



Analysis Tool of the Management of Integrated Systems of Implementation in the Design of Systems of Industrial Organization in Smes Industrial Devoted to Mounts and Electrical Installations

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Abstract

In the present communication sets out the main characteristics of a tool of software developed for the analysis of the management of integrated systems of implementation in Smes industrial devoted to mounts and electrical installations.

The design of this software and its implementation in different companies in this industrial sector, is one of the stages that make up the development of the doctoral thesis with the title SYSTEMS DESIGN OF INDUSTRIAL ORGANIZATION IN SMES INDUSTRIAL DEVOTED TO MOUNTS AND electrical installations, in the territorial scope of the Autonomous Region of Aragon.

After the analysis of commercial applications of management, and detect shortcomings relevant for companies in this industrial sector, raised the development of a tool of control and valuation of the management of processes adapted to the particularity of the companies installing electric, which would act on appropriate procedures and thereby save the conditioning raised.

The implementation of this software on a representative number of companies, has enabled progress in the next stages of generating a model for the management organizational integral that meets the requirements of a functional design dynamic, and in which the technical structure and manager of the system, is responsible for the coordination and overall management of the same.

At present, and because of the situation of decline in production and economic deflation, the management structure does not evolve toward criteria of expansion, but maintains its functional structure. The work associated with this activity is based on tasks that can sustain this business structure minimum, and being expectant that the time economic change and the economy to resume challenges more ambitious.

1 Introduction

This report gives the main features of a software tool developed to analyse the management of integrated systems applicable in SMEs involved in Mounts and Electrical Installations in the autonomous community of Aragon.

The development of an Industrial Organisation Systems Design in SMEs in this sector gives a structure based on work systems, technical management, staff control, quality management and electrotechnical advice. Therefore in such companies, the requirement is often repeated of documenting and maintaining an Integrated Quality and Environment Management System by constantly improving its efficacy and respect for the environment, based on UNE-EN ISO 9001:2000 and UNE-EN ISO 14001:2004 requirements.

The Integrated Quality and Environmental Management System therefore focuses on guaranteeing that the products and services provided by these companies meet the specifications previously set by the company and by the customer, all as part of sustainable development and respect for the environment.

The implementation of these conditioners are the basis of the use of a software tool that enables the information to be managed suitably and gives analysis indexes and process control.

After making an exhaustive study of the different commercial softwares on the market, we are faced with several problems in answering this action. Most of the applications will not enable the works and materials required to be controlled in the manner required. In all cases, the company must adapt to the quality management system followed by the purchased software, thus duplicating the effort of introducing software. The third problem is the time needed for adapting to the said

software, which generates a cost to which the cost of purchasing the licence would have to be added

Therefore it was believed that the best solution was to develop specific software to adapt to the special nature of such companies, and to seek to meet the necessary characteristics. It will thus be possible to overcome the problems, including the cost, as this will be considerably lower than that of any of the discussed applications.

2 Initial conditions

The software to be developed is designed from the typical company process diagram, as in such a diagram, it is possible to see at a glance all of the processes of the company and the interaction between them.

This diagram can be seen in figure 2.1.

As shown, there are four key processes in the company: work management, purchase management, commercial management and product design. Others interact around these: supplier management, store management, resource management and document control.

All of the above processes are completed overall by management of the registers, environmental management, quality management and measurement, analysis and improvement.

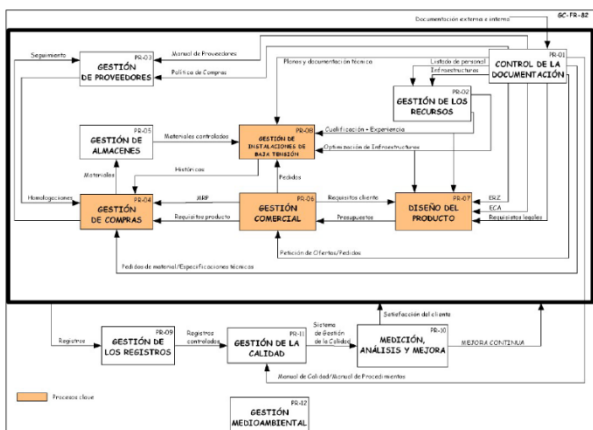


Fig. 2.1 – Process Interaction Diagram

In turn, these, and those preceding, are oriented outwards by strategic management. The diagram shows the most important interactions between processes. Resource management therefore interacts with works management because one allocates a series of human and mechanical resources to the other.

As one of the requirements considered at the end of the previous section is to achieve an intuitive graphic environment, the principal axis of the application will be the typical process diagram of an SME of the studied industrial sector, devoted to Electrical Assemblies and Installations.

The main screen, which gives access to most forms, will therefore be almost an exact copy of the mentioned diagram.

The graphic environment of the program, figure 2.2, can therefore be compared with the company process diagram, figure 2.1.

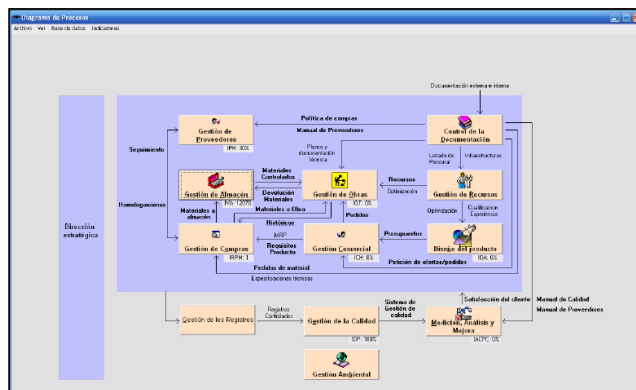


Fig. 2.2 – Program Graphic Environment

The Integrated Quality and Environmental Management System therefore focuses on guaranteeing that the products and services supplied by such companies meet the specifications established beforehand by the company and by the customer, based on the requirements of the UNE-EN ISO 9001:2000 and UNE-EN ISO 14001:2004 standards.

The management system describes the following processes with their resulting diagram.

- Supplier management.
- Store management.
- Purchase management.
- Work management.
- Commercial management.
- Product design.
- Resource management.
- Document control.
- Register management.
- Quality management.
- Measurement, analysis and improvement.
- Environmental management.

The key processes are the works management, purchase management, commercial management and product design. The quality management system covers the following procedures.

- Procedure for purchase management.
- Procedure for design control.
- Procedure for control of service provision.
- Procedure for monitoring and measuring the service.
- Procedure for order feasibility.
- Procedure for customer offer management.
- Procedure for dealing with customer complaints.
- Procedure for revising the contract.
- Procedure for purchase management.
- Procedure for identifying and assessing environmental aspects.
- Procedure for managing human resources.

In order for the implementation of these processes to be correct and to guarantee that this software is successful, the demand must prevail, in designing the program, that the largest possible number of these registers is automatically generated, and naturally that they must be

highly intuitively accessible from the application in order to have all of the documentation controlled and logically ordered.

An important premise is that the company must have previously introduced a quality and environmental management system or be in the process of implementing one, as this software is not intended for companies to establish a management system, but rather in order that an application is developed that easily adapts to the existing system.

3 System design associated with processes

In order to describe the activities necessary for carrying out all of the processes of the typical company, an analysis procedure is defined as EASUZ. This consists of modelling the process while highlighting all of the states (E), activities (A), systems (S), locations (U) and zones (Z), in addition to indicating external actions (X).

Special attention is paid to E, A and S. An inventory will be made of all the activities of each process and of the systems with which they are effected. Within the systems, the different forms will be considered that form part of the computer program, in addition to the rest of the company systems. At the end of the analysis, it will be possible to see how many activities have been able to be controlled through the application.

There follows an example of several of the typical company processes, indicating the parameters that can be required in each case: person responsible, inputs and outputs, indicators used to measure the process, resources, registers generated, EAS diagrams (U and Z will not be considered as it hardly gives relevant information for this project) and HATE graphs.

3.1. Commercial Management Process

Person responsible: COMMERCIAL MANAGEMENT.
 Indicator: customer claim report.
 Resources: - 1 commercial manager.
 - Management Software.

Registers to be generated: COFR01, COFR02, COFR03, COFR04, COFR05 and COFR06.

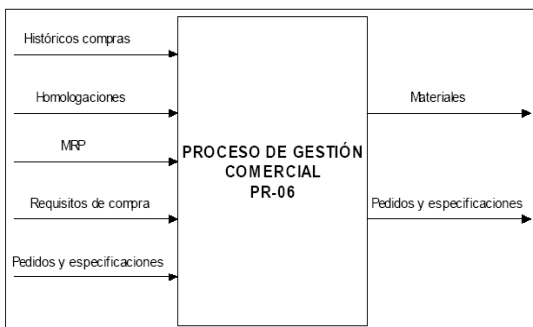


Fig. 3.1 – Inputs and outputs of the Commercial Process.

States:

- E0 – Awaiting orders.
- E1 – Order received from a new customer.
- E2 – Customer created.
- E3 – Order received from an existing customer.
- E4 – Order noted unconfirmed.
- E5 – Request for offer registered.
- E6 – Quote sent.
- E7 – Quote accepted.
- E8 – Order confirmed.
- E9 – Quote accepted.
- E10 – Quote rejected.
- E11 – Rejected offer noted.
- E12 – Claim received from the customer.
- E13 – Customer claim registered and awaiting corrective or preventive action.
- E14 – Corrective or preventive action registered.
- E15 – Corrective or preventive action closed.
- Ex – In any state.

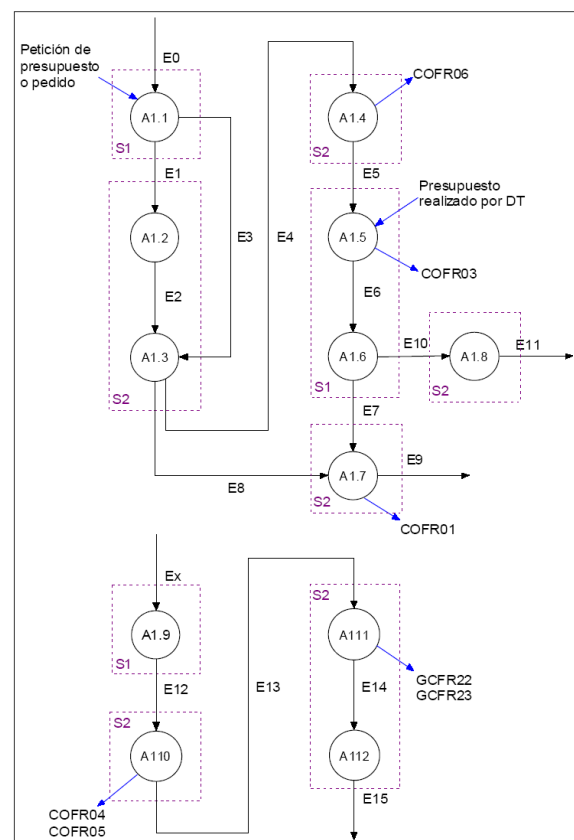


Fig. 3.1.1 – Inputs and outputs of the Supplier Management Process.

Activities:

- A1.1 – Receive request for offer or order.
- A1.2 – Create customer file.
- A1.3 – Note order data.
- A1.4 – Produce request for offer.
- A1.5 – Ask for quote from product design.
- A1.6 – Send quote.
- A1.7 – Register accepted offer.
- A1.8 – Register rejected offer.
- A1.9 – Receive a customer claim.
- A1.10 – Register the IRC.
- A1.11 – Create an IACP if necessary.
- A1.12 – Close the IACP

Systems:

S1 – Conversation, telephone, fax.
 S2 – Managerial management.

3.2. Supplier Management Process

People responsible: - PURCHASING MANAGER.
 - WORKS AND QUALITY MANAGER.
 - TECHNICAL MANAGER.
 Indicators: - evaluation index.
 - reliability index.
 Resources: - 1 Purchasing Manager.
 - 1 Quality Manager.
 - 1 Technical Manager.
 - Management Software.

E34 – Negative previous evaluation survey.
 E35 – Positive audit.
 E36 – Negative audit.
 E37 – Updated list of approved suppliers and supplier available for order.

Activities:
 A3.1 – Seek supplier.
 A3.2 – Note potential supplier data.
 A3.3 – Send and receive previous supplier evaluation survey.
 A3.4 – Calculate results and register previous evaluation survey.
 A3.5 – Perform aptitude evaluation and register.
 A3.6 – Approve supplier.
 A3.7 – Perform audit.

Systems:
 S1 – Telephone, conversation, fax.
 S2 – Management control.

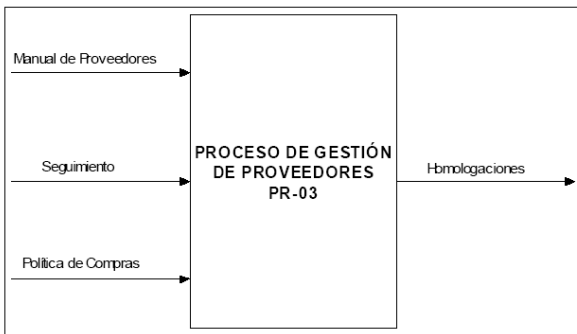


Fig. 3.2 – Inputs and outputs of the Supplier Management Process.

Registers to be generated: GCFR24, GCFR25, GCFR26, GCFR27, GCFR28, GCFR29 and GCFR30.

States:
 E23 – Need for supplier for order.
 E27 – New potential supplier.
 E28 – Registered potential supplier.
 E29 – Previous evaluation survey carried out by supplier.
 E30 – Positive previous evaluation survey, provision approval.
 E31 – Positive aptitude evaluation, positive approval.
 E32 – Follow-up in time.
 E33 – Negative aptitude evaluation.

Fig. 3.2.1 – EAS of the Supplier Management Process.

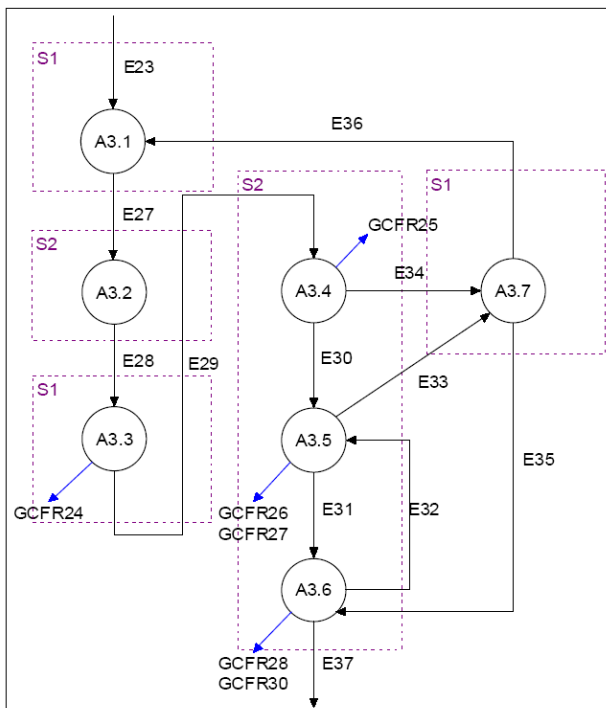
4 Indicators and diagrams used

The computer application created to help in managing the system uses the basic indicators that the quality management system regularly uses, and also enables new indicators to be generated without this increasing company employee workload.

Therefore, with the new indicators, there is an increase in quality, as it is possible to measure new factors that had been highly costly to assess up to now.

It is therefore possible to consider an increase in the use of the system capacity, because, with the same time and energy, the utilities are increased.

The following table includes all of the indicators seen up to now, and also the new indicators also controlled by the developed software.



Abrev.	Cálculo	Proceso medido	Nuevo								
IRC	Número de informes de reclamaciones del cliente	Gestión comercial	No								
ICRT	Compras responsable de compras / Total	Gestión de compras	No								
ICAR	Ofertas de compra aceptadas / Rechazadas	Gestión de compras	No								
IFP	Fiabilidad del proveedor (en función de retraso y cantidad)	Gestión de proveedores	No								
IEP	Evaluación del proveedor (según evaluación previa, aptitud y auditorías)	Gestión de proveedores	No								
IRC	Número de informes de reclamaciones del cliente	Gestión de obras	No								
IRBT	Informe de revisión de baja tensión	Gestión de obras	No								
IRC	Número de informes de reclamaciones del cliente	Diseño del producto	No								
INCP	Número de no conformidades a proveedores	Gestión de almacenes	No								
IARV	Averías / Revisión vehículos	Gestión de los recursos	No </tr <tr> <td>IBPM</td> <td>Bajas de personal / mes</td> <td>Gestión de los recursos</td> <td>No</td> </tr> <tr> <td>INC</td> <td>Número de no conformidades</td> <td>Medición, análisis y mejora</td> <td>No</td> </tr>	IBPM	Bajas de personal / mes	Gestión de los recursos	No	INC	Número de no conformidades	Medición, análisis y mejora	No
IBPM	Bajas de personal / mes	Gestión de los recursos	No								
INC	Número de no conformidades	Medición, análisis y mejora	No								

IPH	Proveedores homologados / Total	Gestión de proveedores	Sí
INPH	Número de proveedores homologados	Gestión de proveedores	Sí
IVA	Valor de los materiales en almacén	Gestión de almacenes	Sí
IVAT	Valor de los materiales en almacén / Total materiales en obra y almacén	Gestión de almacenes	Sí
IRPM	Retraso en los pedidos medio	Gestión de compras	Sí
ICH	Clientes habituales / Total	Gestión comercial	Sí
IOA	Ofertas aceptadas / Total	Diseño del producto	Sí
IAP	Adecuación del presupuesto (Presupuesto - Coste de cada obra)	Diseño del producto	Sí
IBO	Beneficio obtenido en la obra	Diseño del producto	Sí
IOT	Obras terminadas / Total	Gestión de obras	Sí
IACPC	Acciones correctivas o preventivas cerradas / Total	Gestión de calidad	Sí
IDP	Empleados con política distribuida / Total	Gestión de calidad	Sí
IPQC	Planes de calidad cerrados / Total	Gestión de calidad	Sí
IDP	Empleados con política distribuida / Total	Gestión medio ambiental	Sí

Fig. 4.1 – System management indicators

The system design includes up to 14 new indicators in addition to those of the system, which are intended to measure fulfilment of objectives and company profitability.

For example, the list of corrective and preventive actions carried out will be controlled, and also the quality plans that have been met. If this is complemented by control in the distribution of the corporate policy, an improvement can be seen in the management of the quality and the environment.

Furthermore, for each work, it will now be possible to see the profit achieved and the suitability of the budget by

comparing the cost of the work for the company and the budgeted value.

It is also necessary to stress the importance of the indicator that measures the percentage of the total offers that have been accepted. These indicators help us to improve a key aspect of the company, namely, the adequacy of the budgets. Up to now, the person responsible for preparing budgets in the company used to find great difficulty in estimating the cost of the work, given that many factors were involved.

Finally, due to the ease with which calculations can be made in the computer, it would be possible to add far more indicators, but a smaller number was considered more suitable to help us make an assessment of the management in accordance with the consideration of these kinds of companies.

With time and experience, in future versions of the program, it will be possible to modify the estimated variables and to add and eliminate as required.

It was decided that the software would include a form using a Pareto diagram to clearly show the importance of some customers over others with regard to billing level. It will also show the customer ranking by order of billing and the possibility of an ABC classification.

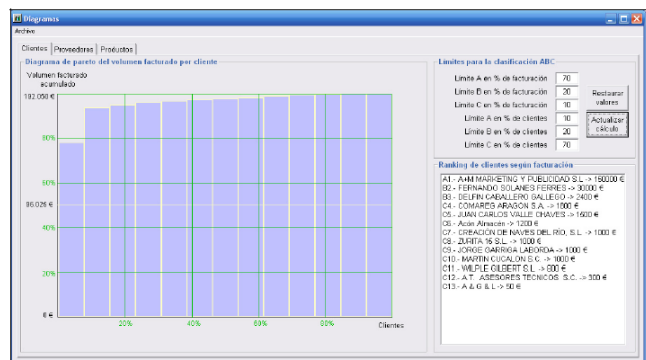


Fig. 4.2 – Pareto diagram for customers

After witnessing how well this analysis operated, its use is extended to suppliers and materials classified by families.

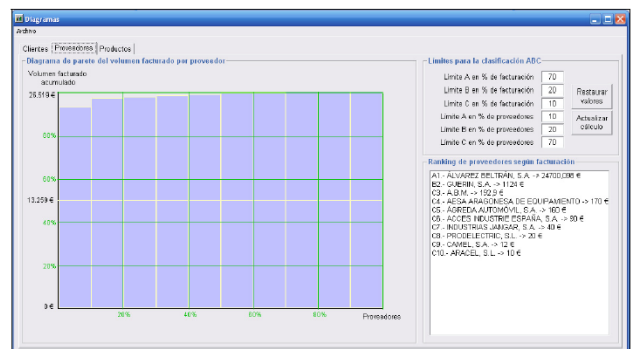


Fig. 4.3 – Pareto diagram for suppliers.

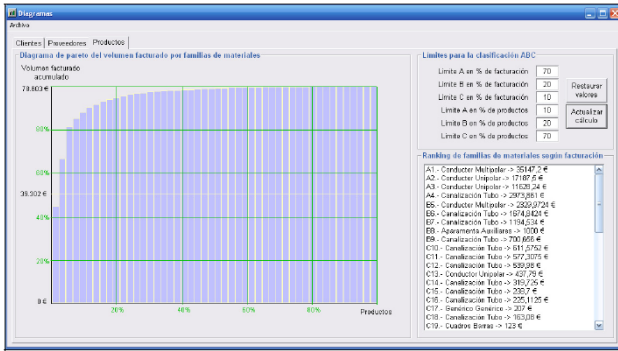


Fig. 4.4 – Pareto diagram for product families



Fig. 4.5 – Strategic management

A form has been created to make an analysis of one's own strategic profile and to be able to compare it with the competition.

It is thus possible to identify strengths and weaknesses. It will simply consist of assessing a list of variables coinciding with the key factors of the different functional areas and will serve as a qualitative, intuitive instrument for making diagnoses.

5 Software application formats

- COMMERCIAL MANAGEMENT:

The file of company customers is accessed through the button named commercial management.

As the figure shows, the form consists of a customer database with the forward, end, back and home buttons for browsing the different customers' files. Each file shows the general data of the customer (registered name, address, venue, etc.), the financial data and the orders which the customer in question has placed. From the file menu customers can be created, changed, deleted, updated and sought. For example, to create a new customer register, we click on file, new customer and then complete the data. To save the register, click on file, update customer.

Fig. 5.1 – Commercial Management

The figure shows a 'Clientes' form with sections for 'Datos generales', 'Datos financieros', and 'Pedidos'. The 'Datos generales' section includes fields for 'Razón social' (A & G & L), 'Dirección' (CINCO DE MARZO 10), 'Localidad' (ZARAGOZA), 'Provincia' (ZARAGOZA), 'Fecha de alta' (07/03/2007), and 'Tipo de cliente' (Habitual). The 'Datos financieros' section includes 'CIF' (B-0229807) and 'Forma de pago' (Contado). The 'Pedidos' section shows a table with columns for 'Número Pedido', 'Estado', 'Fecha', and 'Descripción', with one entry: '2008', 'En Espera', '15/06/2007', 'Instalación de transformador'.

- PRODUCT DESIGN:

The product design button is used to access the form to create design plans of a site. The design plan can only be created if the site exists. Therefore, this step will be performed after starting the work from the window of orders pending for sending to site.

A new plan cannot be created on the design plan form, for each site has its own one that is automatically generated when the site is created. This will remain blank until we enter and change it from the file menu. When the design plan is updated, the register is automatically created in Excel format. From the site menu, we can repeat this operation if necessary, and also enter the site management menu directly.

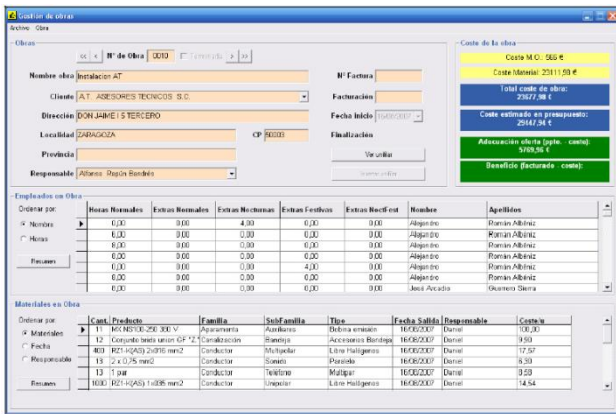
Fig. 5.2 – Design Plan

The figure shows a 'Plan de obra' form. It includes fields for 'Nombre obra' (Transformador A & G & L), 'Cliente' (A & G & L), 'Responsable' (Daniel Oloro Fernández), and 'Fecha inicio' (05/05/2007). There are sections for 'Especificaciones y requisitos del cliente', 'Requisitos legales y reglamentarios aplicables', and 'Petición a empresa administradora'.

- SITE MANAGEMENT

To enter the site management form, click on the button of the same name on the initial screen. This shows the log of sites, both in progress and finished. They will have been produced either from the order form by clicking on start site or from the site management form itself. This is not to be recommended because if the site is created from here, we omit all of the previous order management steps.

Fig. 5.3 – Site Management



In addition to being able to see all of the registers of sites with their data, we are here able to see the employees who have worked on site and the materials that have been used, both in detail and summary. Once the site is finished, it must be closed from the site menu, finish site. The final site report register will automatically be generated in Excel format, and will be saved in the corresponding folder.

The same menu also gives access to daily site reports, technical site folder and site visit report. When the site is finished, the data can be changed in order to enter the invoice number and billing.

- STORE MANAGEMENT

We can enter this section from the button of the same name. This shows the database of all registered materials. This list in the table above includes all materials in order to make it easier to go through the database, given that it is highly extensive.

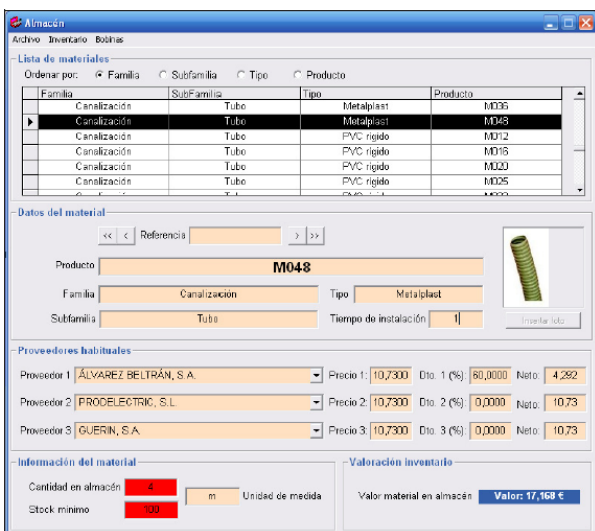


Figura 5.4 – Material in store.

In addition to the general data and installation time, the material data enables a photograph to be inserted to identify the material. The data is also shown that refers to regular suppliers, with their prices and discounts. Finally the amount of the material available in the store appears with its unit of measure and the minimum stock that has to be guaranteed, in addition to the value of the material in the store. If the stock is broken, an alarm is lit in red in order to solve the problem.

In this and other forms, it is possible to create a new register, modify and existing one, delete, search and update. In this case, when modifying or creating a new product, a different procedure is followed when choosing the names of the families, subfamilies, type and product of the material, in order to avoid making mistakes.

- RESOURCE MANAGEMENT

This section, which manages human resources and infrastructure, is entered by pressing on the button: resource management. A password is required on entering this section. If the password is not correct, it will not be possible to see the financial data for each human resource, but the rest of the section will work similarly.

The window is divided with tabs for entering the different resources.

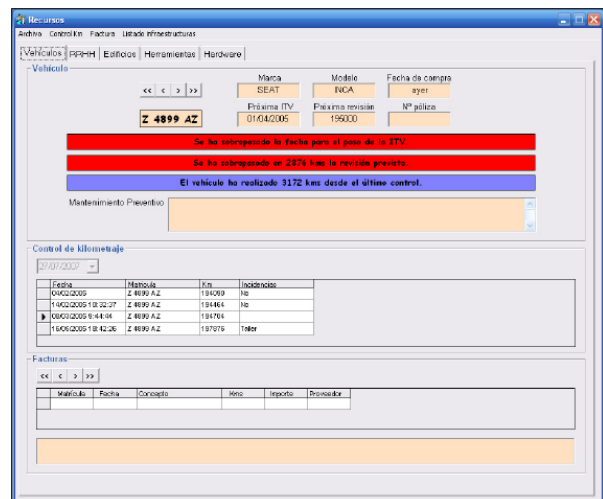


Figura 5.5 – Resource management.

- SUPPLIER MANAGEMENT.

This section is similar to that of commercial management. By pressing the button indicating supplier management, we enter the form where the different files of each supplier are managed. The general data of the supplier is managed, their financial data and finally a list with the remittances requested from the supplier.

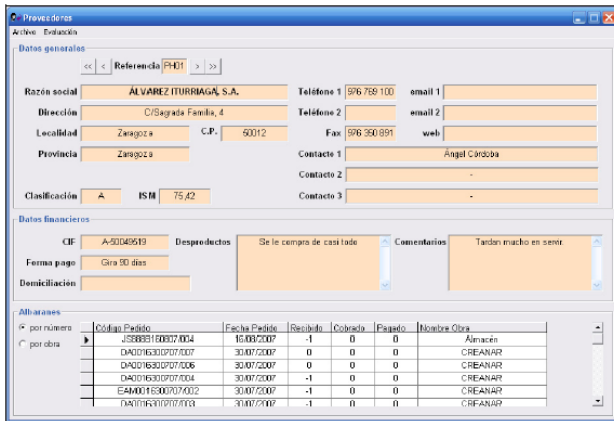


Figura 5.6 – Supplier file.

The main particularity of the supplier management is the evaluation to which they are subject. As a result, the same form shows the reference, classification and evaluation indicator.

- MEASUREMENT, ANALYSIS AND IMPROVEMENT.

The measurement, analysis and improvement of the processes starts with a series of indicators for the basic processes of the company. As always, this section is entered by means of the button of the same name. The general indicators of the company are seen from here. Objectives can also be created for some, in order to see whether at year end the targets have actually been achieved.

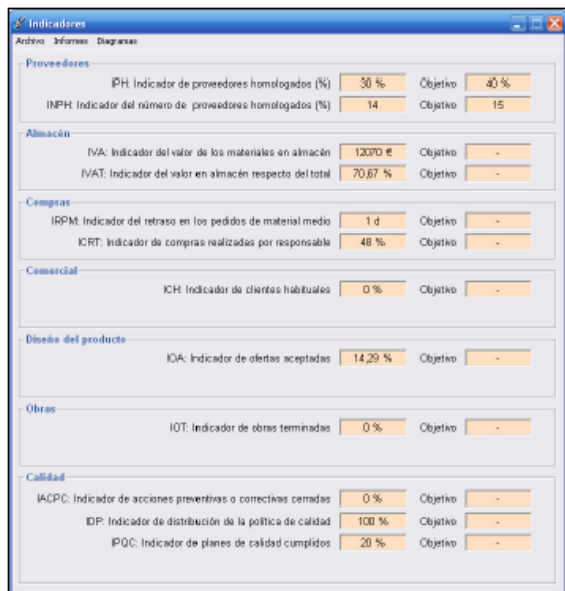


Figura 5.7 – Measurement, analysis and improvement of indicators.

The file menu allows the targets to be modified and updated. There are also other ways to measure, analyse and improve the processes. The reports menu gives access to the customer claims and non-conformities forms mentioned before and the corrective or preventive action reports.

A form has also been designed that shows a series of diagrams for facilitating the analysis of customers, suppliers and products.

6 Conclusions

The time saved in the use of the developed program should help all employees do their work with greater quality, paying more attention and showing more interest in the key aspects that will help to improve the operation of the company, which will, in itself, already be an improvement in the quality.

After the development and practical application of the system in different companies of the specified industrial sector, the following main improvements associated with the implementation of this management software are listed.

- The previous and new indicators used by the system have improved the view of the operation of each of the company processes, and are also intended to foster target achievement. Indicators are used that measure the percentage of approved suppliers, the percentage of regular customers, budget adequacy, profit per site, the percentage of accepted offers, the percentage of quality plans met, the percentage of closed IACP, etc.

- The graphic results and the strategic profile functional analysis form give the company management a valid tool that enables a comparison to be made with the competition. By simply stopping at the form and thinking and considering improvements, the strategic management of the company will already have been improved.

- The system includes a suitable analysis based on generating Pareto diagrams associated with each of the groups representing management: customers, suppliers and products, allowing the parameters to be observed that are associated with them and the importance of each one. A ranking is also produced that includes an ABC classification by turnover of products and also of customers and suppliers.

- By using the computer application, all of the processes are managed with meticulous control. Therefore, by managing the processes better, we are managing quality better.

- By using this application, the registers are produced and saved automatically in the management system, enabling organised, efficient management of documentary security - something that is complex when the production volume is very high.

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