

Engineering of the Decisional Information System by the reuse of patterns

Aziza Sabri¹, Laila Kjiri²

¹ SABRI AZIZA

ENSIAS, Université Mohammed-V-Souissi, Rue Mohammed Ben Abdellah Regragui,
B.P. 713 Agdal , Madinat Al Irfane,
Rabat, Maroc

² KJIRI LAILA

ENSIAS, Université Mohammed-V-Souissi, Rue Mohammed Ben Abdellah Regragui,
B.P. 713 Agdal , Madinat Al Irfane
Rabat, Maroc

Abstract

When analyzing the needs of a DIS, many problems related to inconsistency and to the difficulty of modeling requirements, are detected. Thus, we propose a complete approach for analysis and design of a DIS [3] to analyze business requirements collected to establish the star schema. This approach integrates the notion of business context of the organization and provides a process for formalizing business requirements for a DIS directing the treatment of business requirements, collected in the form of goals, in order to systematically extract facts and dimensions. Moreover for reasons of reuse, we opt for an approach guided by the patterns [5] [6] for the analysis of business requirements for a DIS, which consists of proposing a catalog of reusable patterns which capitalize the processes and models of the approach

Keywords: *Decisional Information System (DIS), Engineering of Business requirements, P-Sigma formalism, catalog of patterns, Process pattern.*

1. Introduction

The purpose of business intelligence is to define the methods and tools in a company, in order to implement its decisional project and facilitate the access to global data from the company. For this reason the development of a Decisional Information System (DIS) is strongly linked to steps of requirements analysis, design and development of such system.

The analysis phase is to define the project environment and all data and processes required in the development process. Many problems related to inconsistency and difficulty of modeling requirements are detected. This causes a different expression of requirements and sometimes contradictory requirements. Despite the diversity of approaches suggested in the literature for the analysis and design of SID

The approaches don't guide explicitly the collection and the treatment of the DIS's requirements. The basic steps for the requirements analysis such as user's orientation and accompaniment in the expression for their requirements, the classification of the collected requirements, the treatment of the requirements and the documentation of the analysis' process of requirements are treated by some works [45] [27] [15] [39], but they need to be developed to

facilitate the task for the SIDs's analyst-designers and consider the automatic extraction of business intelligence data. Thus, we propose a solution methodology for analyzing the business requirements [3] It is a complete approach to analysis and design to analyze the collected business requirements collected requirements, in order to establish the star schema. This approach offers a process of formalization of business requirements that directs the processing of business requirements, collected in the form of goals, in order to systematically extract facts and dimensions. It includes also the concept of business context of the organization which consists in defining the structure of the organization and its actors and identifying business requirements of each actor in a predefined context.

In addition, in a decisional project, it is often necessary to reuse the tasks analysis process requirements in an empirical way by the designers. Thus, the extraction of clear criteria for reuse is a difficult task since we have to specify and identify components suitable for reuse. In this sense, we opt for an approach guided by the patterns [5] [6] for analyzing the business requirements that consists in proposing a catalog of reusable and flexible patterns, which we associate a reuse strategy to ensure adaptation. The reuse capitalizes the process and the models that perform each step of the analysis process, providing the possibility to adapt the analysis process according to need and context. It provides, therefore, an effective guidance for analyzing the business requirements.

The paper is organized as follows. As a first step, we present the problem approached by the present work and that is related to three areas of research: requirements engineering, engineering of CISs and reuse. Then we provide a state of the art approaches for analyzing the requirements of a DIS and reuse work. In Section 3, we briefly present the approaches based patterns. In Section 4, we present the catalog of process patterns related to the phase of analysis business requirements. Finally, we conclude our paper by a conclusion and perspectives of our work.

2. Problem

Our fundamental problem is to define a rapid method of analysis and design business requirements of a SID in the context of reuse, used by all analysts' designers' decision. Thus, the present research addresses issues related to the three more specific areas of research: requirements engineering, engineering of SIDs and reuse.

2.1. Requirements engineering and DISs' engineering:

The requirements' engineering, introduced by J. Hagelstein [25] and E. Dubois [16], is defined as the process of developing requirements through an iterative and cooperative process of the problem analysis, documentation of observations resulting in different representation formats and checking results [23]. It means the part of the development of information systems which is related to the investigation of the problems and user's requirements and the development of future's specifications system. In the literature, there are three types of approaches for requirements engineering: approaches based on Scenario [31], approaches based on goals [32] [18] [13] and approaches coupling scenarios and goals at once [43] [34] [11] [33]. A scenario describes "a finite set of interactions between agents whose behavior is directed by separate targets" [11]. Each interaction involves two agents and can achieve a goal. A goal may be defined as "something that someone hopes to achieve in the future" [11]. The coupling of this two concepts is to attach a purpose to one and only one scenario (which illustrated it), and conversely, any scenario illustrates one and only goal. A couple goal-scenario is named fragment of requirements and specify any system specification which is intended / desired.

Like the engineering of Information System which is the process by which the analysts' system, computer engineers and end users build information systems [14], the engineering of DIS is the process by which analysts designers and decision makers build the DIS The DIS is "a collection of some data oriented subjects, integrated, time-dependent, not volatile designed to assist managers in their decisions " [46]. According to this definition, it exists a strong link between the data that the DIS manages and the decision making process which it supports. Generally, its establishment through the three levels of usual design: conceptual, logical and physical. For the conceptual level, most studies agree to distinguish the following steps to design a Data Warehouse (DW): requirements analysis, conceptual modeling, logical modeling, ETL (Extraction Transformation Loading) physical modeling. The objective of the analysis stage, situated upstream the process of development, consists of collection, specification and formalization of requirements.

A good expression of needs is a key to the success of any business intelligence project. However, this step raises several problems, namely: lack of familiar models for formulation and processing requirements of decision makers, lack of diagnosis of the organization, decision-makers have an incomplete idea of their requirements, the

analysts have a little knowledge of domain analysis, the decision maker and analyst talk different languages. It is easy to omit information, there can be more conflict of views between different decision makers, the existence of problems of ambiguity and semantic consistency requirements. Furthermore requirements are often vague and not measurable, the decision makers know how to express their requirements in terms of goals and still they don't master the concepts of data structures, or sequence of actions, which are under the operational. In order to remedy all of these problems, we have opted for an approach based on goals in the expression of an organization's business requirements. We also proposed a set of models in the engineering's requirements of a SID, which will be described later in this article

2.1. Reuse and capitalization on the DIS's engineering:

The establishment of a DIS is a complex activity and expensive on resource and time consuming [37]. It requires, however, specific developments of the characteristics and requirements of the organization. Indeed, the idea of an approach to reuse is likely to be beneficial in terms of speed and quality of project results. This reuse consists in the implementation of the existing capitalized components from development done for the definition of new systems.

Generally, five tasks are recurrent during the development [8]: requirements analysis, data design, architecture design, system implementation and deployment of the system. In this article, we will focus on the reuse of task analysis phase and the design of a DIS. Thus, it often happens to repeat the activities of analysis and design from a BI project to another, this is due to the similar nature of the phases of analysis and design of a decision-making's project and because projects decision relating to the same field of activity or to different areas, have many common tasks. Our approach consists of systematizing reuse of the analysis phase and the design of a DIS so that the analyst-designer can gain time to develop new reliable and more relevant DIS. We therefore find interesting and relevant to capitalize approaches and models of our work in reusable patterns to facilitate their eventual reuse.

In the following, we present a state of the art concerning the approaches of analysis and design of a DIS as well as work of reuse and capitalization into DIS' projects.

3. State of art

The approaches that we have chosen to evaluate here are the steps to design and analysis of the requirements of a DIS as well as the work of reuse. We define criteria of evaluation, on the one hand, to compare the work of requirements analysis needs a DIS and the reuse and on the other hand, to position our work in relation to these approaches.

3.1. Criteria of evaluation

We chose to evaluate approaches for analyzing or expressing requirements and for designing and manipulating design's reusable components. This reference criterion proposes a set of criteria to measure the similarities and differences between these works, by detecting their weak points. We cite all the suggested criteria:

- Completeness of analysis approach,
- Means of requirements gathering,
- Models of requirements formulation,
- Orientation and support for users on their expression's requirements,
- Distinction of the actors of DIS,
- Classification of collected requirements,
- Treatment of requirements,
- Capitalization and reuse of knowledge,
- Documentation of process analysis of the decisional requirements.

After defining the criteria enabling us to compare approaches to requirements analysis of a DIS, we will present a state of the art practices.

3.2. Methods of requirements analysis of a DIS : State of art

In this section, we study some methods for analyzing the requirements of a DIS , represented by the proposed approaches in [21] and [45] [15] and some proposed models for the representation of these approaches namely entity-Relationship model [26], use cases [44] and class diagrams [9], the query models [20], and models of goals [1] [35] [41] [27] and [39].

3.2.1. Procedures of requirements' Analysis of a DIS

In the literature, several methods have been proposed for modeling decision-making requirements. Thus, in [21], modeling requirements consists of the following activities: (1) the first phase of initialization allows to select the models of data to use , data sources and relevant processes decisions to be taken, (2) the second phase allows the analysis of existing data sources and reports used regularly by users, (3) the third step is to establish priorities between the information requirements and (4) the last step is to develop a model identified requirements, using basic conceptual model. A second methodology was proposed by [44]. It is constituted by a process of requirements analysis, including the following five tasks: (1) the collection of user requirements, (2) a comparison of these requirements with data sources, (3) evaluation and homogenization of requirements, (4) the prioritization of requirements and, finally, (5) the formalization of requirements in order to facilitate its validation by users. In [15], the process of requirements analysis is performed in three steps: (1) the collection of user requirements in crosstabs, (2) the formalization of these requirements, (3) the comparison of the requirements. The conception phase is composed of four steps: (1) the choice of architecture DIS, (2) design DIS modules, (3) the definition of matching schemas, (4) evaluation of these schemas. The cited works provide steps to analyze the requirements of a

DIS. However, these approaches are limited and they don't guide, in an explicit way, the collection and treatment of the requirements of a DIS. No approach has proposed steps for the delimitation of work context, or the distinction between actors except [15], [39]. In addition, the basic steps for the analysis of requirements such as guidance and support users in expressing of their requirements, the classification of collected requirements, and treatment of requirements and process documentation of decisional requirements analysis are occluded in the majority of the work.

In the next section, we present models of requirements 'representation of a DIS.

3.2.2. Models of requirements' representation of a DIS

In the literature, three models are proposed for the requirements' representation of a DIS namely: the existing models (entity-relationship, use cases) [9], requests to represent the requirements [20] and models of goals [26] [38] where the authors represent requirements following the goals they seek. Among the models used for formalization of requirements, none come close to the representation of data which is multidimensional [15]. In addition, these models do not explicitly systematically way extract decisional data (facts and dimensions) and do not take into consideration the notion of context for gathering business requirements of an organization.

Thus, the works based on existing models are not familiar to decision makers. As for work based on queries, query structuring forms is unfamiliar to non-computer makers and decision makers validate, with difficulty, the specification of their requirements. As for work based on requests [20], the structure form of requests is not familiar to non-specialists. Also, these studies do not guide the collection and do not distinguish makers.

The workbased on goals do not distinguish between different types of decision makers except [15], [39] and use models of formalization of requirements, not approaching of the multidimensional representation of data expressed by makers. Also, some difficulties persist for the validation of formalization of the requirements before designing the DIS schema. Also, all methods based on goals do not explicitly how to extract actionable data, in an automatic manner, starting from the goals' structure.

3.3. Reuse work

In the literature, several works address reuse in the development of a DIS. We include three proposed methods for developing DIS dealing with the issue of reuse [27], [24] and [15]. In [27], [24], the authors propose that reusable patterns are selected and used as belonging to the same field. These patterns capitalize products development process but do not capitalize the entire development process. The authors have failed to maintain the systematization of tasks because the patterns established are neither linked between them nor organized to facilitate reuse.

Another work that has succeeded systematization of tasks is that of [15]. The authors propose a catalog of patterns analysis and design patterns as product and process patterns, guiding the designer in the development of a DIS. However, the context of reuse is not completely valid because it requires, at each iteration, corrections and

improvements.

The comparison results of the work evaluated according to the criteria that we have defined above are illustrated in the following table:

Table 1: Comparative approaches to requirements analysis of a DIS

<i>Approaches of requirements analysis of SID</i>	Cavero et al. 2001	Luján-Mora et al., 2003	Winter and Strauch, 2003	Prakash et al., 2003	Giorgini et al., 2005	Mazon et al., 2005	Soussi et al., 2005	Ghozzi et al., 2005	Annoni, 2007	El Golli, 2008
Completeness of analysis approach	Explicit (global Approach)	Implicit task	Implicit (task)	Explicit (global Approach)	Explicit (task)	Explicit (task)	Explicit (task)	Explicit (task)	Explicit (task)	Explicit Approach)
Means of requirements gathering	Natural language	Natural language	Natural language	Natural language	Natural language	Natural language	Natural language	Natural language	Table	Natural language
Models of requirements formulation	Entity-Association	Use case		GDI	i* Model	i* Model	UML (Class Diagram)	Request	Table	MAP (but)
Orientation and support for users on their expression's requirements	implicit	incomplet	incomplet	incomplet	incomplet	Explicit but incomplet	Explicit but incomplet	Explicit but incomplet	Explicit but incomplet	Explicit incomplet
Distinction of the actors of SID		no	yes		yes	yes			yes	yes
Classification of collected requirements					yes	yes			yes	yes
Treatment of requirements			yes			Implicit			Implicit	Explicit incomplet
Capitalization and reuse of knowledge							Yes (Class diagram)		yes (pattem)	yes (class diagram)
Documentation	incomplet	incomplet	incomplet	incomplet	incomplet	incomplet	incomplet	incomplet	yes	yes

According to this study, we could detect the aspects on which we can act. Thus, the analysis of a DIS requires a complete and well-structured process, guiding the designers from the step of gathering requirements in order to the establishment of the star schema. The originality of our work is to achieve the following objectives:

- Diagnose of the organization by defining its activities,
- Collect the requirements of an organization according to a given activity in a predefined context,
- Provide models of requirements gathering, Provide models of treatment of the collected requirements,
- Provide simplified processes for analyzing business requirements of a DIS,
- Build a shared vocabulary between decision makers and analysts designers,
- Capitalize the approaches and models in reusable patterns.

We were able to achieve these objectives [3][4][5][6][7] . Approaches and models provided which are capitalized in the patterns described in Section 5. In the following, we will provide a state of the art approaches based on patterns.

4. Approaches based on patterns

4.1. Definition

In our context, a pattern is defined as "a fully realized form, original or proposed or accepted model for imitation, something that is seen as a normative example which can be copied, or used as an archetypical example" [40]. Other reusable components that have been proposed in the literature including: frameworks [42], cases [12], business objects [22], the pattern has a good level for three criteria recognized by the OMG that characterize a reusable component. These are:

- Granularity: the number of problems solved and component alternatives offered by the component
- Variability: the possibilities offered for the user to adjust the component to its needs,
- Articulation: the degree of completeness of artifacts to achieve one or more solutions

4.2. Classification of patterns

In the literature, we identify three principal types of patterns: analysis patterns, design patterns and implementation patterns. Analysis pattern identifies recurrent problems in the expression of requirements of different application domains. The patterns' analysis [29], [38] is an example of patterns used in the phase of requirement analysis. Design patterns [17] identify, appoint and abstract out common themes in the area of object-oriented design. Implementation patterns are generally specific to a programming language by

describing the implementation of particular aspects of components or the relations between them in a particular programming language [30].

4.3. Patterns' catalogue

The catalog of patterns is defined as "a set of patterns that allows solving problems related to the same problem in a given context" [38]. We define a catalogue of patterns which are defined according to the problem-oriented approach components by the triplets <Problème, Solution, context> [10]. This approach separates the specification of the problem to its realization. The problem is an approach to achieve or define a product. The solution is an approach or a model represented by respective algorithms, activity diagrams, document templates and models of data. Finally, the context defines the situation in which the solution described in the component is used. For the representation of patterns we used the formalism P-SIGMA [2].

4.4. Formalism of patterns P-SIGMA

Formalism P-SIGMA [2] is an attempt to unify structured formalisms that have been proposed [40] [17]. We chose this formalism as the basis of our performance because it incorporates aspects in the expression products and processes and a large number of inter-patterns. Thus, we present the formalism P-SIGMA chosen to represent our approach to needs analysis in [5]. Our aim through this formalism is to facilitate the selection, the organization and the reuse of patterns.

5. The process's patterns of the business requirements analysis' phase of a DIS: proposition

The reuse function of several parameters namely the experience, the ability to correlate and reuse strategy adopted by the designers. In this sense, we have opted for an approach guided by the patterns for the analysis of business requirements of a DIS, which is to provide a catalog of reusable and flexible patterns [7]. The reuse of these patterns will be more systematic, since on the one hand, it capitalizes process which realize each every step of the analysis process and offers the possibility to adapt the process of analysis depending on the context. Secondly, it provides effective guidance for the analysis of DIS' business requirements.

5.1. Catalog of patterns for the analysis of requirements:

Our proposal is to build knowledge in engineering DIS in terms of approach and models in a catalog of reusable patterns for analysis and design of DIS to facilitate their reuse in similar cases. This work can:

- Systematize the reuse projects in decision-making
- Facilitate reuse for analysts designers
- Improve communication during project
- Manage the traceability of documentation between the projects
- Correct heterogeneous vocabularies of the designers.

The following figure shows the catalog of patterns analysis of business requirements that we proposed.

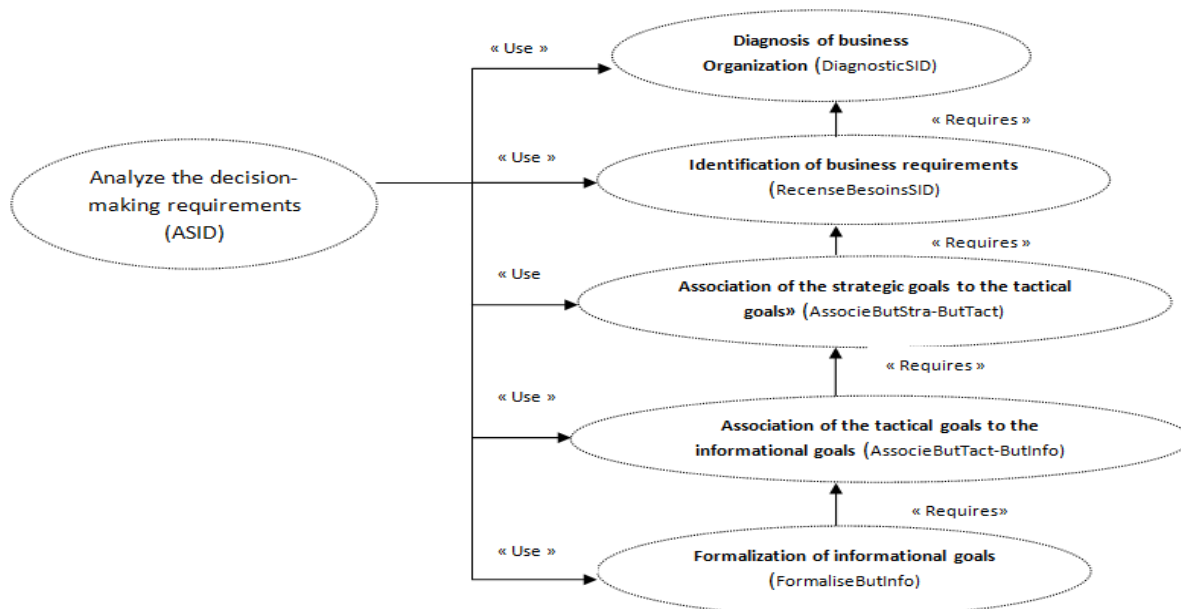


Fig. 1 Patterns' catalogue for Analyzing requirements of a DIS

In the following, we present each of the patterns offered in our catalog.

5.2. Pattern "Analyzing requirements of a DIS"

The process pattern "Analyzing requirements of a DIS" capitalizes all the steps mentioned in the proposed approach to systematize the task of analysis and design. It highlights activities related to the problem studied namely

guide the analysis of the requirements of a DIS. The following figure shows the process pattern [6] according to the formalism adopted P-SIGMA:

Table 2: Pattern "Analyzing requirements of a DIS"

Part	Rubric	Fields
Interface	Symbol	ASID
	Name	Analyse of business requirements
	Classification	SID ^ Analysis ^ Process
	Context	This pattern is reused in a new collection of decisional requirements.
	Problem	Guide the analysis of a DIS requirements
	Strength	This pattern describes the steps to analyze a DIS' requirements
Realization	Process Solution	<p>The solution approach consists of the realization of the following activity diagram.</p> <pre> graph TD Start([Start]) --> A[Analyse the specifications] A --> B[Establish the organizational structure] A --> C[Detect the organizational activities] B --> D[Identify actors] C --> E[Determining the business contexts] D --> F{ } E --> F F --> G[Identify goals] G --> H[Classify and formalize the collected goals] H --> I[Reformulate informational goals according to the semantic model proposed] I --> J{ } J --> K[Deducing the star schema] K --> F </pre>
	Model Solution	<p>Models solution obtained when applying the approach are:</p> <ul style="list-style-type: none"> • Model "Classification of SID actors" • Model "Modeling the business context" • Model "Expression of requirements according to contexts" • Model "Expression requirements of a DIS" • Model "DIS requirements classification" • Star Schema from resolution informational goals formulated
Relation	Use	This pattern uses other patterns being defined

Through this pattern, we could systematize and facilitate the analysis phase of decision business requirements, provide an explicit reuse within BI projects, promote and improve communication during projects.

5.3. The pattern « Diagnosis of organization »

The diagnosis of the organization consists of three tasks: (i) define the business of the organization, (ii) determine the activities defining the job and (iii) list contexts associated to each activity. Thus, we propose the

following activity diagram which illustrates the process of defining the business of the organization:

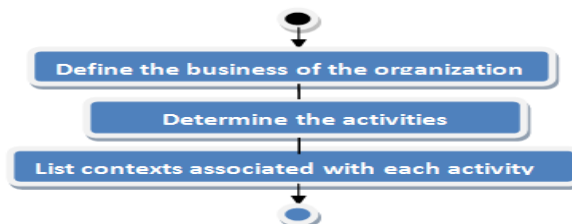


Fig 1: Activity diagram "Defining the organization business"
 After defining the business context of the organization [5] we have the step of the collect of requirements. Thus,

we propose the following model for the systematic collection of information concerning the organization. This is the model "Diagnosis of the Organization":


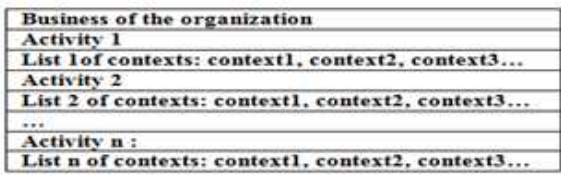
Business of the organization
Activity 1
List 1 of contexts: context1, context2, context3...
Activity 2
List 2 of contexts: context1, context2, context3...
...
Activity n :
List n of contexts: context1, context2, context3...

Fig 2: Model «Diagnosis of the Organization»

This model serves as a document of diagnosis for the organization. It allows identifying all activities related to the business of the organization and the contexts associated with each activity.

To ensure capitalization and reuse of this model, we establish the pattern "Diagnosis of the organization" as follows:

Table 3: The pattern « Diagnosis of the Organization»

Part	Rubric	Fields
Interface	Symbol	DiagnosisSID
	Name	Diagnosis of business organization
	Classification	DIS ^ Analysis ^ Product ^ Process
	Context	This pattern is reused in the definition of business organization.
	Problem	Guide the discovery of an organization's activities and contexts associated with them.
Realization	Strength	This pattern details the steps to determine the contexts associated with the activities of the organization.
	Process Solution	<p>The process solution consists in the achievement of activity diagram "Defining the business organization" as follows:</p> 
Realization	Model Solution	<p>The model solution obtained during the application of activity diagram is the model "Diagnosis of the Organization" as follows:</p> 
	Relationship	Uses

This pattern encapsulates the activity diagram "Defining the business of the organization" that guides the task of defining activities and contexts of the organization, also the model "Diagnosing of the organization" which allows their representation.

5.4. The pattern "Identification of business requirements"

The collection aims to understand the area that must be modeled. In our approach to requirements assessment decision [5], we have adopted a use case diagram to determine the actors of DIS and their goals. The actors of the diagram are actors which are predefined in the DIS (strategic, tactical and system). The use cases represent the goals defined by each actor.

In addition, the task of collecting business requirements is to achieve three main tasks: (i) define the actors of the

organization, (ii) identify the requirements of each actor, and (iii) establish the use cases "Expression's requirements of DIS". Thus we present the following activity diagram which illustrates the process of identifying business requirements:

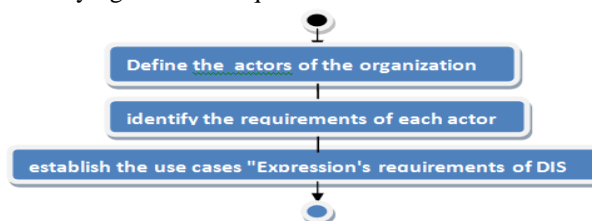
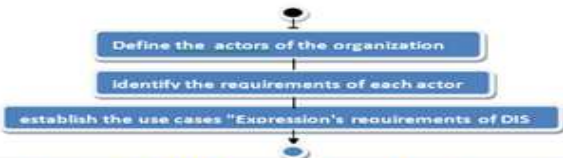



Fig 3: Activity Diagram « Identifying a DIS's business requirements »

To ensure capitalization and reuse of this model, we establish the pattern process "Identifying business requirements" as follows:

Table 4: The pattern « Identification of business requirements »

Part	Rubric	Fields
Interface	Symbol	RecenseBesomsSID
	Name	Identification of business requirements
	Classification	SID ^ Analysis ^ Process ^ Product
	Context	This pattern is reused in a new collection of a DIS's business requirements.
	Problem	To guide the collection of a DIS's business requirements.
	Strength	This pattern describes how to identify a DIS's business requirements.
Realization	Process Solution	It consists in the achievement of the activity diagram "Identifying a DIS's business requirements" as follows: : 
	Model Solution	The model solution obtained when applying the process is the following use case model " Expression's requirements of DIS": 
Relationship	Uses	
	Requires	The pattern «Diagnosis of the Organization»

This pattern capitalizes both the solution approach which consists in the realization of the activity diagram "Identifying business requirements" and the model solution "Expression's requirements of a DIS" obtained when applying the approach.

5.5. Pattern "Association of the strategic goals to the tactical goals»

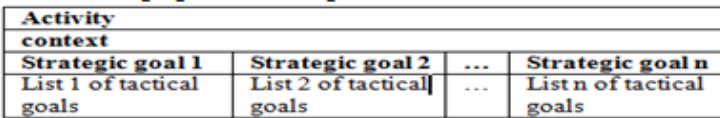
In our approach [4], business requirements are collected in the form of goals. This collect is based on principle on a formulation of goals in a natural language. The classification of decision-making requirements, identified as goals, consists of organizing them into three

types (strategic, tactical and informational). This classification will allow us to make explicit the links between goals in a given context. After this classification of goals, we proceed to the association of each strategic goal to all tactical goals attached to it according to a predefined context. This association is carried out according to the following model:

Activity context			
Strategic goal 1	Strategic goal 2	...	Strategic goal n
List 1 of tactical goals	List 2 of tactical goals	...	List n of tactical goals

Fig 4: Association model of strategic goals to tactical goals
 For the reasons of capitalization and to ensure possible reuse, we propose the following pattern:

Table 5: The pattern «Association of the strategic goals to the tactical goals»

Part	Rubric	Fields
Interface	Symbol	AssocieButStra-ButTact
	Name	Association of the strategic goals to the tactical goals
	Classification	SID ^ Analysis ^ Product
	Context	This pattern is reused in the Association of the strategic goals to tactical goals.
	Problem	To guide the treatment of business goals and associated strategic goals to tactical goals.
	Strength	This pattern describes how to assemble the tactical goals associated with each strategic goal.
Realization	Process Solution	From the use case "Expression's requirements of DIS" established the analyst can classify goals into three types (strategic, tactical and informational) and then associate each strategic goal to all tactical goals that are associated with him according to a predefined context.
	Model Solution	The model solution obtained from the application of process steps is the following use case model " Association model of strategic goals to tactical goals": 
Relationship	Uses	The pattern «Diagnosis of the Organization»
	Requires	The pattern «Identification of business requirements»

The pattern "Association of the strategic goals to the tactical goals "capitalizes model" Model Association of strategic goals to the tactical goals ".

5.6. Pattern "Association of the tactical goals for informational purposes»

After establishment of the association models of strategic goals to the tactical goals, we proceed in the same way by associating each tactical goal to all informational purposes which are attached to it according to a predefined context. This association is performed according to the following table:

Activity			
Context			
Strategic goal			
Tactical goal 1	Tactical goal 2	...	Tactical goal n
List 1 of informational goals	List 2 of informational goals	...	List n of informational goals

Fig 5: Association model of tactical goals to informational goals

For the purpose of reuse, we capitalize the association model of the tactical goals to informational goals into the following pattern':

Table 6: The pattern «Association of the tactical goals to the informational goals»

Part	Rubric	Fields										
Interface	Symbol	AssocieButTact-Butinfo										
	Name	Association of the tactical goals to the informational goals										
	Classification	SID ^ Analysis ^ Product										
	Context	This pattern is reused when associating the tactical goals to informational goals.										
	Problem	To guide the treatment of business goals and the association of the tactical to informational goals.										
	Strength	This pattern describes how to assemble informational goals associated with each tactical goal.										
Realization	Process Solution	From the use case "Expression's requirements of DIS" established, the analyst can classify goals into three types (strategic, tactical and informational), then associate each strategic goal to all its tactical goals, then select a strategic goal and associated it with each of its tactical goals and select each tactical goal in order to associate it to all informational goals associated with it according to a predefined context.										
	Model Solution	The model solution obtained during the application of activity diagram «Association model of tactical goals to informational goals» <table border="1" style="margin-left: 20px;"> <tr><td>Activity</td></tr> <tr><td>Context</td></tr> <tr><td>Strategic goal</td></tr> <tr> <td>Tactical goal 1</td> <td>Tactical goal 2</td> <td>...</td> <td>Tactical goal n</td> </tr> <tr> <td>List 1 of informational goals</td> <td>List 2 of informational goals</td> <td>...</td> <td>List n of informational goals</td> </tr> </table>	Activity	Context	Strategic goal	Tactical goal 1	Tactical goal 2	...	Tactical goal n	List 1 of informational goals	List 2 of informational goals	...
Activity												
Context												
Strategic goal												
Tactical goal 1	Tactical goal 2	...	Tactical goal n									
List 1 of informational goals	List 2 of informational goals	...	List n of informational goals									
Relationship	Uses	The pattern : «Diagnosis of the Organization»										
	Requires	The patterns : The pattern «Identification of business requirements» and «Association of the strategic goals to the tactical goals»										

The following section describes the formalization of the informational goals and then presents the pattern "Formalizing informational goals "to ensure the reuse.

5.7. Pattern "Formalization of informational goals"

To facilitate the task of the analyst of DIS in order to identify business intelligence data, we defined a new version of the model informational goals [36]. We introduced the notion of paramètres_faits and the paramètres_dimensions [4]. To make easy, the task of analysis, for analysts, we propose the following model

formalization that allows to easily extracting business intelligence data:

Activity		
Context		
Strategic goal		
Tactical goal 1		
Verb	Fact parameters	Dimension parameters
V1	FP1	DP1
V2	FP2	DP2
V3	FP3	DP3

Fig 7: Model formalization of informational goals

We capitalize the model and its settlement process into a pattern called "Formalization of informational goals":

Table 7: The pattern «Formalization of informational goals»

Part	Rubric	fields															
Interface	Symbol	FormaliseButinfo															
	Name	Formalization of informational goals															
	Classification	SID ^ Analysis ^ Product															
	Context	This pattern is reused when analyzing informational goals.: extracting facts and dimensions.															
	Problem	To guide the extraction of facts and dimensions after the formalization informational purposes.															
	Strength	This pattern describes how to formalize informational goals associated with each tactical goal which is in turn associated with a strategic goal in a predefined context.															
Realization	Process Solution	From the use case " Expression's requirements of DIS " established, the analyst can classify goals into three types (strategic, tactical and informational), then associate each strategic goal to all its tactical goals , then select a strategic goal and associated it with each of these tactical goals and select each tactical goal and associate it with all informational goals associated with it according to a predefined context, and finally formalize informational goals by Fact parameters and Dimension parameters.															
	Model Solution	The model solution obtained during the application of the process is the following "Model formalization of informational goals": <table border="1" style="margin-left: 20px;"> <tr><td>Activity</td></tr> <tr><td>Context</td></tr> <tr><td>Strategic goal</td></tr> <tr><td>Tactical goal 1</td></tr> <tr> <td>Verb</td> <td>Fact parameters</td> <td>Dimension parameters</td> </tr> <tr> <td>V1</td> <td>FP1</td> <td>DP1</td> </tr> <tr> <td>V2</td> <td>FP2</td> <td>DP2</td> </tr> <tr> <td>V3</td> <td>FP3</td> <td>DP3</td> </tr> </table>	Activity	Context	Strategic goal	Tactical goal 1	Verb	Fact parameters	Dimension parameters	V1	FP1	DP1	V2	FP2	DP2	V3	FP3
Activity																	
Context																	
Strategic goal																	
Tactical goal 1																	
Verb	Fact parameters	Dimension parameters															
V1	FP1	DP1															
V2	FP2	DP2															
V3	FP3	DP3															

Relationship	Uses	The pattern : «Diagnosis of the Organization »
	Requires	The patterns : The pattern «Identification of business requirements», «Association of the strategic goals to the tactical goals» and «Association of the tactical goals to the informational goals»

The pattern capitalizes "Model formalization of the informational goals" which clearly explains the facts and dimensions.

6. CONCLUSION ET PERSPECTIVES

In this paper, firstly, we present the problem addressed by the present work, which is to define a rapid method of analysis and design of business requirements of a SID in the context of reuse, used by all decisional analysts-designers. It is related to three areas of research: requirements engineering, DIS' engineering and reuse.

Secondly, we have developed a state of the art of the requirements' analysis Approaches represented by SID requirements' analysis procedures of a SID and proposed models for the representation of these steps work and reuse a SID.

Then we presented a catalog of patterns for the analysis of business requirements of a SID, which capitalizes models and activity diagrams of our approach. These patterns form a basis that is supposed to provide solutions and process models that facilitate the task of

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analyzing to decisional analysts designers of SID. In this section, we have proposed an explicit analytical approach making it easier to analyze business requirements a SID. At first, requirements' gathering is to diagnose the organization and define its activities and contexts in order to collect business requirements associated with each context for a given activity. Then, the requirement specification requires their classification as strategic requirements, tactical requirements, and informational requirements. Then, the treatment of these requirements consists in establishing of the inter-goals association models according to the defined business context. Finally, filling patterns formalization informational purposes an explicit extraction of facts and dimensions to establish the star schema.

To complete this work, we want to validate its application to some case studies, and able to measure the degree of success of the proposed approach. We plan also to establish a complete development tool to enable and guide designers SID, from the initial needs analysis to the establish the star schema. This tool will also allow archiving the patterns used for possible future use.

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