#### c) Cyclical character.

In terms of dynamics, open systems are formed by cycles of events, so cycles of events constitute the existence of an economic entity. Outflows through output enable inflows through input and repetition of transformations, which provides for the cyclical character of open systems. In the class of open systems, which are called organizations, certain categories of inflows and outflows as well as repetitions are usually co-coordinated by an agent of exchange, which is typically some form of money. It is important to note that the introduction of an agent of exchange results in the possibility of non-simultaneity in the movement of the basic object factor and the agent. Such a situation requires controlling not only the resources and the agents, but also related obligations.

<sup>1</sup> Autopoietic systems that are complex are adaptive as well. [Koch, p.197].

<sup>2</sup> There are two kinds of relationship, that is, physical influences and stated connections.

<sup>3</sup> Conceiving of an organization as an open adaptive system is directly or indirectly present within both management accounting (see [Atkinson, Banker, Kaplan, Young, p. 442-443], [Wilson, Chua] and financial accounting (see [FASB SFAC No.5, para.8]).

<sup>4</sup> After [Robbins, p. 15 - 19].

#### d) Negative entropy.

An open system imports energy and information from the environment, which restrains the tendency to growth, which is inherent in entropy. The imports may exceed the exports. In the case of the organization, this means the possibility of preventing destruction and disintegration, thus allowing to maintain internal states (repairing and sustaining elements and relations, avoiding “death”) and, when imports are in excess of exports, also the possibility of adapting the elements and structure to changes in the environment and the possibility of growth and expansion.

#### e) Steady state (homeostasis).

Importation, which restrains entropy, requires a degree of steadiness in the level of exchange with the environment. The exchange denotes inflow and outflow, but the steadiness of the former and the stability of the latter lead to a dynamic balance, which ensures relative stability of the character of the system.

#### f) Movement toward growth and expansion.

The steady state is the feature of rather simple open systems. In order to survive, complex open systems acquire more energy than is immediately needed to counteract entropy. Owing to this surplus the system character preservation can occur through growth and expansion. The most common growth pattern of a complex system is merely a replication of the same type of subsystems or cycles. As a result of such a multiplication, some new properties of a whole can emerge.

#### g) Balance of maintenance and adaptive activities.

In order to balance the state of the open system, it is necessary to reconcile two opposing functions – homeostasis (maintenance of the state) and adaptiveness. The purpose of the maintenance function is to assure internal balance and compatibility with the environment, whereas the adaptive function is aimed at shaping the elements and relations in such a way as to adjust them to changing internal and external requirements. The fulfillment of both functions is a condition of the durability of a system. Stable, well managed systems will not endure for long if they

do not have the ability to adapt to changes. Similarly, systems capable of adaptation will not survive if they are not capable to sufficiently stabilize their states.

#### h) Equifinality.

This attribute means that any given final state may be achieved, even if the initial states and subsequent trajectories vary widely. It follows, then, that an organization may attain its goals even if there is instability of inputs and transformations.

Please note that the tendency to stop and reduce entropy (negative entropy creation) can only occur in case of nonhermetic limit. The limit is the result of separateness, and negative entropy, that is, diminishing entropy, means increasing order. Therefore, leaking limits and negative entropy introduce time into an open system and determine continuance and growth. As continuance is a prerequisite for development, **permanent lack of the tightness of the limit** is the **necessary condition**, and the **tendency towards negative entropy creating – the sufficient condition** of continuance and development of an open system.

When looking at these conditions from a slightly different angle, it can be said that nonhermetic limits induce the ability to draw from the environment and to export to the environment, i.e. **ability to exchange**, while negative entropy induces **the ability to generate surplus of resources** imported over resources used and exported. Both abilities create a foundation for continuance and development of an open system and can therefore be regarded as **fundamental features** of an open system that continues its existence<sup>5</sup>.

It should be noted that, given the limited nature of the system and its environment, to achieve a balance between these two beings, it is necessary to restrict exchange, which is done by introducing the equivalent of importing in the form of the **medium of exchange**.

In the light of the systems approach, chief attributes of an organizations have the character of natural features. Therefore, representations of these attributes by means of monetary unit are not artefacts created by accountants and

<sup>5</sup> These attributes should be seen in the context of **cardinal systemic attributes of an economic entity**, i.e. in the context of: **identity**; **exogenous wealthiness** (ability to accumulate resources and their cardinal external determinants); **exchangeability** (capacity for exchange); **superfluosity** (ability to generate an excess of imported resources over the utilized or exported resources); **equifinality**; **periodicity** [Nowak W.A., 2003].

managers<sup>6</sup>. They are representations of natural properties of an open system.

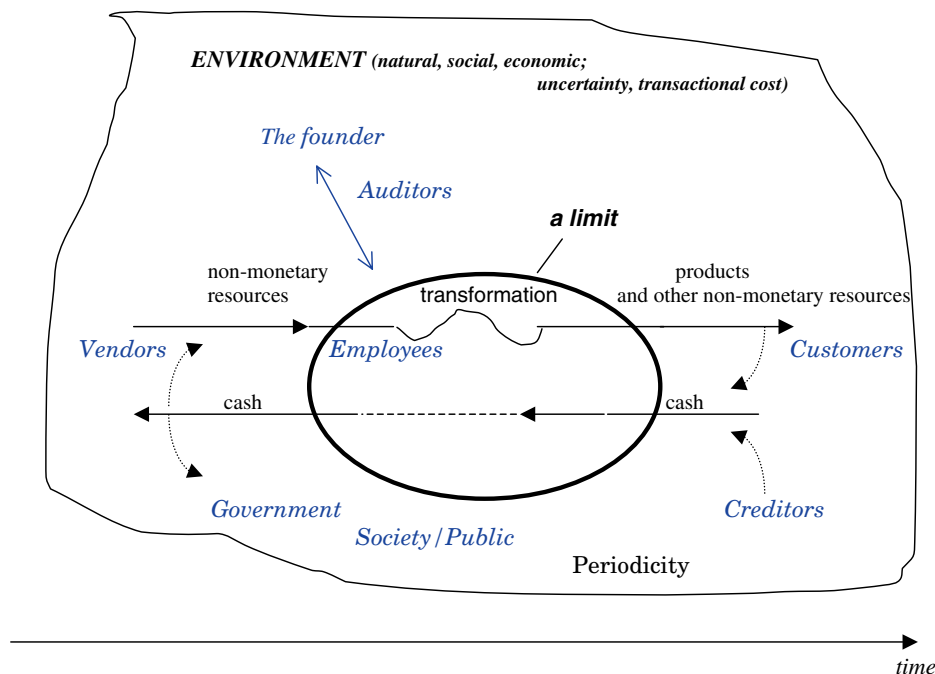
#### 4. THE ORGANIZATION AS AN OPEN SYSTEM

A model of an organization perceived as an open system, using money as a medium of exchange, is shown in **Figure 1**<sup>7</sup>. Non-monetary resources in this case mean both substance plus energy and information.

The necessary and sufficient conditions of

continuance and development of an organization take the following shape<sup>8</sup>.

- 1) the necessary condition – the **ability to exchange** (paying ability), appropriate to the volume of resources and shape of relationships of an organization, that is, proper intensity and continuance of cash flows;
- 2) the sufficient condition – the **ability to generate surplus** of imported resources over resources used and exported, appropriate to the volume of resources and shape of relationships of an organization.



Source: Author's concept on the basis of [Nowak, 1998c]

**Figure 1 – An organization as an open system with the exchange determined by cash**

<sup>6</sup> On artefacts within accounting, see for example [Hedriksen, van Breda, p. 126].

<sup>7</sup> The model of the metastructure of an organization as a complex adaptive (open) system is presented in Appendix 2.

<sup>8</sup> Both conditions are general and apply to any economic entity.

Please note that the sufficient condition implies, among other things, a need to generate a surplus on information resources, that is, to create knowledge. This property is the source of information asymmetry, i.e. the source of specific information advantage of an organization over its environment in general, and its founder in particular. Information asymmetry interlaces with the agency relationship, which is created as a result of the separateness of an organization. Both features are the natural consequence of the systemic attributes of an organization.

The model presented in Figure 1 demonstrates systemic contingencies of social relations of an organization as well. Thus, it creates a conceptual framework for the theories of the social aspect of an organization, such as the stakeholders theory, the contract theory of a firm (see [Sunder]) or the sociological theory of a social action unit by Talcott Parsons (see for example [Turner, pp.38-40] and [Nowak, 1998a, pp.29-34]).

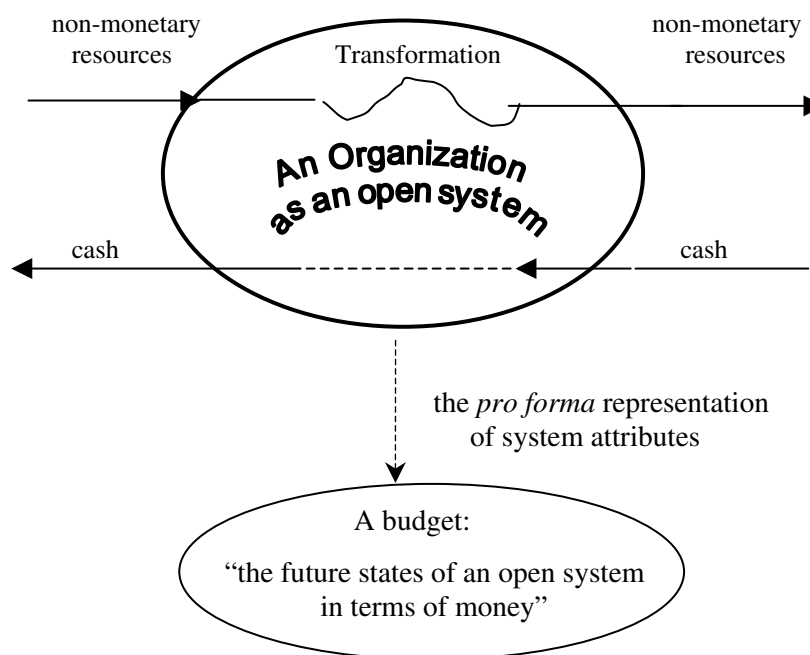
It should be pointed out that, as an organization is a specific form of an economic entity, so an enterprise is a specific form of an organization. An enterprise is simply an organization whose goal it is to generate

economic benefits for the owner. Therefore, everything that relates to the organization from the systems perspective, also relates to the enterprise. However, it should be emphasized that, to a great extent, what relates to an organization relates to an economic entity as well.

## 5. BUDGET AS AN COMMUNICATED PREDICTION OF THE STATE OF AN OPEN SYSTEM

In the light of the considerations presented hitherto, it can be said that a master budget describes some of the likely future states of an open system in terms of money (the medium of exchange), which is illustrated in **Figure 2**.

In practice, it is accounting that is concerned with representing wealth, capacity to exchange and ability to create surplus. It is done both from the *ex post* and *ex ante* perspectives. The latter is the domain of management accounting, which comprises budgeting concerning – *nota bene* – the effect of future states of resources and related obligations and changes in these on an organization's capacity for continuance and development.



Source: Author's concept

Figure 2 – A budget: a systems perspective

Therefore, as a predicting activity, budgeting should aim at optimization of factors shaping fundamental system attributes of the organization, while budgets represent periodic culminations of budgeted trajectories of the movement of these attributes. A way of using budgets for the control of an organization, justified by the system perspective, has been shown in **Appendix 3**.

The model presented in Appendix 3 also illustrates feedback as a condition of manageability of organizations' performance and organizational learning<sup>9</sup>. According to the feedback principle, in order to achieve the desired results, it is necessary to shape future activity on the basis of information on actual results of activities intended earlier. In other words, manageability requires both generation of retrospective and prospective information from planning and measurement plus disclosure of actual results of planned and completed activities. Therefore, planning and budgeting derive from the striving for manageability.

The budgeting itself has the system nature and constitutes the specialized open subsystem of an organization, which must be seen as the primary system. Due to this, the budgeting product, i.e. prospective information, can get to the subsystem environment, which – like in the case of any subsystem – consists of the internal and external environments of the primary system. The behavior of actors operating in the environment are determined by both the information transmitted

and the information accumulated until the moment of transmission.

As the actors also have the character of open systems, they tend to enhance their ability for continuance by affecting relevant phenomena. Information provided by budgets will affect actors' behavior on the condition that it can be absorbed by them (come within the scope of their perception) and yield benefits in the areas of their continuance and development. At individual level, it means that information must be understandable, sufficiently relevant to phenomena to be controlled and must bid fair to benefits surpassing the cost of obtaining it. This statement leads us to the roots of financial information quality, which consist of understandability, materiality, relevancy, reliability and excess of benefits over the costs of obtaining it.

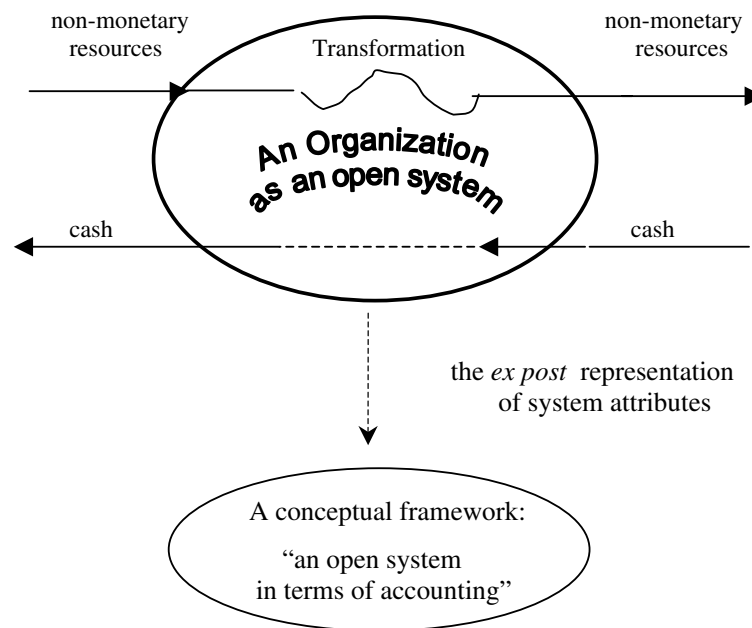
## 5. ACCOUNTING AND THE SYSTEM MODEL OF AN ORGANIZATION

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In the context of the considerations presented so far, it can be stated that the system model of organization reflects both the attributes fundamental to the continuance and development of an organization, and the groups of persons potentially interested in information on past, present and future states of these attributes and trajectories of their changes. Therefore, this model can provide a theoretical basis for the conceptual framework of accounting, which is illustrated in **Figure 3**.

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<sup>9</sup>For more on organizational learning, especially double-loop learning, see for example [Dierkes, Antal, Child, Nonaka, 2003].



Source: Author's concept on the basis of [Nowak, 1998b]

**Figure 3 – A conceptual framework for financial accounting a systems perspective**

In the light of the necessary and sufficient conditions of continuance and development of an organization, as of any economic entity, accounting can be seen as a tool for the representation of the actual and prospective states of these conditions' fulfillment. The formal system definition of accounting can be formulated as follows:

*Accounting is an instrument of measurement of and communication about, both of them in terms of money, the fundamental systemic attributes of an economic entity.*

Within this definition, an economic entity is a collection of human and non-human resources aiming at the creation of the value for its founder, due to the fulfilment of consumers' needs for the results of this entity's activities.

The fundamental system attributes of an economic entity are:

- a) the collection of resources and obligations related to them;
- b) the ability for exchange with the economy, society and nature;
- c) the ability to create a surplus of resources imported over resources used and exported.

According to the system definition, accounting is a rational and natural system that needs no inventor.

## 6. CONCLUSION

Budgeting plays a major role in the running of enterprises and other organizations. It is generally accepted that global budgeting with a given time horizon leads to the prediction of the final state of key attributes of an organization and to the identification of trajectories to arrive at this state.

In the context of accounting and financial management, the key attributes of an organization are: resources and commitments related to them, ability for exchange with the environment and ability to create a surplus. The systems approach to the organization indicates that these attributes are natural characteristics of an open system.

In the light of systems theory, accounting, including budgeting, does not create artifacts. It only represents and communicates past and future states of natural features of an open system.

Thus, the theory of organization as an open system is the theory that offers a conceptual framework of accounting, from both *ex post* and *ex ante* perspectives. As such, it legitimates both financial accounting regulation and financial plan preparation. It is also an instrument of significant explanatory power for educational purposes.



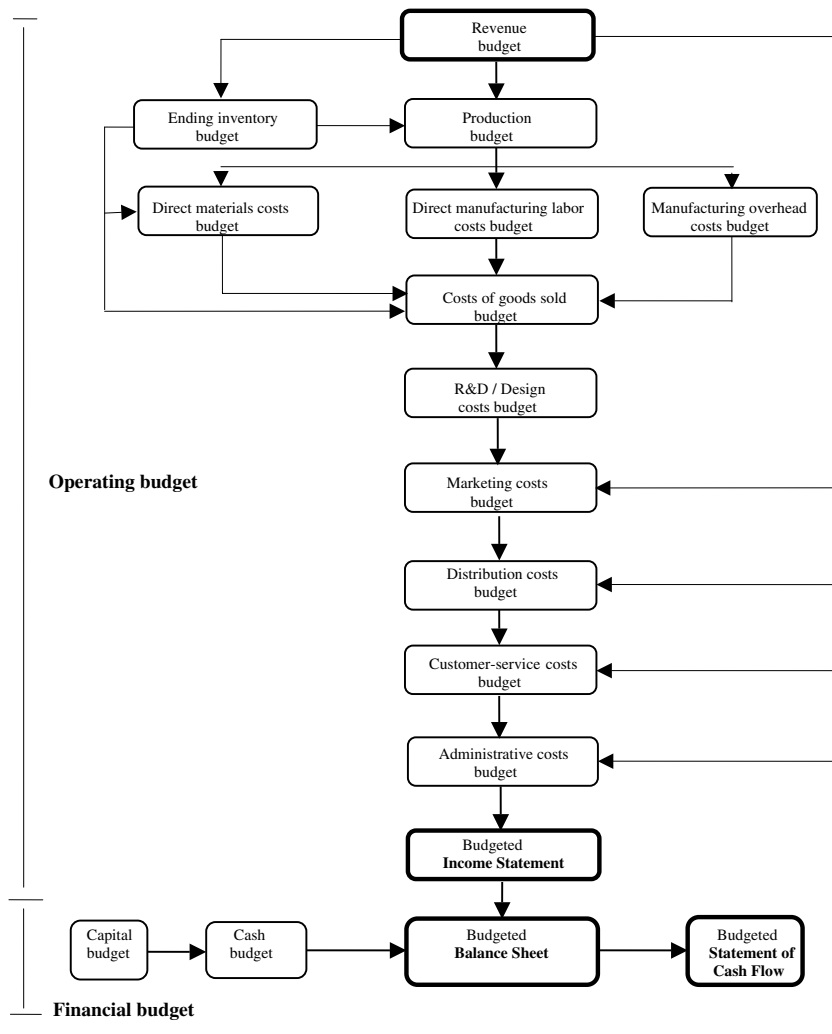
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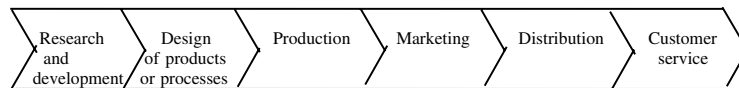
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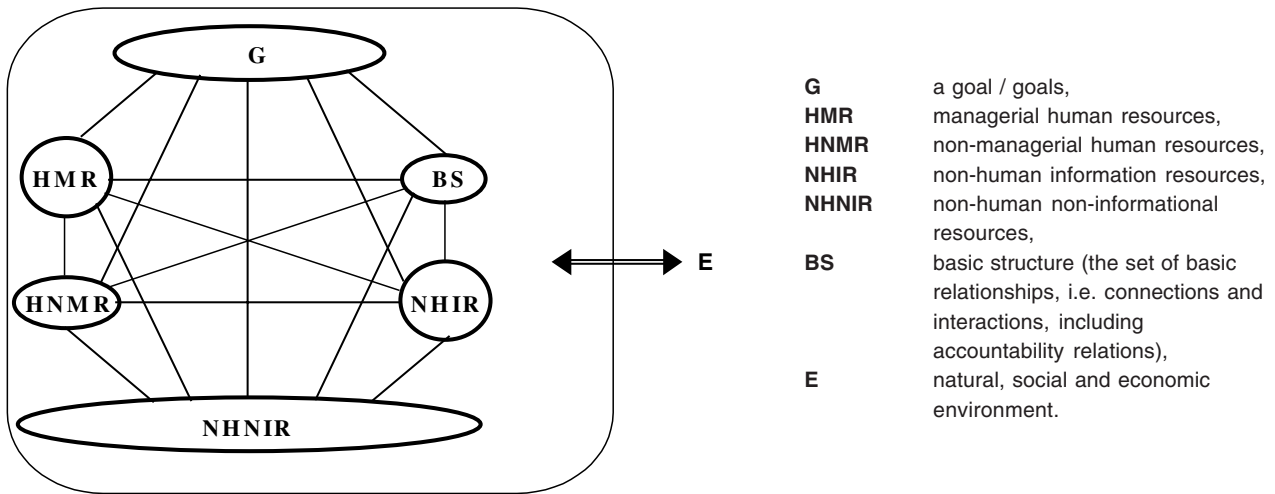


**The value chain of business functions**



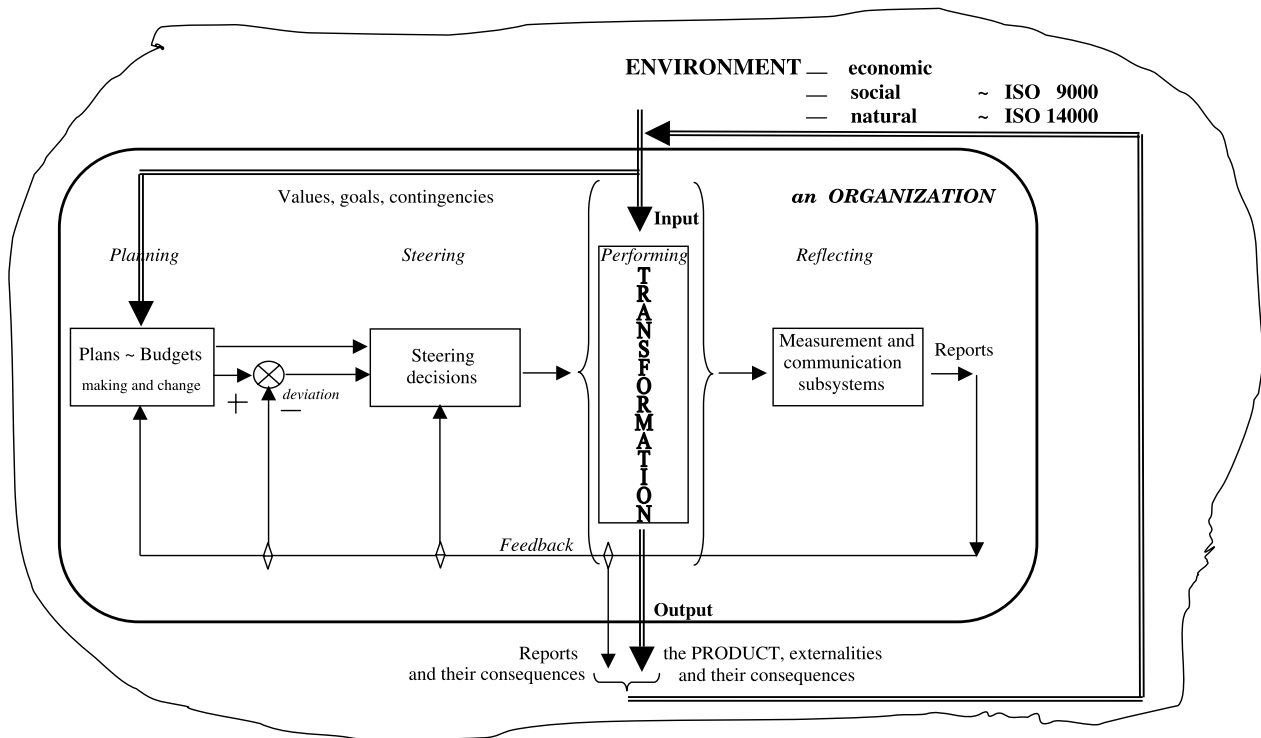
Source: [Horgren, Foster, Datar, pp. 7 (the value chain) and 183 (the master budget)]

**Appendix 1 – The master budget of an enterprise**



Source: Author's concept on the basis of [Leavitt], [Krzyżanowski] and [Nowak, 1998b]

**Appendix 2 – The metastructure of an organization as a complex adaptive economic entity**



Source: Author's concept

**Appendix 3 – Systems (controlling) approach towards management**