

Implementation of a Decision-Making Platform Based on Heterogeneous Indicators for HCWFFAD

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Abstract

Today the needs of The High Commission for Water and Forests and the Fight against Desertification (HCWFFAD) agents are to have tools that allow:

- Automatic consolidation of all the information without redundancy in order to ensure more reliable data usage.
- Automatic generation of data related to Moroccan waters and forests.
- The decision support and data monitoring.

Thus, the HCWFFAD business priority processes are those of ACTIVITY monitoring. the priority of these processes is defined not in terms of their importance, but based on their connection with the Office's business areas have already demonstrated many software investment in the past IN TERMS of time and manpower. The breakdown of the information system based on the organizational division often leads to redundancies while computer applications should lock on the business processes that can span multiple functional areas. For this, in the future it will be important to have a decision-making information system meets all predetermined requirements related activities.

INTRODUCTION

The Moroccan government has relied in recent years on the digitalization of services in order to keep up with the rapid development of technologies and to facilitate the decision-making of the leaders. To do this, the use of BI has become essential. The HCWFFAD is not an exception and the presence of a BI tool would allow to have a vision on all the activities and to make the strategic decisions in the short or the long term. In this perspective, this work is part of a decision-making solution in order to assemble the various business domains of the HCWFFAD.

CONTEXT

After having analyzed the existing application and the needs of the host organization [3], we have been able to notice the

problems facing the managers of the HCWFFAD.

Indeed, the major difficulties encountered by these leaders are the following:

- The 2015 performance project. This project consists of establishing indicators to evaluate the performance of the HCWFFAD. A large majority of these indicators do not exist in already-existing reporting modules.
- The partnership of the HCWFFAD and the European Union which requires the satisfaction of several indicators for the conservation and development of the forest inheritance for the financing of several projects.
- At the technical level, we notice a problem related to direct access to data generation. Indeed; the users of business applications access the database directly to view reports. This affects the performance of the base as well as its response time which increases progressively according to the number of treatments to be made.
- We also mention the availability and quality of the data. Indeed, the indicators presented by the modules of reporting related to the SSE applications and land affair management include some test data and defects. We detected an error in the SSE application, where we notice a surrealist engagement rate.
- There is also a problem of structuring and coherence of the data [4]. Indeed, since we work on 3 different business domains, the databases also differ in their structuring and even in the spelling, which quietly poses a problem in terms of consistency of data among applications.
- And finally, there is the problem of centralization. Indeed, with the reporting modules already present in the processed applications, executives must access each application to consult their dashboards.

Thus, in order to meet the needs expressed, the solution is to develop a centralized decision-making platform that encompasses all performance indicators.

HYPOTHESIS

It is assumed that a decision-making information system can respond to the expectations of HCWFFAD leaders, which will be evolved according to the varying needs and time [5]. For this we have considered to :

- Homogenize and make the data more reliable.
- Provide a centralized decision-making platform.
- Build dashboards that meet the requirements of the organism.
- Allow automatic updating of dashboards.
- Publish dashboards to allow remote access.

LIST OF INDICATORS

Before starting to design our platform, we documented each of the business areas that were part of our study in order to extract and possibly add the necessary indicators to accomplish this work. This analysis phase ended in a comprehensive list of 40 business-specific indicators, including the list of indicators and as follows:

Catégorie	PKI	Définition
Condamnations	Somme MTAJ/E	La somme des montants des condamnations des pvs TAJ par entité
	Somme MC/E	La somme des montants des condamnations de tous les pvs par entité
	Somme MJ/E	La somme des montants des condamnations des pvs jugés par entité
	Somme ME/E	La somme des montants des condamnations des pvs exécutés par entité
Suivi PVs	% pvs T/E	Pourcentage des pvs transmis au tribunal par entité
	% pvs J/E	Pourcentage des pvs jugés par entité
	% pvs E/E	Pourcentage des pvs exécutés par entité
	Nbr pvs/E	Nombre des pvs par entité
	Nbr pvs/QD	Nombre des pvs par qualification de délit
Dégâts	V coupé de bois/E	Volume coupé de bois par entité
	V coupé de bois de cèdre/E	Volume coupé de bois de cèdre par entité
	S défrichée/E	Surface défrichée par entité
Durée de traitement	Durée moyenne de clôture / E	La durée moyenne entre la date de constatation et la date de clôture des pvs pour une entité
	Durée moyenne d'envoi au tribunal / E	La durée moyenne entre la date de clôture et la date d'envoi au tribunal des pvs pour une entité

These indicators are indexed according to the three business areas mentioned above. We took an indicator of each business area (trade field) as a sample.

With respect to management of case litigation, we have as an indicator the sum of the amounts of the PVS convictions which consists in calculating the sum of the PVP TAJ convictions, judged and executed by entity.

For the land domain, we have the "number of temporary occupations per entity" indicator, whose goal is to determine which entities know the most OTS.

Finally, for the ESS, we have taken as an example the indicator concerning the commitment and issuing rate of the credit payment for a given period. To achieve these indicators, we used 10 dimensions for analysis. These include the classical dimensions such as time and entity, as well as other dimensions such as the qualification dimension of offence which includes the types of offenses committed.

DESIGN OF THE DW

Concerning the design of our DW[6] and After merging the flake models representing each fact, this gave us the following DataMart which consists of 3 facts and 5 dimensions. The contentious performance act is related to the spatial-temporal dimensions in order to determine the capacity to manage the PV-Penal.

GFP performance act is related to land management, including the five business processes such as temporary occupation and delimitation.

The administrative performance act includes the issuing and commitment rate indicators for each entity.

THE ARCHITECTURE OF THE PROPOSED SYSTEM

Applying the principle of semantic annotation and matching (illustrated in FIG 1). It consists of the following components:

1. Global Ontology: Ontology built for the management of HCWFFAD business areas. It consists of several interconnected sub-ontologies and its instantiation generates metadata.
2. The XML / HTML document server: it allows the storage and management of documents to be annotated (information needs defined by each HCWFFAD directorate management and priority indicator).
3. System interface: it offers two features. The annotation interface gives the user the possibility to annotate his document based on the instantiation and exploitation of the SSE sub-ontology
4. The matching component: this component allows the interpretation of the user's requests and the calculation of the degrees of semantic, superficial and competence-based matching

PRESENTATION OF THE BUSINESS AREAS

Management of contentious cases : Management of contentious cases by setting up an application for the automation of work processes. This application is of great added value for the management of litigation of criminal cases. Indeed, it allows the forestry agents to seize the report (PV) Of

an offense committed, To attach a scanned version of this PV and to follow up the offense.

Land Management Was set up to manage the land transactions and the delimitation of the forest estate which is installed at the levels of the provincial directorates, This land management system covers the management of five processes related to the management of cases relating to land matters

1. **Delimitation:** A continuous process of technical and legal operations that make it possible to fix the boundaries of a forest irrevocably. It is a question of administratively delimiting the forest domain by determining for each forest, Its surface area and its adjoining areas and by setting up terminals on its periphery.
2. **Distraction :** The distraction consists in distracting a land from the forestry regime and to pay it to the private domain of the state for public utility. It is initiated by a request made by a public institution (usually ministries). It results in the cancellation of the distracted area of the state property.
3. **Expropriation** Expropriation is the operation by which a forestry building is removed from the forest estate for the purposes of a public utility project of an urgent nature. It is distinguished from distraction by the fact that it is generally experienced.
4. **Exchange Real Estate:** The exchange of real estate is an operation allowing the exchange of land between the High Commission for Water and Forests and the Fight against desertification on the one hand and a natural person or legal person on the other hand.
5. **Temporary occupation:** Temporary occupancy is an operation that allows a natural or legal person to temporarily occupy a forest land (possibly with an

exchange option) for a fixed period, in exchange for one or more Royalties depending on the nature of the project (tourism, socio-economic, mining, quarrying).

Monitoring and Evaluation Management: The application will allow an instantaneous follow-up of the information relating to the contracts programs and executions by officials at the levels: Central, DREFLCD and DPEFLCD. In addition, a considerable number of output states will feed the system in order to lighten the daily work of the Monitoring and Evaluation department, the main objectives of this application are:

- Consultation of information on projects, actions and orders of a program contract via the network,
- Consultation, input and follow-up of the phases specific to an order,
- Consultation, input and follow-up of budget implementation by subordinate,
- Assistance in decision-making through editions and graphs,
- Advanced search: project / action / orders,
- Deployment of the application across the network.

The application can be consulted at the central, regional or provincial level. The Monitoring Evaluation service will feed the BDD with the program contract at the beginning of each year, and it is the subordinator (DREFLCD or DPEFLCD) who will regularly update the actions of this contrat

INDICATORS GENERATED BY DIFFERENT APPLICATIONS:

After three years of exploitation of the three system of heterogeneous and non-exploitable results as indicated in the following figures:

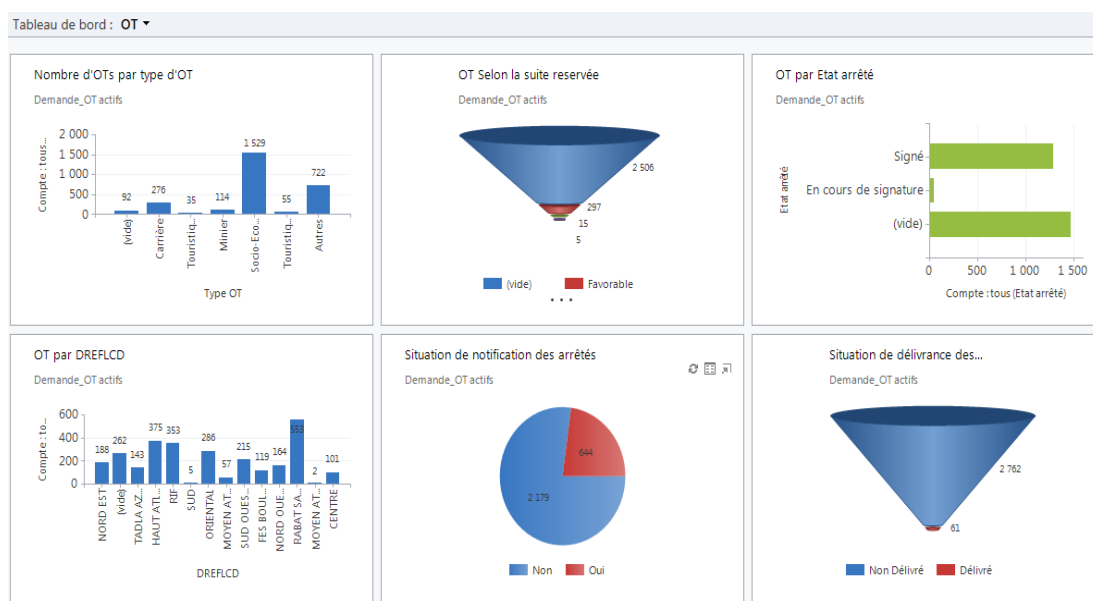


Figure 1: Dashboard representing temporary occupations classified by regional management

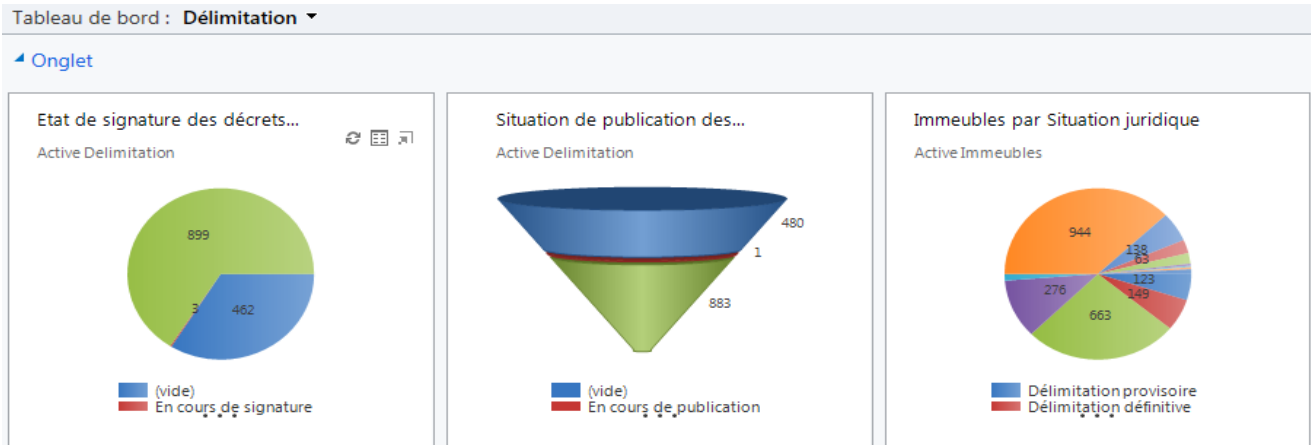


Figure 2: Dashboard showing delimitation operations

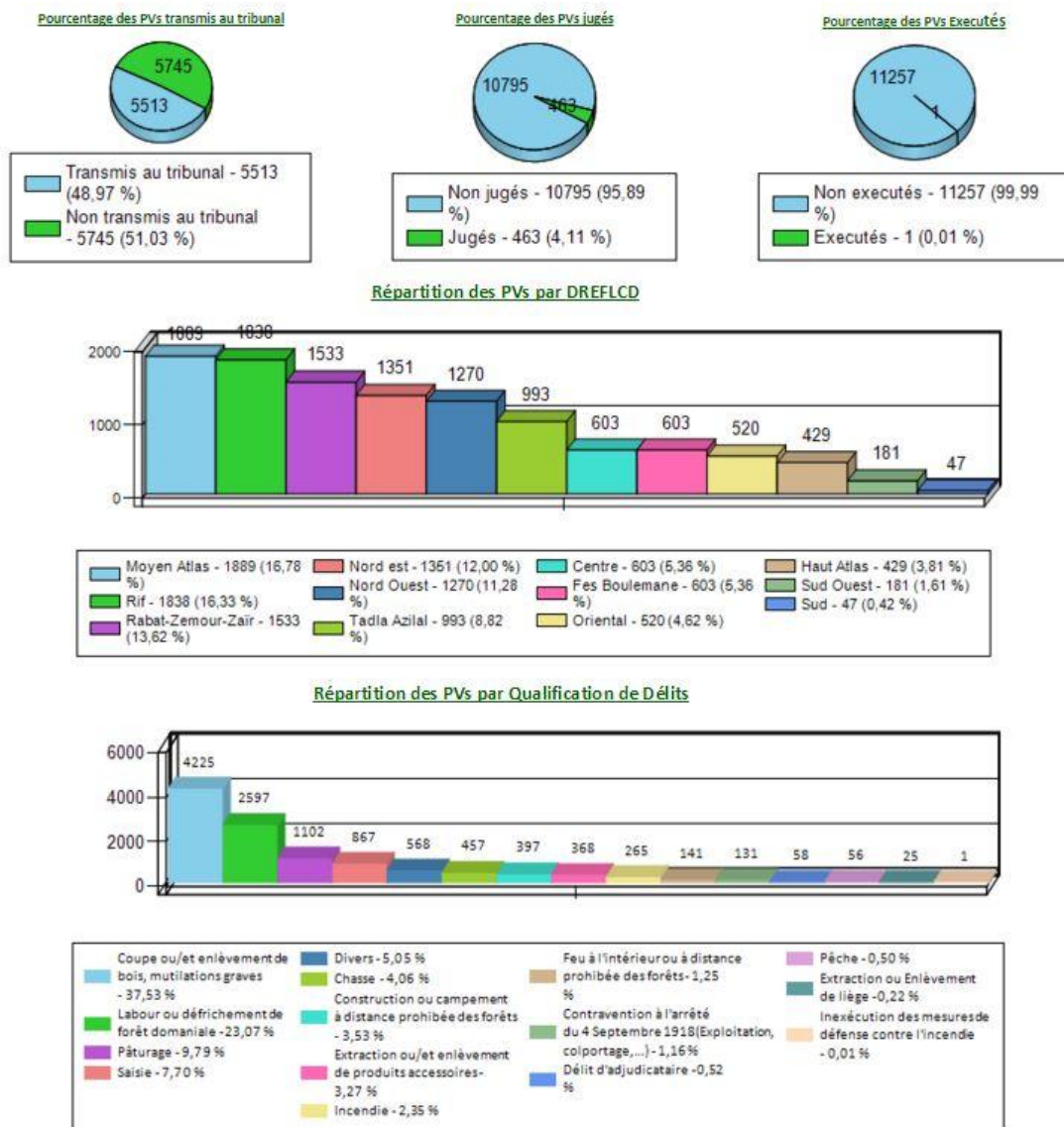


Figure 3: Dashboard of the evolution of registered, judged and executed pvs

PRESENTATION OF THE CLASSIFICATION METHOD

In order to better understand the performances displayed by the various indicators we before proceeded to the classification of the different provincial directions according to multi-dimensional vectors as we explained in detail in the previous article.

However, cluster formation is done using the K-means algorithm, the basic idea is that you start with a collection of elements (genes for example) and a selected number of clusters (k) that you want to do . Elements are initially randomly assigned to a cluster. K-means is the repeated product of a two-step process :

- The mean vector for all the elements of each group is calculated
- The elements are assigned to the cluster whose center is closer to the element.

However, to calculate the distance between the different clusters, we use the Euclidean distance

$$d(i, j) = \sqrt{(|x_{i1} - x_{j1}|^2 + |x_{i2} - x_{j2}|^2 + \dots + |x_{ip} - x_{jp}|^2)}$$

Euclidean distance takes the difference between two levels directly the expression of the genes. It should therefore only be used for expression data that are standardized appropriately. In sum, we include only the terms for which both xi and xj are present, and divide by p sequences. Unlike distance measurements as a function of correlation, the Euclidean distance increases in the magnitude of changes in d Gene expression. The k-means algorithm is presented in 4 steps:

1. Choisir K objets formant ainsi K clusters
2. (Ré)affecter chaque objet O au cluster Ci de centre Mi tel que dist(O,Mi) est minimale
3. Recalculer Mi de chaque cluster (le barycentre)

Go to step 2 if you just made an assignment

Each provincial direction will be represented by a three-dimensional vector.

Provincial Direction: (Performance_Contentious, Performance_Administrative, Performance_GF).

The sub-ontology Performance_Contentieux is composed of the indicators: Average of the recorded PV, the rate of PV transmitted, and the rate of PV judged.

The Performance_Administrative sub-ontology is composed of the indicators: Commitment Rate and Issue Rate

And the Performance_GF sub-ontology is composed of three indicators: average of titled buildings, average of recovered taxes and average of applications processed

After execution of the algorithm, the formation of the clusters was done as follows:

Table 1: Results of clusters obtained

Direction provinciale	GROUPE
Khémisset, Benslimane, Azilal, Ouazzane, Agadir	0
El Jadida, Taza, Tiznit, Tinghir, Es-Smara	1
Kénitra, Safi, Al Hoceima, Guercif Taroudant, Marrakech, Es-Saouira	2
Settat, Chefchaouen, Tétouan, Tanger Sefrou, Fes, Zagora	3
Taourirt, Berkane, Béni Mellal, Larache Laayoun, Assa Zag	4
Ifrane, Errachidia, Chtouka Aït Baha Ouarzazate, Tan tan, El Kalâa,	5
Meknes El hajeb, Midelt, Oujda, Tata	6
Nador, Driouech, Khouribga, Casablanca Sidi Ifni, Guelmim	7
Figuig, Sidi slimane, Rabat, Taounate, Chichaoua	8
Khénifra, Jerada, Boulemane, Dakhla, Boujdour	9

CONCLUSION

The implementation of this decision-making information system, and using the K-means algorithm, allowed us to segment the different regional directorates into ten groups, so that we could prepare a personalized training and coaching program for each provincial Increase its performance and improve public

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