CONCEPTUAL ARCHITECTURE FOR A SUPPORTING SYSTEM OF ASSISTANCE IN DECISION Making with a View to Assessing the Impact of Structural Funds in Romania- SSD FS PO

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Abstract: The paper intends to present the conceptual architecture and implementation methods of a supporting system of assistance in decision making with a view to assessing the impact of structural funds financing in Romania, a system based on a network of private virtual interconnection on web and a database conceived as a central base distributed to store and share data among users, namely an assemble of calculation sheets for the evaluation and foretelling of the structural funds impact. The system uses a VPN platform with a NeoRouter [1] zero configuration to secure the final users' connections to the database through a virtual LAN network, using an Oracle database which memorizes the main data from the three modules of the Herom analysis model and a set of Excel modules to do the calculations and the graphical representations of the used models.

JEL classification: C15, C87, D78

Key words : structural funds, Herom Model, processing data, System of Assistance in Decision Making, VPN

INTRODUCTION

An important category of informatics instruments used in solving problems linked to an acurrate assessment of structural funds impact on the economic-financial results of ecomomic agents in every operational program is the decision-making assistance systems. They are also called decision-making support systems or SSD (Decision Support Systems). The most helpful are the SSD based on a multidimensional analysis of data, a multiple criteria analysis (multiple attribute and multiple objective), risk management, data mining, advanced statistics. The first two, namely the one based on a multidimensional analysis and the one based on the multiple criteria analysis (multiple attribute and multiple objective), can consider the conflicting nature of the elements that define an accurate assessment.

To develop a VPN-type infrastracture in the context of SSD management to facilitate structural funds use in the Romanian economy (SSD FS PO) is the main objective of this paper. I have chosen a detailed preliminary presentation of the three concepts out of which the proposed SSD model is derived.

The IT solution chosen for implementing a SSD model that uses HEROM requires the use of a VPN platform with a NeoRouter-type [1] zero configuration, in order to secure the final users' connections to the database through a virtual LAN network, Oracle distributed database, which memorises the main data from the three modules of Herom analysis model and a set of Excel modules to do the calculations and the graphical representations of the used model.

1 THE SSD FS PO SYSTEM ARCHITECTURE

The system's architecture is shown in the image below:



Fig. 1 SSD FS-PO Arhitecture

The system's components are:

- a. an Oracle database which contains the main values of the HEROM model's indicators over a given period of time.
- b. a web server which permits advanced users' local connection (in the same room) to the Oracle database to populate, maintain and manage it.
- c. a VPN application which permits local secure connection from the outside to the server through a PPTP protocol.
- d. a set of Excel applications for the final users, which extract data from the database and provide for their processing (calculating the HEROM model's equations), along with a series of graphical representations of the resulting time series.

2 CONNECTING THROUGH THE VPN

Users who are in another location than that where the system's key components are stored can access the system through a VPN connection, enjoying full security of data transfer owing to the encrypted channel. Locally, specialized users (who maintain the database) need not use the VPN network because the Oracle server's security is sufficient for data confidentiality.

NR NeoRouter Net – 🗖 🗙
Eile Langauge Help
User name:
tester
Password:
•••••
Log on to:
neorouter1
Remember my password Sign me in automatically Start when I log on to Windows Sign in

Fig. 2. NeoRouter connection interface

The chosen VPN connection is a PPTP, Point to Point Transfer Protocol" variant of the NeoRouter Free for Windows system [1], which permits a "remote desktop" secure connection to the Oracle data base server of the application. The private virtual network sees the Oracle server as an Internet server with a specific IP (10.100.200.81), different from the web IP of the computer (169.254.173.10, also see fig.10)

C:\WINDOWS\system32\cmd.exe	- 🗆 🗙
C:\Documents and Settings\C. Boldea≻ipconfig	
Windows IP Configuration	
Ethernet adapter Local Area Connection 2:	
Connection-specific DNS Suffix .: inf.ucv.local IP Address: 10.100.200.81 Subnet Mask: 255.252.0.0 Default Gateway: 10.100.0.1	
Ethernet adapter Local Area Connection:	
Media State Media disconnected	
Ethernet adapter WeOnlyDo:	
Connection-specific DNS Suffix .: Autoconfiguration IP Address : 169.254.173.10 Subnet Mask : 255.255.0.0 Default Gateway :	
C:\Documents and Settings\C. Boldea>	-

Fig. 3. IPAddress within VNP

The NeoRouter application permits users to configure and manage user accounts, as well as computers accepted in the virtual network (fig.4). Using a Firewall is recommended for any outside connection.

	Jser			Add
tester				
				Delete
				Copy From
A company Co	a beal tink			
- Access Co	introl List			
Block a	الد			
This se	tting makes this comp	uter invisible to the sele	ected u	ser.
Eirour	ll on (rocommondod)			
I riewa	in on (recommended)			
This se with th	tting blocks all outside to following exceptions	sources from connecti	ng to t	his computer,
File an	d Printer Sharing		-	Add
FTP				
HTTP				Edit
				Delete
HTTPS			•	
HTTPS LDAP				
HTTPS LDAP	II off (not recommend	ed)		

Fig. 4. Access Control in VNP

3 THE DATABASE

The application's database constitutes its central part, supporting the writing and processing of data. It has been implemented with Oracle 11g, using Oracle SQL Developer 3.1.07. The database's structure is compliant with the HEROM model's structure described in section 2, with the three modules of Offer, Absorption and Distribution of Income, respectively. The data is grouped in eight indicators' charts, interconnected inside a relational conceptual model.

The main charts of *Offer* are described in the following figures:

ORAC	DRACLE' Application Express									
					De∨elopm	ent 🔻		ion 🔻		
Home > So	QL Workshop $>$ Object B	rowser								
Tables							Oferta	SectorT		
<i>P</i>	62	Table	Data Indexes	Model Constrai	nts Grants	Statisti	cs UI Defaults	Triggers	s Dependencies	SQL
APEX\$_ACL	~			1						
APEX\$_WS_F	ILES	Add C	olumn Modity Column	Rename Column	Drop Colum	rename	Copy Drop 1	uncate U	reate Lookup Table	
APEX\$_WS_H	IISTORY		olumn Name	Data Tuno	Nullable	Dofault	Drimary Koy			
APEX\$_WS_L	INKS	0.14		butu type	Humubic	Deruun	T THINK Y IVEY			
APEX\$_WS_M	IOTES	Code	an -	NUMBER(2,0)	NO	-	1			
APEX\$_WS_F	ROWS	PRO	DUCTIE	NUMBER	Yes	-	-			
APEX\$_WS_1	AGS	INVE	STITII	NUMBER	Yes	-	-			
APEX\$_WS_\	VEBPG_SECTIONS	OCU	IPFORTEIMUNCA	NUMBER	Yes	÷				
APEX\$_WS_V	VEBPG_SECTION_HIST	STO	CCAPITAL	NUMBER	Yes	-	-			
Absorbtie		PRE	TPROD	NUMBER	Yes		-			
DEMO_CUSTO	DMERS	RATA	Sal	NUMBER	Yes					
DEMO_ORDER	RS	COM	DETITINATATE		Vac					
DEMO_ORDER	R_ITEMS	DOC		NUMBER	165					
DEMO_PRODI	JCT_INFO	PRE	IREL	NUMBER	Tes	-	•			
DEMO_STATE	S	PRE	TRELEXPECT	NUMBER	Yes	-				
DEMO_USERS	6	PRO	FIRREPATRIAT	NUMBER	Yes	-	•			
Demografie		CER	EREINT	NUMBER	Yes	÷	-			
DistributieVen	it						1 - 12			
OfertaSector	۹.	Davus	le e el							
OfertaSectors	3	DOWII	IUau							

Fig. 5. Indicators of Offer for T Sector

					OfertaSectorN
Table Data Index	es Model	Constraint	s Grants	Statistics UI	Defaults Triggers Dependencies SQL
Add Column Modify C	Column Renam	ne Column	rop Column	Rename Copy	Drop Truncate Create Lookup Table
Column Name	Data Type	Nullable	Default	Primary Key	
CodAn	NUMBER	No	-	1	
Productie	NUMBER	Yes	-	-	
OcupForteiMunca	NUMBER	Yes	-	-	
Investitii	NUMBER	Yes	-	-	
StocCapital	NUMBER	Yes	-	-	
PretProd	NUMBER	Yes	-	-	
InflatiaS	NUMBER	Yes	-	-	
PretRel	NUMBER	Yes	-	-	
PretRelExpect	NUMBER	Yes	-	-	
CerereIntPond	NUMBER	Yes	-	-	
				1 - 10	

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Fig. 6. Indicators of Offer for N Sector

					OfertaSectorG		
Table Data Index	ces Model	Constrain	ts Grants	Statistics UI	Defaults Trigger	s Dependencies	SQL
Add Column Modify (Column Renam	ne Column	Drop Column	Rename Copy	Drop Truncate C	reate Lookup Table	
Column Name	Data Type	Nullable	Default	Primary Key			
CodAn	NUMBER	No	-	1			
Productie	NUMBER	Yes	-	-			
OcupForteiMunca	NUMBER	Yes	-	-			
ConsumNSal	NUMBER	Yes	-	-			
InflatiaS	NUMBER	Yes	-	-			
				1 - 5			

<u>Download</u>

					OfertaSec	torA		
Table Data Index	ces Model	Constraint	s Grants	Statistics UI	Defaults Tri	iggers	Dependencies	SQL
Add Column Modify	Column Renam	ne Column	Drop Column	Rename Copy	Drop Trunca	te Cre	ate Lookup Table	
Column Name	Data Type	Nullable	Default	Primary Key				
CodAn	NUMBER	No	-	1	1			
Productie	NUMBER	Yes	-	-	1			
OcupForteiMunca	NUMBER	Yes	-	-	1			
Investitii	NUMBER	Yes	-	-				
StocCapital	NUMBER	Yes	-	-				
Amortizare	NUMBER	Yes	-	-	1			
				1-6	1			

Fig. 8. Indicators of Offer for A Sector

to which there have been added Demographic charts, with the following structure:

					Demografie		
Table Data Index	ces Model	Constraints	s Grants	Statistics UI	Defaults Trigg	ers Dependencies	SQL
Add Column Modify C	Column Renam	e Column D	rop Column	Rename Copy	Drop Truncate	Create Lookup Table	
Column Name	Data Type	Nullable	Default	Primary Key			
CodAn	NUMBER	No	-	1]		
CresterePop	NUMBER	Yes	-	-			
Migratie	NUMBER	Yes	-	-			
OfertaFortaMunca	NUMBER	Yes	-	-			
Somaj	NUMBER	Yes	-	-			
RataParticip	NUMBER	Yes	-	-			
				1 - 6			

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Fig. 9. Demographic Indicators

and a Chart of correlation between the research years and calender years (necessary for interconnecting the relational model's charts) with the following structure

Column Name	Data Type	Nullable	Default	Primary Key
AN	NUMBER(4,0)	No	-	1
CODAN	NUMBER(2,0)	Yes	-	-
				1 - 2

Fig. 10. Structure of the correlation chart

(for a correlation with the HEROM model's indicators, see section 2)

The relations in the charts have been created with SQL, after the following model

```
ALTER TABLE "PERIOADA"
ADD CONSTRAINT "PERIOADA CON" FOREIGN KEY ("CODAN")
                 "OfertaSectorA" ("CodAn") ON DELETE SET NULL
  REFERENCES
ENABLE;
ALTER TABLE "PERIOADA"
  ADD CONSTRAINT "PERIOADA CON D" FOREIGN KEY ("CODAN")
  REFERENCES "Demografie" ("CodAn") ENABLE;
ALTER TABLE "PERIOADA"
  ADD CONSTRAINT "PERIOADA_CON_G" FOREIGN KEY ("CODAN")
REFERENCES "OfertaSectorG" ("CodAn") ON DELETE SET NULL
ENABLE;
ALTER TABLE "PERIOADA"
  ADD CONSTRAINT "PERIOADA CON N" FOREIGN KEY ("CODAN")
  REFERENCES "OfertaSectorN" ("CodAn") ENABLE;
ALTER TABLE "PERIOADA"
  ADD CONSTRAINT "PERIOADA CON T" FOREIGN KEY ("CODAN")
```

REFERENCES "OfertaSectorT" ("CodAn") ON DELETE SET NULL ENABLE;

Absorption and Distribution of Income are described in the charts with the same name, with a basic structure defined by SQL codes

```
CREATE TABLE "Absorbtie"
   ( "CodAn" NUMBER(2,0) NOT NULL ENABLE,
  "VenitPersDispMediu" NUMBER,
  "ConsumMediu" NUMBER,
  "InvestLocuinte" NUMBER,
  "Stoc" NUMBER,
  "VarStoc" NUMBER,
  "Competitivitate" NUMBER,
  "Export" NUMBER,
  "Import" NUMBER,
  "PIBpretpiata" NUMBER,
  "CerereInt" NUMBER,
  "SurplCom" NUMBER,
  "PIBChelt" NUMBER,
   CONSTRAINT "Absorbtie PK" PRIMARY KEY ("CodAn") ENABLE
   );
and
CREATE TABLE "DistributieVenit"
   ( "CodAn" NUMBER NOT NULL ENABLE,
  "Venit" NUMBER,
  "ImpoziteNete" NUMBER,
  "ImpoziteIndirecte" NUMBER,
  "Subventii" NUMBER,
  "VenitDisponibil" NUMBER,
  "TransferuriSociale" NUMBER,
  "TransfStrainat" NUMBER,
  "TransferitiTotale" NUMBER,
  "BalataPlati" NUMBER,
  "ImprimSectPubl" NUMBER,
  "RataDobaziiDPub" NUMBER,
  "DatorieSectPubl" NUMBER,
  "DatorieExt" NUMBER,
  "RataDobaziiDExt" NUMBER,
  "ProfituriTotale" NUMBER,
  "ProfituriRetinute" NUMBER,
  "MazaMonetara" NUMBER,
   CONSTRAINT "DistributieVenit PK" PRIMARY KEY ("CodAn")
ENABLE
   );
resepctively.
```

Some fields of the charts are taken from the *Offer* charts, for example *Absorption.Competivity* is taken from *SectorToOffer.Competivity* through a *"many to many*" relationship of the two charts.

A number of supplimentary attributes have also been inserted, such as *PubInterestRate* (Public Interest Rate) or *ExtInterestRate* (External Interest Rate), because they were needed for the calculation of some compound indicators (such as *PublicSectorDebt*)

Initially, populating charts with data was done through the Oracle 11g Express' interface.

Table:Demografie* Codan2Cresterepop-0.03Migratie-0.08ertafortamunca0.014Somaj0.11	reate Row	
* Codan 2 Cresterepop -0.03 Migratie -0.08 ertafortamunca 0.014 Somaj 0.11	Table:	Demografie
Cresterepop -0.03 Migratie -0.08 ertafortamunca 0.014 Somaj 0.11	* Codan	2
Migratie -0.08 entafortamunca 0.014 Somaj 0.11	Cresterepop	-0.03
ertafortamunca 0.014 Somaj 0.11	Migratie	-0.08
Somaj 0.11)fertafortamunca	0.014
	Somaj	0.11
Rataparticip 0.45	Rataparticip	0.45

Fig. 11. Model for initial data insertion (subunitary data represent percentages)

A large part of the indicators are calculated according to the HEROM model or can be taken from the Excel Sheets of the final users. Calculation methods are fully described in [2].

4 EXTRACTING AND PROCESSING DATA

The last part of the application, still under construction, sees to processing data from the database and introducing them in Excel Sheets in order to obtain reliable predictions and visual graphical representations.

To connect to the Oracle server, you have to use the Excel's Import Data option (*Data->Import External Data->Import Data->Conect to External DataSource*) with an Oracle database. Connecting to the server will necessitate authentication through the VPN connection, by supplying the IP it provides.

Data Connection W	Vata Connection Wizard						
Connect to Database Server Enter the information required to connect to the database server.							
1. Server name: 1 2. Log on credential	0.100.200.81/oracle						
• Use <u>t</u> he follow	ving User Name and Password						
<u>U</u> ser Name:	admin						
Password:	•••••						
	Cancel < <u>Back</u> Next > Finish						

Fig. 12. Connecting to Oracle server

Importing data from the database. Oracle transfers the relational model's chart contents in the current work sheet where they can be later processed. This part remains to be implemented in the near future.

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