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tecsi@usp.br

Universidade de São Paulo  
Brasil

Ribeiro de Toledo Filho, Jorge; Elias, Paulo Roberto

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## **AN INFORMATION SUB-SYSTEM MODEL FOR THE UTILIZATION OF THE RECEIPT PRINTER AS A MANAGEMENT INSTRUMENT IN THE SUPERMARKET SECTOR IN THE STATE OF SANTA CATARINA**

**Jorge Ribeiro de Toledo Filho**

University of Blumenau, Santa Catarina, Brazil

**Paulo Roberto Elias**

University of Blumenau, Santa Catarina, Brazil

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### **ABSTRACT**

The supermarket sector in the State of Santa Catarina, as well as other sectors, has invested in technology and information systems. Public authorities make legal requirements about this sector which, at first, serve only as fiscal control, as in the case of the Receipt Printer-RP. This paper aims to demonstrate how the RP is used in the companies studied. It also aims to show the feasibility of the RP as a tool for management purposes, with results in reducing expenses, costs and tax charges, by means of specific reports. An information subsystem model will be considered as a management tool with the use of the RP. The methodology adopted was quantitative, with an exploratory and deductive study. The universe of this study is the supermarket sector in the State of Santa Catarina, using a sample chosen by the invoicing criterion. The database was formed by questionnaires sent to the sector and other information provided by public agencies, through the use of special data from the State Department of Finance, which is responsible for the control of RPs. Results indicate that it is possible to use the RP as a management instrument.

**Keywords:** *Receipt Printer; Information Systems; Supermarket sector*

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Endereço para correspondência/ *Address for correspondence*

*Jorge Ribeiro de Toledo Filho*, Doutor em Controladoria e Contabilidade pela FEA-USP. Professor do Programa de Pós-graduação em Administração e Contabilidade da Universidade Regional de Blumenau. E-mail: [jtoledo@furb.br](mailto:jtoledo@furb.br) Endereço Av. Jesuíno Marcondes Machado, 2201 apto. 103- Chácara da Barra, Campinas-SP CEP 13092-321. Telefone 19-32530756

*Paulo Roberto Elias*, Mestrando em Ciências Contábeis no Programa de Pós-Graduação em Ciências Contábeis da Universidade Regional de Blumenau. Agente Fiscal da Secretaria da Fazenda do Estado de Santa Catarina. Endereço Rua Hercílio Luz, 278 - 2º Andar – Centro Lages /SC CEP: 88501-010 E-ail: [pelias@sef.sc.gov.br](mailto:pelias@sef.sc.gov.br) Telefone 49-33214816.

## 1. INTRODUCTION

Trust and transparency in accounting information must be the basic premise observed by most accountants, because according to Iudícibus (1997, p. 77), "(...) it is the quality that makes the user accept the accounting information and use it as a basis for their decisions, thus becoming a fundamental link between the user and the information itself".

This disclosure gives accounting information a very important status, since improvements can only be detected by using reliable information. In the supermarket sector, a great amount of this information goes through the receipt printer systems, the legal and official system for controlling the entry and exit of goods. In this fiscal document issuance system, there are several reports to be extracted, with lots of information in them.

As the Information Systems are very broad and involve different areas, such as computing, administration, accounting, legislation and logistics, among others, it is necessary to focus this study on the areas closer to the supermarket sector in the State of Santa Catarina, particularly on commercial automation, which will offer strategic advantages for the whole segment through information technology.

It is worth mentioning that the operational system of receipt printing is not only related to the check-out cashiers; behind the software managing this system, there are the front cashiers, the rear system, stock maintenance, balances, price consulting systems, payment through credit or debit cards – the so-called Electronic Transfer of Funds (TEF) – and many other related systems that need to be studied for better management in this sector.

Because of their legal connotation, this information is often confused with the real movement of the economic activity, putting the company into a legal context – this is required by the tax collecting organizations. However, this legality brings the need for official report on the economic activities, and also fiscal and managerial reports which will be the foundation for adequate decision making, and consequently, a reduction in fees.

The detailed study of the RP and its related systems form a particular type of legal information system, since its use not only guarantees the reliability of the accounting information, but also prevents trouble with the taxing entities. The RP is valid only if it is linked to an information network that can manage all the entry and exit flow of goods in the company; therefore, although other sectors may be studied in a similar way, we decided to study the supermarket sector since almost all sale information comes from the RP.

The RP system allows several departments of the company to operate in an integrated way. For instance, in sales with credit cards, the stock control systems (goods write-off) are synchronized with the pricing system, as well as the integration system of electronic transfer of funds – TEF – and others. According to this example, the RP engages different departments of the supermarket, since Accounting is responsible for

registering all the transmission of this information from sales to restocking; or also from payment to the amounts that must be paid to the credit card companies.

Thus, the RP can be used as a managerial instrument, by using an AM information sub-system model.

## 2. INFORMATION SYSTEMS

The use of RP itself does not imply an IS; it is part of the technological potential of the company formed by hardware, software, information networks, databanks and applications which give support to the system. The IS collects, processes, stores, analyzes and disseminates information with a particular objective through inputs (data, instructions), processing and outputs (reports, calculations). The entry data are processed in a usable format and sent to specific users, such as the managers, accountants, or a specific department (e.g. sales), or another IS which will use these data for another treatment depuration and change of focus for the use of this information. Below, find a sketch of an information system:

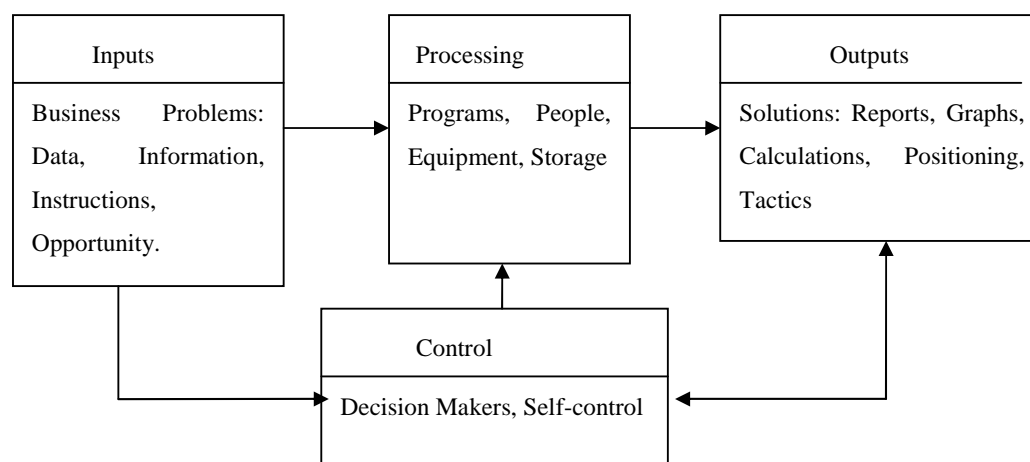


Figure 1- Schematics of an information system.

Source: Turban, Mclean and Weterbe (2001, p. 39)

An IS uses a physical part (hardware), another part composed of application programs, a databank and mainly people who work directly in the information system, and other people who use the information generated by the system.

For Turban, Mclean and Weterbe (2001, p.40), an IS can be classified according to its organizational structure as follows:

- a) IS by department, where specific applications are used for each area;

b) Enterprise IS, which would be an IS by department combined with other functional applications, such as the *ERP – Enterprise Resources Planning*, or a management integrated system; this system substitutes for several application systems in a unique and integrated system.

Establishing a comparison parallel, the RP and its information system would be the IS kind enterprise; it is directly connected to the sales department, but in combination with several other departments, such as stocks and receivables, among others. There is already an idea of having the RP in an integrated way, as a transition to the ERP.

Directly linked to the sales department, the information of the RP migrates to the financial, accounting and even to the marketing ISs through promotional sales, presentations on the *check-out* computer screen, information on the receipts and others. These systems are in constant evolution, increasing their abilities and providing more useful information; however, the information reliability determines the use of the IS – if the system is not fed properly, this will imply in the malfunctioning of the whole system. Oliveira (2001) initiates his discussion on the ISs by presenting some kinds of faults in information, such as:

- a lot of inaccurate and not so accurate information;
- information is dispersed, demanding a great effort to locate and integrate it;
- sometimes important information is retained exclusively by some executives;
- important information usually arrives late and many times it is not reliable.

This information needs to be compiled in order to get all its potential. For Oliveira (2001, p.24), a system needs to have an objective – in other words, the reason why it was created. A system must have controls and evaluations to check whether the exits are in accordance with the objectives pre-established by the system. Also, another system integrating part is feedback; that is, use exit information and reintroduce it into the system to generate new information.

For Ross and Murdick, *apud* Oliveira (2001), Information Systems consist of a group of people, manuals and data processing equipment focused on selection, storage and recovery of these data aiming at reducing uncertainties in the decision-making process by providing information to executives in time for them to be used more efficiently.

### 3. THE RECEIPT PRINTER- RP

The compulsoriness to use fiscal control equipment is relatively new in the Brazilian juridical system, established by the Federal Law number 9.532/97, and its integration with the microcomputers has changed companies' behavior, which invest now in commercial automation as a way to be more competitive.

This market has called the attention of many software and hardware companies, which have highly invested in this sector - IBM do Brasil, Itaotec, Bematech, Urano, Schalter, Digisat, Zanthus, Sigtron, NCR, Daruma, Elgin, General, Ionics, Sweeda and

many others – as manufacturers of Receipt Printers, and also of countless commercial software developers that meet the legislation requirements, the so-called Software Houses.

The Receipt Printer – RP – is the adequate equipment to be used in commercial automation operations, due to its capacity of printing fiscal documents required by the tax legislation, as well as performing fiscal and managerial controlling related to goods circulation operations. Similar to a computer with a mother board, the RP – in its three modes: RP-CR (cash register), RP-FP (fiscal printer) and RP-POF (point-of-sale terminal) (RICMS/SC/01, article 1<sup>st</sup>, paragraph one of Appendix 9) also has an integrated circuit board called Fiscal Control Board (FCB) (RICMS/SC/01, article 2<sup>nd</sup>, Item I of Appendix 9), which contains memories storing information records of all operations performed in the RP system either permanently or temporarily. One of them is the Detail Tape Memory - (MFD) (RICMS/SC/01, article 4<sup>th</sup>, Item V, letter “a” of Appendix 9) – which is a hardware resource of the Fiscal Control Board for permanent storage of the necessary data to reproduce all the documents issued by the equipment, and for the generation of a databank with this information, allowing the reproduction of data in electronic media.

According to Filipak (2004), the RP with MFD has significant advantages:

- electronic access to the analytical activity (sales by item) of the RP;
- data are stored in a non-re-recordable memory with an overwritten protection. This protection prevents the electronic alteration of data stored in the RP;
- besides the analytical sales recorded on the MFD, there are also the synthetic ones recorded in the fiscal memory;
- convenience of not having to store the detail-tapes (coils); in the case of large retail stores, these coils must be kept for the prescription term (5 years) by a legal requirement, meaning storage savings. Sometimes companies even rent warehouses to store the detail-tapes.

It is worth pointing out that this legislation is highly technical, therefore the professional of the accounting area must be aware of these legal provisions so that they do not disrespect the accessory obligations and main obligations (tax payments), and can comply with supervision and avoid high fines for the company.

#### **4. RESEARCH METHODOLOGY**

This research is of the quantitative type, with an exploratory and deductive study. According to Richardson (2009), the quantitative method, as the name indicates, is characterized by the use of quantification, both for the collection and treatment of data. It has exploratory objectives, due to the insufficient knowledge about the theme studied (BEUREN, 2004). As for the method used, it is a survey with a questionnaire.

This study universe is the supermarket sector in the State of Santa Catarina, using a sample chosen by the invoicing criterion. The database was formed by

questionnaires sent to the sector and also by data collected at public agencies, particularly data from the Department of Finance of the State of Paraná, the agency responsible for controlling the RPs.

The 33 largest companies in the supermarket sector in the state of Santa Catarina were contacted, and 16 (a little less than 50%) answered the questionnaire. These companies have stores all over the state; therefore, there is a total of 102 units/stores - 16 head offices and 86 branches.

In order to reach the objective of the study, a questionnaire was created and sent to the 16 head offices to understand if the largest supermarkets in Santa Catarina have an information system linked to the RP, and capable of helping the sector with management and decision-making.

## 5. PRESENTATION AND DATA ANALYSIS

During the course of the research, we could notice that the RP Information Systems are being used in different ways, not having a unique position about the criteria of the system importance, integration and so on. Therefore, a questionnaire was created to identify whether the largest supermarkets in Santa Catarina have an information system linked to the RP which is capable of helping the sector with the management style and decision-making.

The survey revealed a higher trend of the sector to use a more specific commercial automation system (10 companies), representing 62.5%, and 37.5% representing the companies which use pre-developed systems for the segment in general. Thus, we can infer that the sector is searching for its own systems to make integration easier. From this point of view, the survey confirmed the information found in the theoretical construct exposed in this article.

As for stock control, the survey showed that only one (1) among the sixteen (16) companies said control is performed daily, and so compatible with rigid controlling; 3 companies answered their control is performed weekly, what can be considered as reasonable controlling; 7 (43.50%) said they have a monthly control, which is considered not safe enough for the economic market; 4 have their control performed once in a semester (25%), which actually must create problems mainly to the purchasing sector, since it is very difficult for their administrators to optimize functions with such a long delay; one company declared they perform control annually. Thus, we can say the situation is worrying in relation to stock control because this is one of the pillars of the sector; moreover, we can infer that this area is very promising for new studies in search of solutions. A relevant piece of information concerns the fact that none of the companies work with real time stock control, perhaps because even though it is already technically available, this is still a very distant reality for the sector by means of integrated systems (ERPs), in accordance with what can be found in the theoretical framework.

The survey indicated that the RP is an important tool for agility in the check-out sale flow. Fourteen companies (87.50%) considered the RP to be very important, even

essential, to the sector; one company (6.25%) said the high cost of the equipment is a negative point; and another company (6.25%) believes the RP is only a fiscal control tool, not managerial.

In Table 1, the question involves the use of the TEF system – Electronic Transfer of Funds via Pin Pad (sending data from debit/credit cards to the RP) or via POS – Point of Sale (sending data from debit/credit cards which are not integrated to the RP).

Table 1 - TEF - Electronic Fund Transfer

Credit/Debit cards transmission methods	Absolute Frequency	Relative Frequency (%)
Pin Pad - dedicated phone line	12	75,00
Pin Pad - dialed line	2	12,50
POS - dedicated phone line	1	6,25
POS - dial line	0	0,00
Not Used	1	6,25
Total	16	100,00

Source: research data

The survey showed that 75% of companies make use of the TEF system with a Pin Pad dedicated phone line (exclusive transmission), indicating the increasing use of credit cards as a method of payment. Also, two companies use the Pin Pad dial-up (common transmission by telephone, slower but cheaper), representing 12.50%; and 1 company uses the POS, dedicated phone line (in POS there is no integration with the RP), representing 6.25%. Only one company does not make use of the TEF system, therefore not working with credit cards. The survey indicated a strong integration of the sales department and the receivables department.

Concerning commercial automation, all the 16 companies (100%) rated the system as: “Very important – high priority”. Therefore, if the whole sample behaves the same, the Information System of the RP is also important.

In the grading format (1 for the most important to 5 for the least important) in Table 2, the importance of the IS in the RP can be seen as follows:

Table 2 Importance of Is in the FCP

Importance of Is in the FCP	Results															Sum	Average	Median	Mode
Fiscal and accounting services	1	3	1	1	1	5	1	1	1	1	1	1	3	1	1	24	1,50	1,00	1
Help with decision making	5	4	1	3	3	2	4	3	4	3	1	5	4	1	3	50	3,13	3,50	3 and 4
Help with sale price definition	4	5	1	4	2	3	3	4	5	4	1	4	5	1	2	51	3,19	4,50	4
Effectiveness in customer service	2	1	1	2	1	1	2	2	2	2	1	2	1	1	4	27	1,69	2,00	1 and 2
Help with cost reduction	3	2	5	5	5	4	5	5	3		1	3	2	1	5	54	3,38	4,00	5

Source: research data

We can see by the “mode” that fiscal and accounting services are the main argument for using the RP system; thus, there is a bimodal tendency indicating that besides fiscal and accounting services, effectiveness in customer service is also a main point in the use of the RP system. Therefore, for this research the most important functions of the RP information system are considered. Next, the responders consider – in this order – the help with decision-making, pricing and lastly, reduction of costs. By



the “average”, we have first fiscal and accounting services (1.5) and effectiveness in customer service (1.69). As the scale is decreasing (from the most to the least important), the lower the value, the more important it is. According to importance, by the average, we have help with decision-making (3.13), help with pricing (3.19) and help with cost reduction (3.38), the same tendency of the “mode”.

## **6 MANAGERIAL SUBSYSTEM MODEL FROM THE RP**

There are several definitions of information systems in the literatures. In this chapter we propose – in a synthesized way - a model that complies with a system of managerial information that has the RP as a support and framework.

As for concepts and managerial techniques, we have in mind the need of planning, direction, organization, execution and also control of entrepreneurial activities, in this case, supermarkets. Previously, it is necessary to clarify some concepts about the model proposed.

Being a management model, it is worth pointing out that in a managerial system or subsystem, the goal is not producing documents, reports, spreadsheets, and so on, that are not useful to the company; in other words, the focus of the managerial system/subsystem merges with the entrepreneurial goals. To Arantes (1998, p.91):

“The function of the managerial subsystem is to provide instruments for the establishment of more specific orientations, giving the administration the necessary support to define future plans, their direction and the results expected (planning), execute plans (direction), evaluate results and promote corrective measures (control), in a permanent process.”

The primary goal of a managerial subsystem is not past data compilation, but instead the production of elements which can contribute to the company’s development. Also, this system or subsystem is interrelated with other systems in the search for their objectives, such as operational, organizational, communication and information subsystems. The following figure illustrates a subsystem:

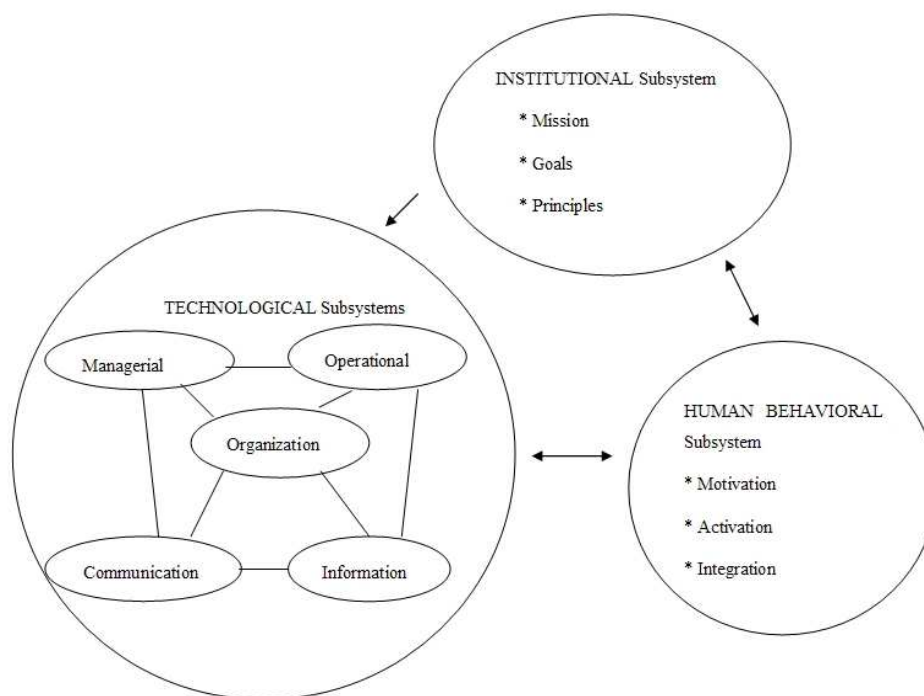


Figure 2- Managerial subsystems

Source: Adapted from Arantes (1998, p.88)

In this Business Management System chart we can see the interpellation of the Human, Technological and Institutional subsystem, where the Institutional subsystem would be the core of a company, and the Human-behavioral subsystem would be the human being mobilization in search of better business performance. In the Technological subsystem there are several subsystems, such as the Information subsystem, which aims at producing information for the execution and management of each task and the company as a whole; the Communications subsystem, where the interaction between the external and internal environment takes place, providing the processes and the means to bring clients, employees, entrepreneurs, suppliers and others together; the Operational subsystem, which supplies the means for the administration to decide which operations will be executed and how this will happen; the Organizational subsystem which allows the subdivision of tasks in specific functions and the designation of qualified personnel; and lastly, the Managerial subsystem, responsible for supplying the means to define what the company must do, and what is being done and if it is in accordance with the goals. It is in this last type of technological subsystem that the RP management model is inserted.

The managerial process is complex, determining in which way the functions will be executed and how these functions are integrated, and also demanding planning, execution and control. The proposed model is based on this trinomial, according to figure 3.

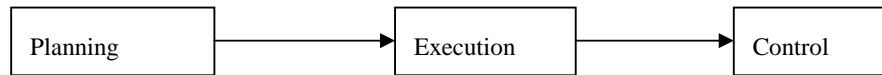


Figure 3- Simplified overview of a managerial model

Source: the authors

In this way, the information subsystem can be divided in three very distinct modules: Planning or Decision Making Module; Execution Module and Control or Corrective Actions Module.

As seen in the theoretical construct about the RP, this is an information receptacle at a planning level. It contains a great amount of data capable of leading administrators to a real planning aiming at decision-making. Note that traditionally several authors divide planning into three perspectives: strategic, tactical and operational. Some authors make other divisions, but still agree on this basis, even using different names. For instance, Catelli (2001, p.123) on his view of Economic Management (GECON) stated:

“When we define the stages of a management process according to the needs imposed by the environment; we are establishing a way of dealing with all variables affecting the company. Depending on the peculiarities, we will have management processes with specific characteristics. Whatever these are, this process must support managers with the optimizing of the economic result, from the choice of better strategic and operational plans to corrective actions to ensure the search for the ideal result. Generally speaking, the management process defined by the economic management considers the following stages: strategic planning, operational planning, programming, execution and control.”

In the first module – Planning / decision-making – the administrator may define the routes to be followed and determine what to do, how and when to do it. Figure 4 shows the planning process.

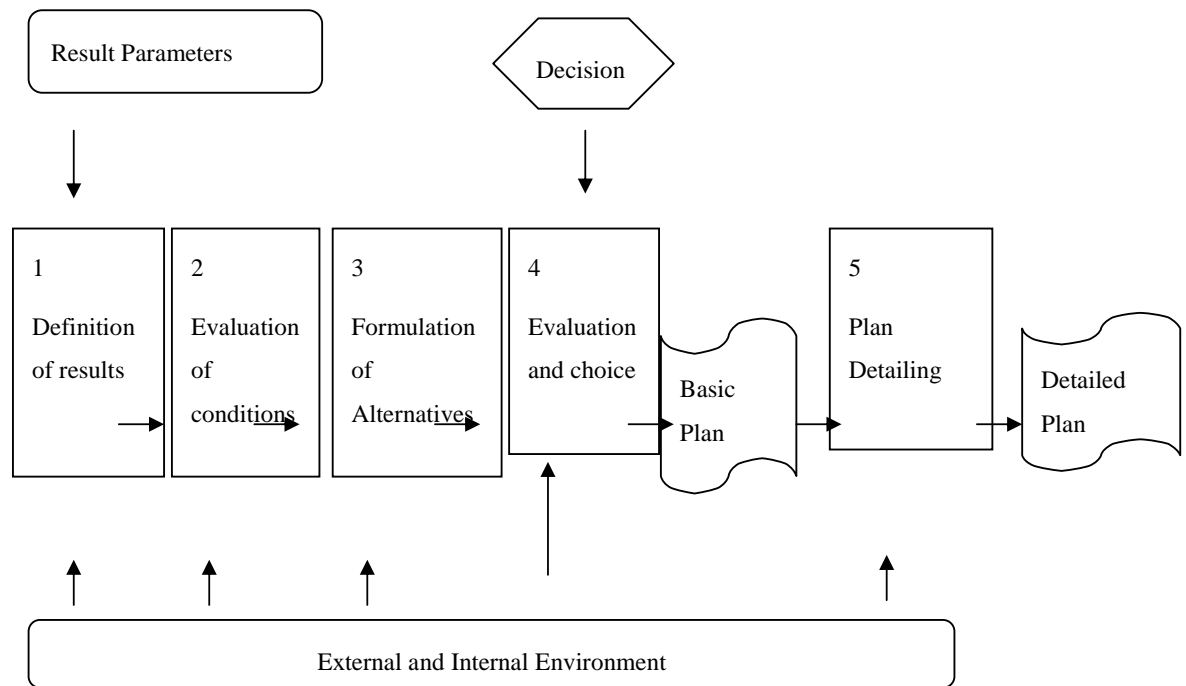


Figure 4-The planning process

Source: Arantes (1998, p. 139)

In order to reach the first module of a management model from the RP, one must first define the results to be reached: how to be the best supermarket, how to increase profitability, how to sell better and more, and so on. Establishing results demands a deep study of the external and internal environment, as follows: considering the external competition a fact, or if there are supermarkets with better infrastructures, the objectives to be reached must take this into account; in other words, they have to determine their *ranking* in this environment, and it is useless to define results impossible to be reached in a short term; internally, the supermarket must have the computing and human elements capable of executing these objectives – it is pointless to have a lot of check-outs and not enough trained human material (cashiers). Therefore, the initial planning stage demands a previous study of the environment and the context of the company at that moment. In order to do so there must be ways to measure the supermarket evolution. One idea would be the creation scaled objectives, or reaching them little by little or in steps.

In the second stage of planning, evaluation of conditions, one must clearly have in mind the favorable and not favorable positions, such as considering the place where the supermarket is, if the neighborhood can handle supermarkets of this size, if there are competitors, or if the check-out number of cashiers is enough for this demand. Determining negative and positive points makes it easier to decide what actions should be taken.

The third step, formulation of alternatives - after the study of external and internal environment and the determination of negative and positive points, relates to the actions to be taken to optimize the strengths and decrease the effects of negative points. There

are always several alternatives in the actions like having special sales, accepting credit cards, having the scale coupled with the RP and others. If sales with credit cards are not significant, maybe the best alternative is not to use the TEF. The operational cost for a check-out with a legal solution for the electronic transfer of funds (Pin- Pad) may be too high for the low volume of sales in this modality.

The fourth step, choice and evaluation, is actually the decision-making process, using the example of the previous paragraph. If sales with credit cards are small, the decision of not having the TEF solution must be the best one; however, if the decision-making is for the use of credit cards for sales, high investments will be necessary. According to Arantes (1998, p.142) we have: "It is a stage of great importance since it involves decisions that will condition actions, changes, high investments which affect significantly the company's performance."

In the last stage we have the planning detailing - the necessary measures have already been taken, the objectives have been established, the teams for each function have already been chosen, and variables have already been studied. Thus, we can sketch the planning module of the management model from the RP in figure 5 as follows.

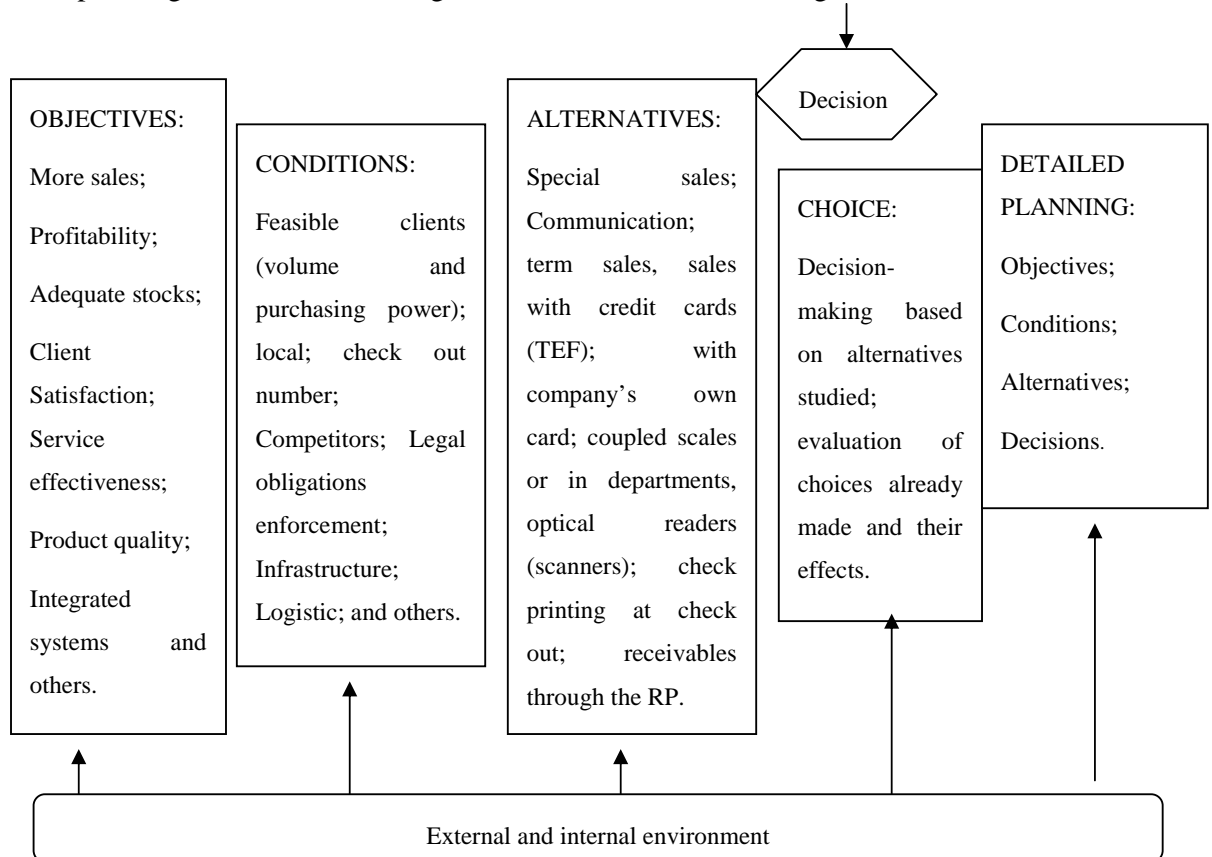


Figure 5- Planning process module

Source: the authors

The second stage of the creation of management model from the RP is about Execution. This is where the potential of RP is more visibly determinant in the management technological subsystem. The Execution model cannot be confused with the operational subsystem, for the latter is about all operational points at the company. The Execution model of the RP is connected to the operational system and works with it in an integrated way. In this chapter we have already demonstrated how it is possible to have an integration between different systems or subsystems.

Figure 6 shows an execution operational scheme:

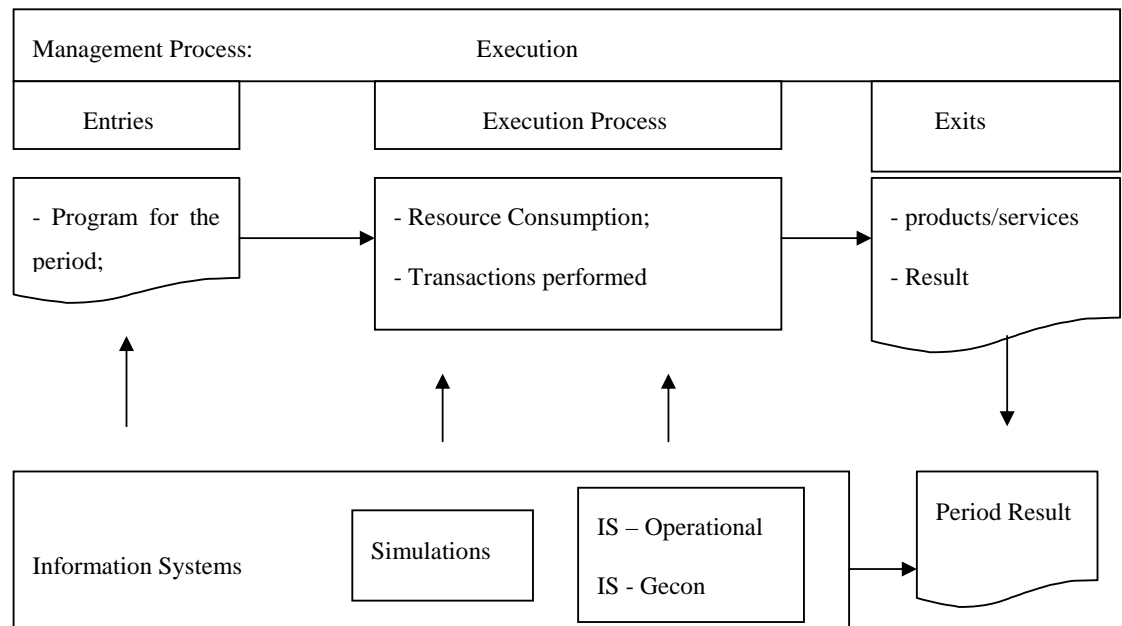


Figure 6- Stage of execution

Source: Catelli (2001, p. 169)

It is in this stage that all execution modes of the subsystem take place. Information is generated and can be evaluated in other stages - control for instance, obtaining from there the period result by measuring the tasks performed. So, we have the stage of management model execution from the RP.

In the RP execution model, there are several parameters to be observed that must be in accordance with the legislation. Because of this legislation one might think at first that the RP is merely a concentrator for data, but the existing control over the RP demonstrates it can be an important managerial tool.

As seen before, the RP has software – the basic software – that is responsible for the correct functioning of the RP. For the start of product sales activities in a supermarket, there is application software (commercial software), external to the RP, which “talks” to the RP basic software. This other software is an application program responsible for the registration of products, suppliers, tax rates, sales commands, cancellation routines, discounts, increases, daily sales opening and closing, by processing data export routines to the accounting System or subsystem. It might seem that the application software is

managing the system, but that is not true. Its programming routines are only implemented if the RP basic software validates the information; that is, the basic software controls the application software not allowing illegal operations.

The sale of goods is the main information feeding the RP system. In sales, the stock system is activated and has its write-off, for accounting and fiscal reasons, as well. The product sold was registered with a rate for tax effects, and it can be registered as a special sales item with differentiated prices. The method of payment is also controlled and can be in the form of cash, tickets, checks, debit or credit cards; this information creates different types of reports: sales, cancellations, returned items, increases made and discounts given, withdrawals (cash); methods of payment, receipt printing, Z reduction, fiscal memory readings, X readings, special sales results. If the product was weighed, the system of scales coupled with the RP is activated, or in a remote mode. In short, a great deal of managerial and fiscal information that will help administrators in their decisions. Figure 7 shows the execution stage:

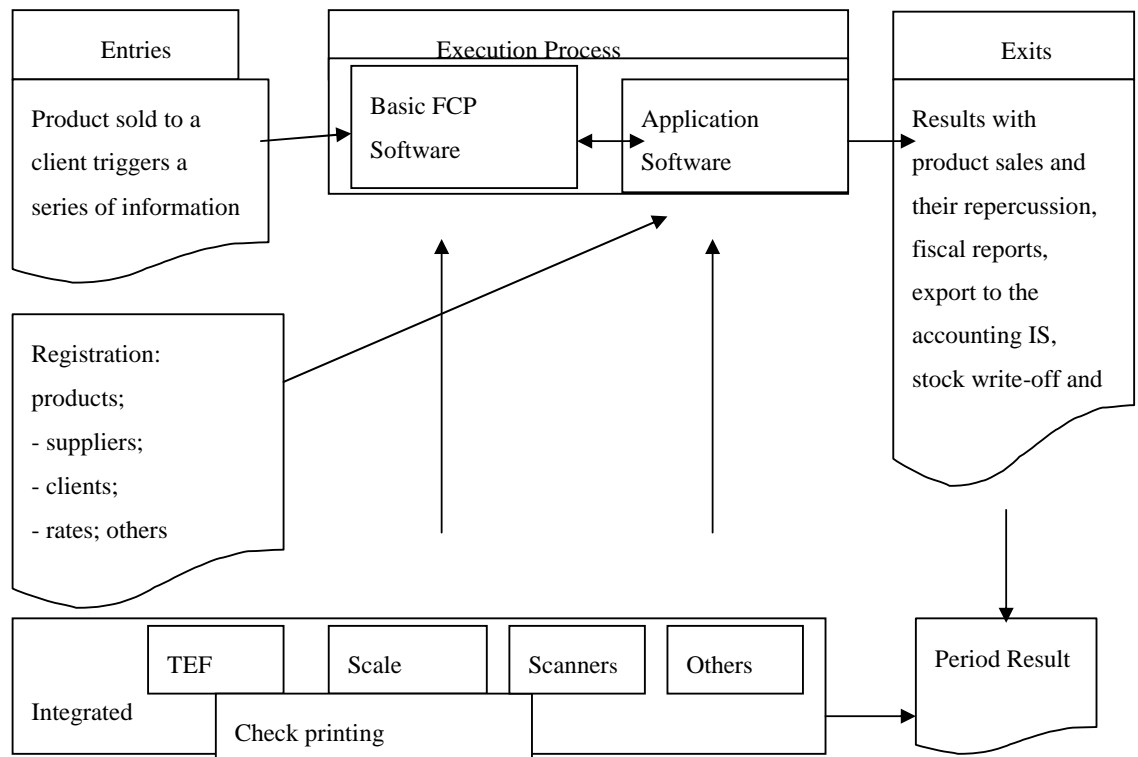


Figure 7- Stage of execution of the management model from the RP

Source: the authors

The RP and the Application Software exchange information, but the sale is performed only by the RP, while the registration of different items is performed by the application software. Several other systems are shared both by the RP and the application. For example: the application must allow sales with debit cards or automatic

credit only if performed by the RP, and these are also entry data.

The third module of this management system is the control stage. In this stage the results obtained are compared with the ones expected, thus identifying improvement and rectification points. Strangling points such as stuck stocks, expired and expiring products and even workers' fraud are identified. A promotional policy can also be used or excluded from planning, according to the results obtained, and then we have feedback; there is the possibility of reintroducing information in the form of data in a new stage of planning. Besides, Catelli (2001, p. 171) states that: "The feedback system offers a great amount of analytical information, which is used in the planning process. It also offers a way to evaluate the pre-established objectives. (...)". We use Catelli again to sketch this control model.

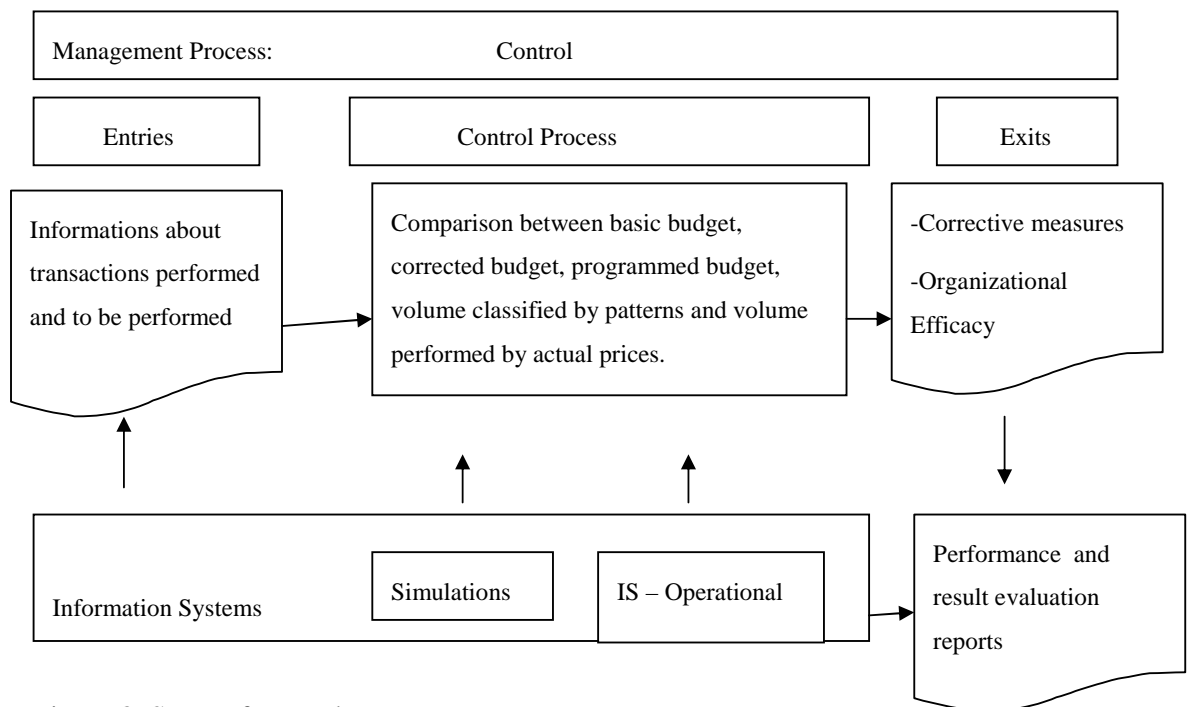


Figure 8. Stage of control

Source: Catelli (2001, p.170)

At the control stage of the proposed model for the managerial system from the RP, several improvement points are identified through comparison between results obtained and expected. Several reports were issued or are available for analysis and corrective measures actions, or even drastic changes in the supermarket running policy. Figure 9 below shows this control model.



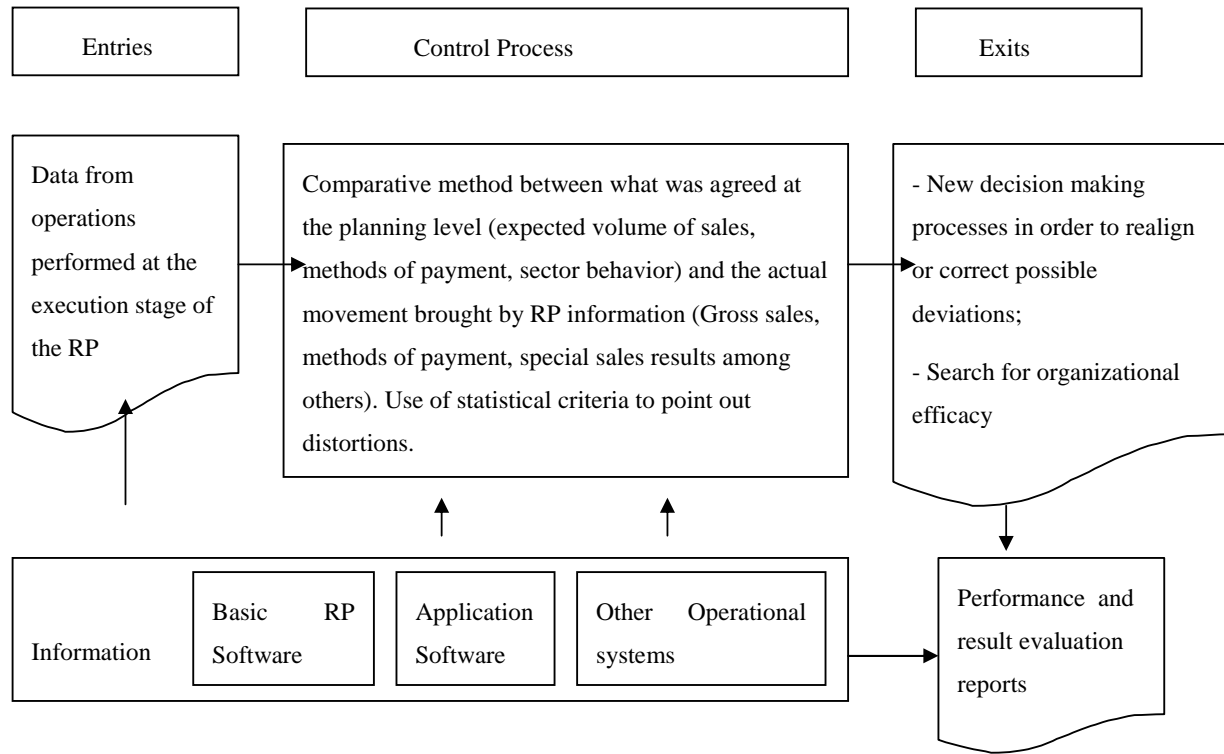
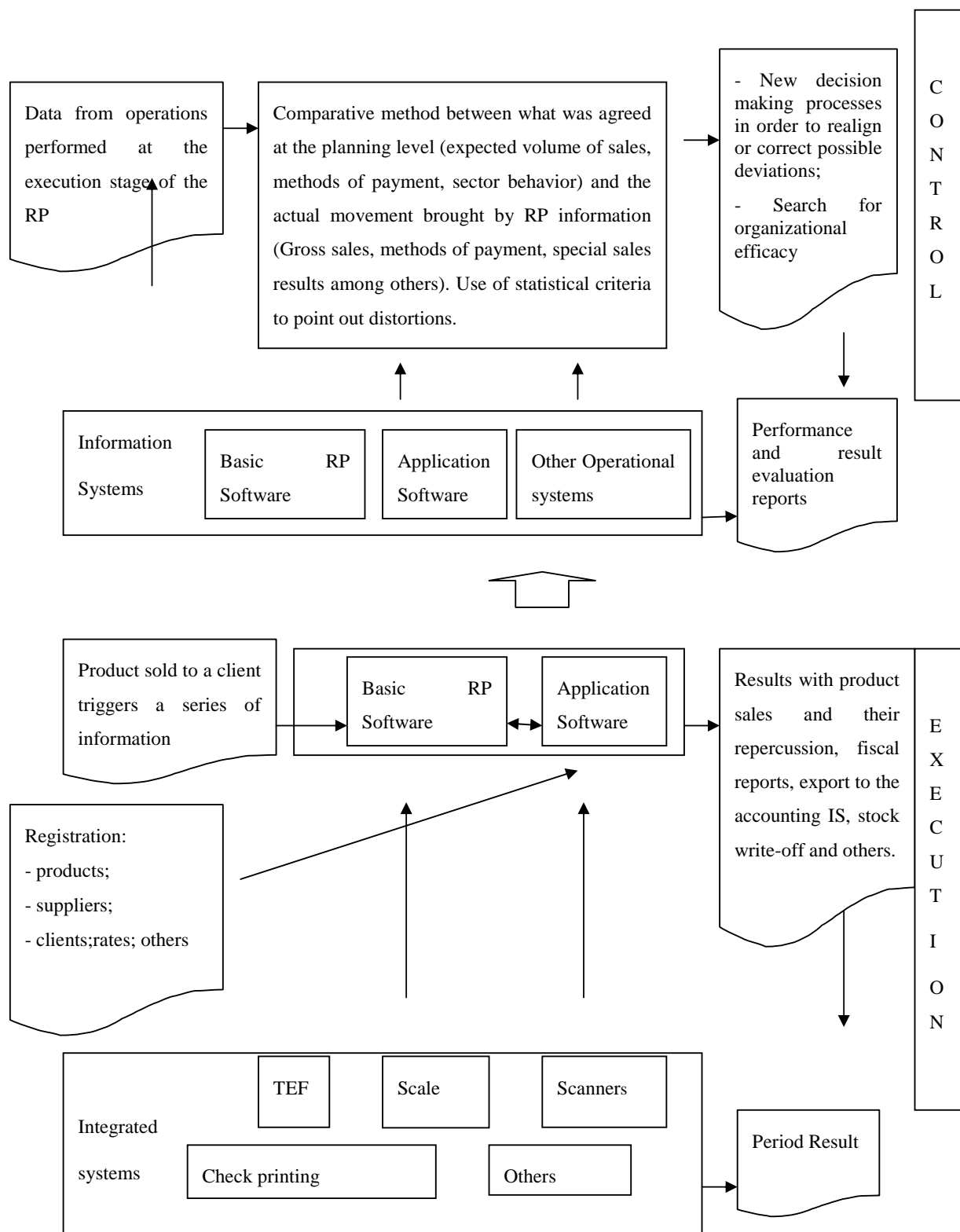


Figure 9-Control stage of the managerial model from the RP

Source: the authors

Finally there is the control stage, or adequacy between what was planned and what was performed. Corrective actions are implemented from a comparative analysis of the expected and the obtained data. It is the administrators' duty to decide between buying/stocking and not buying; increasing, keeping or decreasing the computing system; hiring, keeping, substituting or dismissing workers; integrating different systems or not; increasing or decreasing special sales volume; identifying strangling points; in brief, readjusting and redoing the planning for the next period aiming at improvements for the company.

The proposed model of a managerial subsystem from the RP is shown in Figure 10.



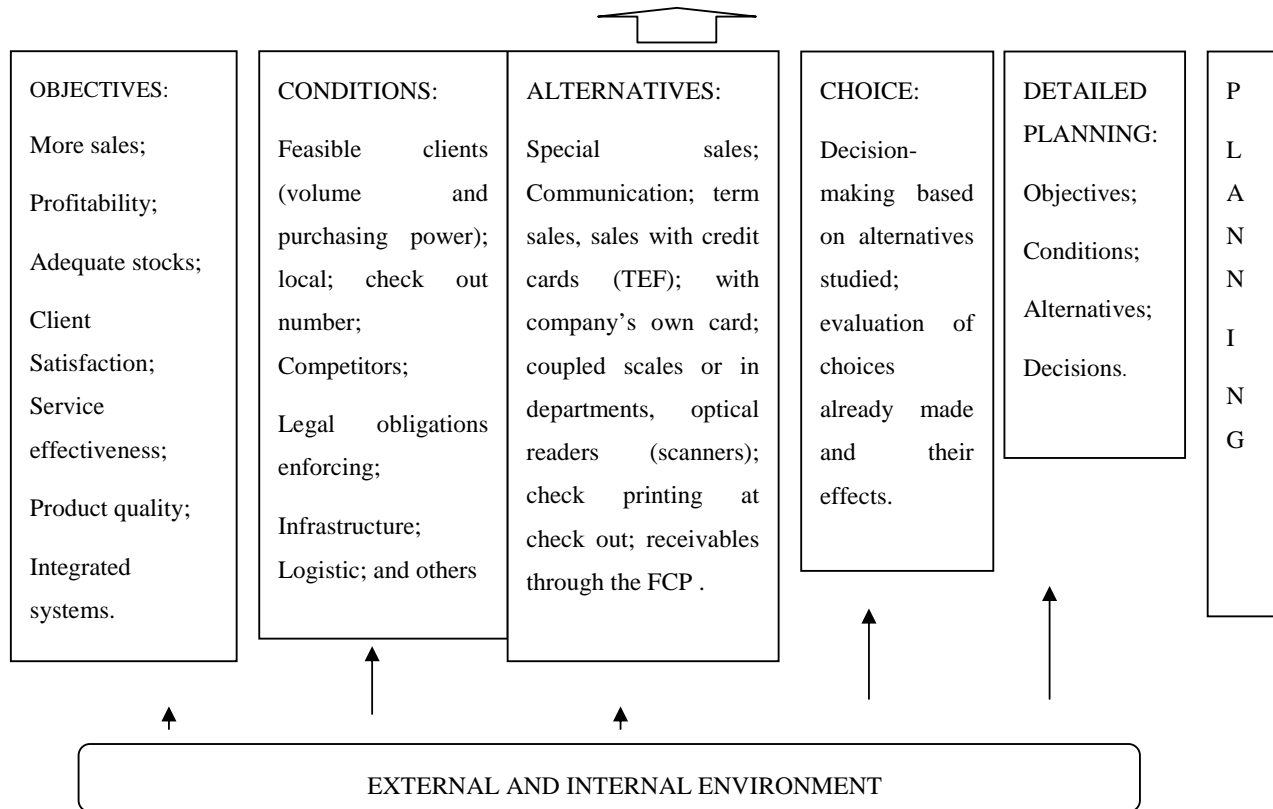


Figure 10- Managerial subsystem model from the RP.

Source: the authors

## 6. FINAL CONSIDERATIONS

This paper aimed to show the importance of the Receipt Printer for management in the supermarket sector of the state of Santa Catarina, characterizing the Information System of the RP as IT, as well as its relationship with other systems, constituting then an integrated system.

The research showed that with the IS of the RP there is greater effectiveness in customer service, improving the sale flow. The system helps with decision-making by controlling stocks and product expiring dates, making the integration with other systems possible; with the possibility of integration, it is important to mention that results are optimized and repetitive work can be reduced.

We detected there is a cost reduction, including personnel payrolls, because with the integration of systems there is a reduction of personnel by eliminating the workers responsible for price-tagging products and weighing fruits and vegetables. The check-out is then an operational island, with an integrated scale, scanners for bar codes, check

printers (the TEF) – all that under the command of a single worker in each operational island. Therefore, cost reduction in this research was proven to be a positive factor of the RP system.

In conclusion, and completing the objective of research, a management subsystem model from the RP was proposed based on existing models in the literature, in order to be a management tool for supermarkets. As a suggestion for the researchers of this area, this same study can be reproduced for other regions or sectors in the country.

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