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**ERP and Time Management: A recommender system**

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**ABSTRACT**

Most of today's companies use management software to support their staff organizing their activity.

In this context, this software makes it possible to centralize company data, and to extract useful information from it for users in order to make decisions, such as the organization of their working time. However, the amount of available data is too large for a user to be analyzed on their own. Thus, it is likely that the user will not take the most satisfactory decision according to the criteria imposed by the managers, and the real-time evolution of the activity of the company. In this article, we present a recommender system that takes into account the activity of the company, the managers' criteria, as well as the end-user own criteria in order to guide him in his activities. It can be used for any type of activity sector as soon as data are available. The recommender system is an additional module for an existing ERP. The Human-Computer Interface (HCI) is presented, as well as a database. The system is operable and fully customizable.

**Keywords:** Recommender System, Time Management, ERP, TAM

## INTRODUCTION

Modern ERP implementation methodology encourages and supports a progressive approach for managing companies [9]. In every sector, the manager faces to the difficulty of scheduling the tasks of his team. Management software frequently helps him to follow the activity of the company but this does not guarantee that each member of his team is occupied with the most suitable task according to the criteria imposed by the management. The sales department is a sensitive area. It is difficult to know if a user is making the right choice when making a quote for customer A while customer B is also waiting, or the opposite. The spent time for each client is an important factor, as it can be seen as the project profitability, but neither the user nor the manager can control all these parameters. A recommender system, in which criteria would thus be defined could ensure the choice of the most suitable alternative under the constraint of these criteria. Some companies have invested millions in management software that is not used by their employees because they spend more time than expected using the software, or they were excluded from the design process of the software.

In this article, we present the prototype of the recommender system, with its interface and its database. We then detail the structure of the database as well as the software architecture. The source code of some forms are exposed, and the development environment as well.

## BACKGROUND

Implementing an ERP system is generally a big challenge, as a typical ERP implementation takes anywhere from one to five years [10].

The basis of ERP systems is to generate the mandatory, relevant, reliable and timely information [1]. This implies that upstream, the information is transformed into a convenient form to use. This objective is achieved on one hand when the user consults this information through the ERP and considers that he has saved time, on the other hand when the organization is able to better perform all its business processes and when the integrated information system can support the performance development of the company [2]. Thus, apart from the computational aspect, there is also the concern of the information presentation. Indeed, each user perceives information with a system of value which is specific to him. Perceived information transparency of the ERP system has significant direct effects on perceived usefulness, ease of use, and indirect effects on attitude and adoption. [7] Moreover, the perceived usefulness fully mediates the relationship between information transparency and the attitude toward using the ERP system. There is therefore a cultural dimension in the knowledge sharing implementation of the ERP [3]. In addition, the mode of transmission of information plays a significant role in the frequency of use. So, the system's Web-aspect provides significant advantages, as the system is distributed through interoperable, cross-platform and highly pluggable Web-service components [4]. In contrast, a local client-server system offers more security, greater control over data, and more robust offline operation [8].

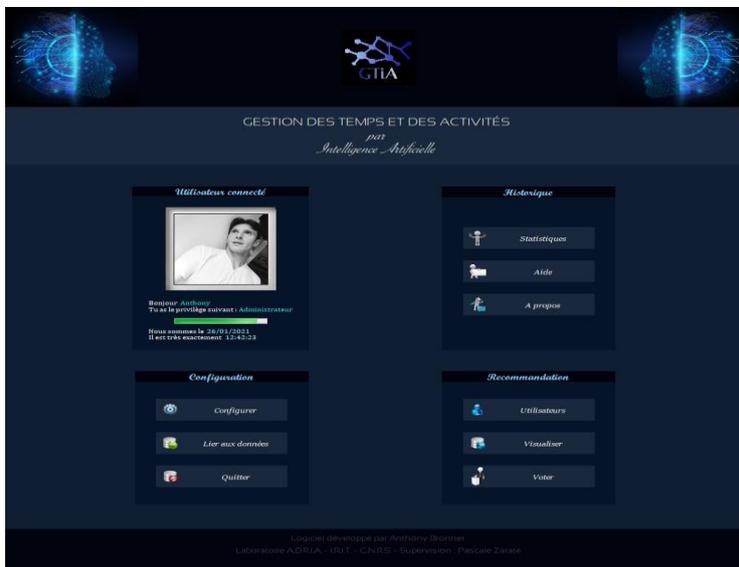
The objective of setting up an ERP is to increase commercial and financial performance. However, a study revealed that operational performance is positively associated with financial performance [5]. ERP therefore influences all areas of the company and affects its overall

functioning. A better understanding of the contribution of ERP systems to operational performance can be achieved if researchers and managers assess changes in operational performance at modular and system levels. A decision support tool complicates the assessment since it indirectly reduces the user's freedom, by suggesting an alternative that might not have been his choice if he had been given the opportunity to decide by himself [6].

## THE RECOMMENDER SYSTEM FOR ACTIVITY & TIME MANAGEMENT

GTiA software is a recommender system intended to improve the time management of ERP users. The ERP is already used in a company and the main objective of this work is to develop and plug this GtiA to the existing ERP. To make recommendations, GTiA is linked to the ERP that contains data on which it can perform calculations, according to predefined criteria and user preferences. In this article, we have coupled GTiA to the database of an existing ERP, including modules such as management of sales, purchases, logistics, human resources, customers and suppliers, projects, communication, marketing, and others. This ERP is currently used by several companies, such as SMEs, in France, to manage their activities, and its marketing is likely to be extended to other countries since it includes several languages, including Spanish and English. Its GUI was designed in the Microsoft Visual Studio environment, in VB.Net language.

### Prototype general presentation

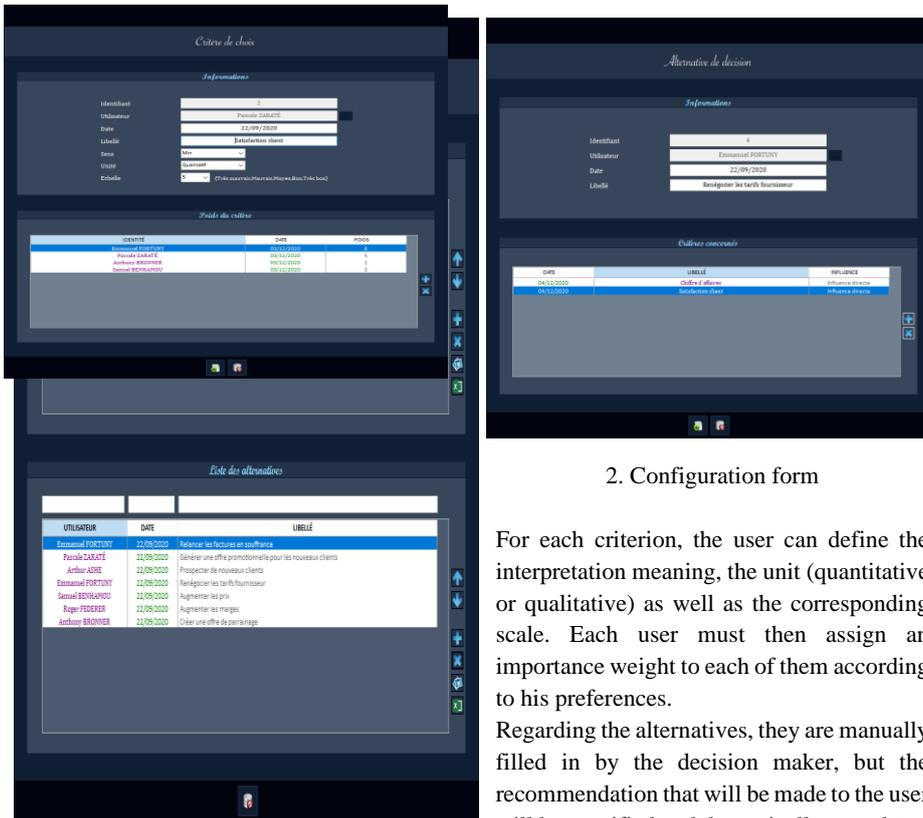


1. Software home interface

Its main interface is designed in the form of a dashboard divided into 4 categories. The first category is devoted to managing the rights and privileges of the logged user, to be defined after their prior authentication. The second is intended to configure the recommendation system, define the criteria, the alternatives, and the influence of the criteria on the alternatives. It is also used to link the database containing the information from which recommendations are to be made. Finally, the last two are used to view statistics, and finally to enter user preferences (Voter) and get recommendations (Visualiser). Details of how these GUI actions (buttons) will be presented later.

### Prototype configuration overview

The configuration form allows the end-user to define criteria and alternatives. Datagridviews (Visual Basic forms) display all of the filled in information in order to obtain the decision-making process overview.



### 2. Configuration form

For each criterion, the user can define the interpretation meaning, the unit (quantitative or qualitative) as well as the corresponding scale. Each user must then assign an importance weight to each of them according to his preferences.

Regarding the alternatives, they are manually filled in by the decision maker, but the recommendation that will be made to the user will be specified and dynamically completed

according to the criterion concerned by the alternative. Thus, the following recommendation will not be obtained: "Complete quotes", but this one: "Complete quote for customer D", depending on the achieved margin or the spent time or other constraints. As you can see in the

second figure, it is also possible to specify the influence of a criterion on an alternative in order to refine the decision.

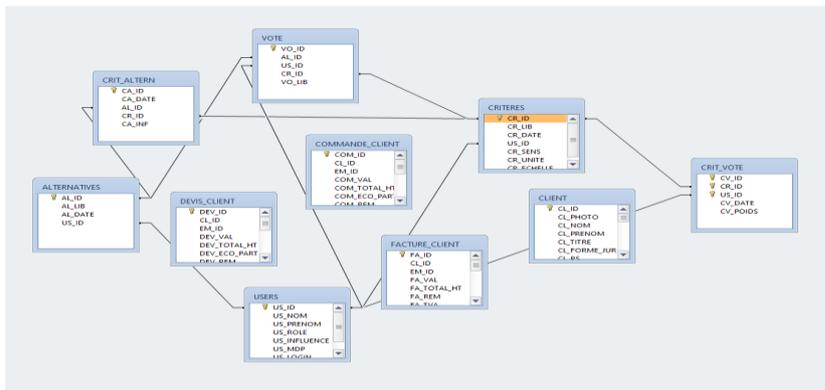
```

67 dgv_critere.Rows.Clear()
68
69 Obj_Command = New DataTableCommand()
70 Obj_Command.Connection = 1stConnexionPrincipale
71 Obj_Command.CommandText = "SELECT CR_ID,CR_LIB,CR_UNITE,CR_ECHELLE FROM CRITERES"
72 Obj_Reader = Obj_Command.ExecuteReader()
73
74 Dim J As Integer = 0
75
76 While Obj_Reader.Read()
77
78     dgv_critere.Rows.Add(Obj_Reader.GetValue(0).ToString(), Obj_Reader.GetValue(1).ToString())
79
80 Dim Vote() As String = Split(Vote_Propose(Obj_Reader.GetValue(2).ToString(), Obj_Reader.GetValue(3).ToString()), ",")
81
82 Dim Valneur_Cellule As DataGridViewComboBoxCell = dgv_critere(2, J)
83
84 Dim Dimension_Tab_Vote As Integer = UBound(Vote)
85
86 For I = 0 To Dimension_Tab_Vote
87     Valneur_Cellule.Items.Add(Vote(I))
88 Next
89 J = J + 1
90 End While
91
92 Obj_Reader.Close()
93
94 End Sub
95
96
97
98
99 Private Function Vote_Propose(ByVal Unite As String, ByVal Echelle As String) As String
100
101 Dim Vote As String = ""
102
103 Select Case Unite
104     Case "Quotient"
105         If Echelle = "1" Then
106             Vote = "Marsouin,Playon,Bon"
107

```

3. Preferences form's source code

### Database structure



4. Relational Database Schema

The database was created under Microsoft Access. It is made up of four main tables, namely "Alternatives", "Criteres", "Users" and "Vote", as well as mandatory tables to establish a relationship with the configurations and the made choices from the main tables, namely "Crit\_Altern", "Crit\_Vote". We can see that some tables are not linked, in particular "Devis\_Client", "Commande\_Client" and "Facture\_Client" that we can translate by quotes, orders and invoices. This means that these tables are independent of the general operation of the software, since they come from an export from the main database of an existing ERP. Time management is only possible if the existing ERP collects this information and records it. In our example, each database tables have a field intended to record the time spent by a user on a task.

Thus, statistics are possible to carry out an assessment of the allocated time to each action, and the recommendation takes this parameter into account.

## CONCLUSION / OUTLOOK

In this paper, we presented the graphical user interface, forms, database and source code snippets of our recommender system, intended to manage the employees activities of a company using an ERP.

As shown in the background section, the implementation of an ERP is a tight process, which must take into account a large number of constraints, both technical and operational since the risk is that the software will not be used.

Our goal is to offer a recommendation that considers user's choices while giving them the opportunity to work on the task that best meets the management wishes as well as the end-user preferences. The granularity of the recommendation is therefore configurable.

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