A Stakeholder Model for Interorganizational Information Systems

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Abstract. Stakeholders constitute the principal source of requirements in the development of information systems. They therefore must be considered allover the process. In order to achieve success, they must be also modelled and then integrated with requirements, design and implementation models. Thus, a more complete perspective is added to traditional modelling. This work presents and describes a stakeholder model for interorganizational information systems, in order to incorporate a stakeholders-including approach to traditional modelling, focusing on interorganizational environments.

Keywords: stakeholder, interorganizational information systems.

1 Introduction

In requirements elicitation, the stakeholder concept is fundamental. Stakeholders are the primary requirements source for software projects [1]. They are defined as any group or individual that can affect or be affected by the attainment of organizational objectives or that must be involved in a project because is affected by its activities or results [2]. Each stakeholder has a unique view on the system. By means of their coordinated efforts the system is conceived, created and maintained.

Diverse changes of perspectives in organizational management and engineering areas are taking place by these days. Nowadays, various issues are changing the way of doing businesses. Organizations now tend to cooperate and create links with other organizations due to economic globalisation, changes in consumers needs and requirements, new market trends, ICTs dynamic development, etc., conforming what is known as Interorganizational Networks (IONs). Operations and interchanges between participant organizations are supported by a special type of information system: Interorganizational Information Systems (IOSs). They are the main tool to support and coordinate interorganizational (IO) processes and relations.

In the engineering area there is a change from design processes centered in the user towards more participative experiences. A new perspective has arisen from design FOR users towards design WITH users, where new ways of thinking and working are required. Participative design is not just a method or a set of methodologies but an

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attitude towards people. It is based on the belief that all the people have something to offer to the design process. This approach is promoted by various authors. Sanders [3] affirms that persons want to express themselves and participate directly in design process development. Thus, the great challenge of creating tools and infrastructures to support and facilitate the design processes considering users experience is posed.

There exist diverse initiatives to disseminate this perspective, that requires the explicit representation of stakeholders in information system development models [4, 5]. This approach not only helps in the common understanding of the system design process, but also supports the coordinated effort required for its development, through the connection of the diverse activities which compose the process with the stakeholders capable to execute them. Also the satisfaction level is assured, since stakeholders needs are considered from early design stages. By representing stakeholders in systems models, diverse issues can be analyzed and addressed such as conflicts between stakeholders, rationale behind requirements, etc.

This approach is even more important in IO environments, where personal interactions are less frequent and more difficult due to the geographical dispersion that generally takes place between participants and where diverse cultures, interests, and points of view exist. Thus, considering the latent needs of (a) counting with tools and systems to support interorganizational linkages and (b) involving stakeholders in systems design processes, this article proposes a stakeholder model. It can be used not only in requirements modelling but also in other stages of the design process, thus obtaining stakeholders-including models and achieving a more complete vision of the process. This proposal helps in reducing the existing gap between what is the *problem domain*, formed by stakeholders and their needs, and the *solution domain*, which has its initial steps in the requirements and needs modelling associated to their main sources (stakeholders).

In order to present an orderly explanation of the model development, Section 2 characterizes IOSs and stakeholders for IO environments. Section 3 relates the stakeholder and the actor concepts and introduces the role concept, very important in process representation. Section 4 progressively develops and describes an integrated stakeholder model using the concepts explained in Sections 2 and 3, and introducing new properties. An example of the proposed model is included in Section 5. Finally, diverse conclusions of the work and new possible research lines are presented in Section 6.

2 Stakeholders and Interorganizational Information Systems

In the context of contemporary global economy, any design process, and more strongly IOSs design processes, implies multiple teams and stakeholders collaborating for attaining a common goal. Being able to capture efficiently and clearly their needs is increasingly more important and complex.

As opposed to traditional environments, in IO environments stakeholders are more numerous and their interests vary considerably. They are defined as “any individual, group or organization which can affect or be affected (positively or negatively) by the system under study and which has direct or indirect influence on its requirements” [6, 7, 8]. Fig. 1 represents the concepts under this definition, where a *stakeholder* can

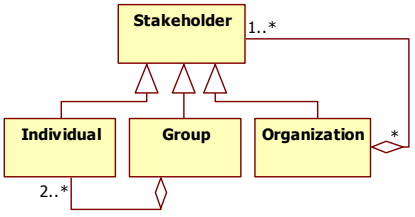

Fig. 1. Stakeholder Concept

be an *individual*, a *group* or an *organization*, where an *organization* is composed by one or more *stakeholder individuals*, *groups* or *organizations*. In general, a *group* is an aggregation of -at least- two *individuals*.

3 Stakeholders, Actors, and Roles

Pfahl [9] considers the actor concept as essential in order to represent processes models besides activities, artefacts (which are used and produced by activities), tools (which are used by activities), and roles (which carry out activities). This concept defines responsibilities between agents and activities of particular processes.

Nevertheless, a subtle difference between the terms *actor* and *stakeholder* exists. Stakeholders are those which have some interest in the process and will be affected positively or negatively by the results to be obtained. Thus, the set of stakeholders of a particular process is more numerous and, at the same time, **includes** the set of actors of that process.

In general, process modelling is limited to represent only individuals who will directly execute activities. Also, in any domain, the execution of activities by actors is restricted to the roles they may play in particular moments. While an actor represents a specific entity (individual, group, or computational program), a role represents a position which might be played by diverse actors. Also an actor might be associated to more than one role and also a role can be played by more than one actor. A role implies the possibility or capacity to execute a set of activities. Van Welie and van der Veer [10] define it as a collection of tasks performed by one or more agents. The tasks might be hierarchically decomposed. Actor's roles analyze and consider their responsibilities on the project and their relation with the artefact or final product to be obtained as result. In the case of information systems, for example, roles arise from the analysis of the possible interaction types which can exist between a particular stakeholder and the future system to be developed.

Thus, the role concept avoids personifying the relation between actors (stakeholders) and activities and is a very useful concept to model properties and behaviours of entities which evolve over time in processes models [11]. Methodologies can be easily described and planned through profiles that can be assumed by the participating entities.

Kueng et al. [12] describe two strengths of the role concept: (1) during modelling stage, abilities, functionalities, competencies and responsibilities must not be discussed,

and (2) during operative stage, when the model is used, entities with the same role are potentially interchangeable.

Role concept can be transferred to collaborative design area, which involves stakeholders with different intentions, formations and knowledges, and where activities are influenced not only by technical decisions, but also by social interactions [13]. Roles and stakeholders analysis and modelling introduce elements of Social Sciences in the representations, shaping a complementary dimension to traditional ones for design processes [14].

Stakeholder analysis provides a baseline for effective requirements engineering and subsequent system design, as well as for eliciting requirements for all key stakeholders. Macaulay et al. [15], Kirby [16] propose approaches to determine the major categories of stakeholders for an information system. Similarly, Robertson [17] and Alexander and Robertson [18] present a well-explained model describing diverse categories of stakeholders using "the onion model" and locating each category in one of the "onion levels" (rings). Nevertheless, in IO environments one more step is needed towards the consideration of certain issues related to those contexts (e.g. the interorganizational dimension is added, from which stakeholders can also exist). Furthermore, some more work towards stakeholders concrete selection must be done. Taking into account this problem, Ballejos and Montagna [19] have proposed a method for stakeholders identification for IOSs.

When identifying the concrete stakeholders for any software project, diverse attributes and properties related with the project are also determined: dimension to which they pertain, roles, and interest and influence degrees. The assignment of roles to stakeholders describes their relation to IOS design process. It also allows an easier stakeholder management, by grouping them through roles. In this way, stakeholders sharing the same profile in relation to IOS can be managed altogether.

Zhang and Chen [14] pose that a clear identification of stakeholders roles and their participation degree in the diverse design stages are important steps towards the success of distributed collaborative design. From this affirmation, the first concepts related to the model development must be addressed in order to represent stakeholders (Fig. 2). The *role* (operator, regulator, responsible, beneficiary, etc.) represents the relation between the stakeholder and the design process activities.

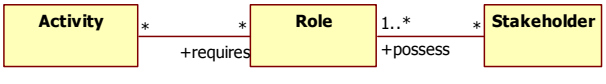

Fig. 2. Stakeholders and Roles

Fig. 2 takes into account that every *stakeholder* has at least one *role* (1..*) and that a *role* can be played by diverse *stakeholders* (zero or more, as indicated by *). The association-end *possess* indicates the stakeholder position in relation to the process or project under analysis.

On the other hand, the execution of activities by stakeholders is performed through the assignment and utilization of roles. Thus, the model must also include the necessary concepts in order to represent that every *activity requires* particular *roles* to be executed and that every *role* is required for the execution of some *activity* (Fig. 2).

Between the approaches which incorporate the role concept, activities are executed only when certain abilities are possessed. In this context, Gonnet et al. [20] use the *skill* concept, while Harzallah and Vernadat [21] refer to *competency* when making reference to the attribute needed to meet a mission or execute an activity in their formal models. However, this can be generalized considering the actor concept by Ellis and Wainer [22]: "*an actor is a person, computational program or entity which must play roles to* ***execute***, ***be responsible for***, *or* ***be associated in some manner*** *with activities and procedures*". Analyzing this concept and comparing it with the IO stakeholder presented in Section 2, it can be deduced that this actor concept for Ellis and Wainer corresponds to stakeholder one. So, it can be used in order to represent participative environments, where other criteria also exist when relating stakeholders with activities, and not only the ability. For example, functions performed, hierarchical level, geographical location, etc. are attributes independent from the ability or specific knowledge of the individuals. In the model, these specific properties will be materialized through the role concept, such as showed by Fig. 2.

However, as it was previously stated, a stakeholder executes a particular activity playing a certain role. Thus, to count with information related to this, an association-class is needed in order to integrate the information regarding the execution of a particular activity. In Fig. 3, *execution* association-class contains the role played by the stakeholder when executing an activity.

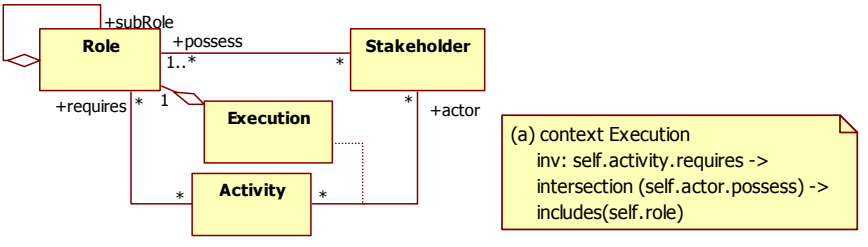

Fig. 3. Stakeholders, Activities, and Roles

Fig. 3 integrates the concepts related with the position of a determined stakeholder (*possess* association-end), activities management (*requires* association-end) and activities execution by a stakeholder playing a particular role (*execution* class). *Execution* association-class indicates, in the moment to be instantiated the model, the *role* possessed in that instant by the *stakeholder* executing an *activity*.

A *subrole* relationship indicates that a *role* includes other *roles*, including also their relations with *activities*. An example is the beneficiary role, whose subroles are: functional, financial, political, and sponsor. Thus, all activities required to be executed by a beneficiary role, may be also executed by all its subroles.

An OCL restriction is included in the model in order to indicate that certain role is possessed by an actor and is also required for an activity to be executed. In other words, stakeholders only can execute an activity when they possess the roles required by that activity.

In conclusion, far from being redundant, the *Execution* class included in Fig. 3 guarantees the independence of concepts: *stakeholder possess role*, *activity requires*

role and *stakeholder with certain role executes activity*. Their integration gives responses to questions involving all of them, such as: which *stakeholders* can execute certain *activity*? (knowing that the activity can be executed only by certain roles), which *activities* can certain *stakeholder* execute? (having the *stakeholder* certain *roles* associated), which *roles* has a certain *stakeholder* who can execute a certain *activity*? (knowing that an *activity* can be executed by certain *roles*), or under which *role* had a *stakeholder* executed certain *activity*?.

4 Stakeholder Model

Stakeholders are the main concept to be considered and represented in order to create complete design models. This idea is more significant in IO projects, where shared objectives are more diffuse and requirements management is more complex.

Once stakeholders to be involved in requirements elicitation are selected, besides counting with basic information about them, descriptive attributes such as roles, interest, and influence are also known.

Interest derives from the relation between stakeholders needs and project goals. Fig. 4 models the concepts associated to a stakeholder interest and determines that the existence of certain *interest* promotes zero or more project goals (*projectGoal*).

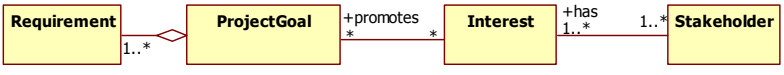

Fig. 4. Interest Model

Information regarding stakeholders interest will be very useful in future modelling stages, when *requirements* and their properties will be associated to project goals. Then, diverse influence analyses could be executed over stakeholders interests when managing requirements and their properties (Fig. 4 only shows *requirements* concept to give a general understanding, avoiding the concepts related to it).

On the other hand, **influence** indicates the stakeholder relative power on the project and the decisions which must be taken about it. In general, when stakeholders are analyzed, authors generally describe two levels in which interest and influence can take place: high and low [23, 24]. So, an initial estimation of the priority associated to requirements is attained. Other authors specify a scale to be used, in order to provide more utility to particular analysis. For example, Bourne and Walker [25] use five values in the range between "very high" and "very low" in order to obtain an intensity index of stakeholders interest.

In some sense, stakeholder roles represent a relation between stakeholders and the project. They can be associated with certain influence or decision power over the project, independently from the particular stakeholder who might play the role. Table 1 presents examples of common stakeholders roles for information systems development projects. From it, the influence degree or each role over the project might be deduced. For example, *responsible*, *decision-maker*, and *regulator* are roles with greater influence than the one associated to *operator*, *consultant* or *functional*

beneficiary. Thus, in the determination of stakeholders influences, their associated roles must be analyzed.

The analysis of each role defined in Table 1 in relation to its possible influence on the project brings out a new property, *roleInfluence*. Through *roleInfluence* such relation is dimensioned and calculated through qualitative (e.g.: high, medium, low) or quantitative (e.g.: 1, 2, 3; or 1, 5, 10) values. Table 2 shows possible influence degrees associated to roles, where High → 3, Medium → 2, and Low → 1.

Table 1. Stakeholders Roles

Beneficiary: Those that benefit from system implementation. They can be: functional, financial, political sponsors.
Negative: Those that undergo some kind of damage or are adversely impacted by system development.
Responsible: They are in charge of the system in all its lifecycle phases. This role includes people working with budgets and schedules (for example, project manager, those responsible for selecting suppliers, etc.)
Decision-Maker: Those that control the process and make decisions to reach agreements.
Regulators: They generate guidelines and outlines that will affect the system development or operation.
Operators: They interact with the system and use its results (information, products, etc.).
Experts: They widely know the implementation domain and can collaborate in requirements elicitation.
Consultants: Include any role dealing with providing support for any aspect of the system development.
Developer: requirements engineer, analyst, programmer, tester, security engineer, project manager, etc.

Table 2. Stakeholders Roles and associated Influences

Role		RoleInfluence	
Beneficiary	Functional	Low	1
	Financial	Medium	2
	Political	Medium	2
	Sponsor	High	3
Negative		Medium	2
Responsible		Medium	2
Decision-Maker		High	3
Regulator		High	3
Operator		Low	1
Expert		Medium	2
Consultant		Low	1
Developer		Medium	2

Bourne and Walker [25] affirm that *power* sources determine the stakeholder *influence*. Yukl [26] defines three possible stakeholder power sources: *positional power*, derived from authority (e.g., organizational), *personal power*, derived from influence on human relationships or specific features such as experience, charisma, loyalty/friendship, etc., and *political power*, derived from control positions over decision processes in relation to the particular project. Thus, once the stakeholders are selected, project manager must determine the power sources associated to each one. Also, the different power sources might be associated to diverse qualitative and quantitative values previously selected by project manager. Fig. 5 outlines the representation of the concepts. The **ppow** attribute for Power types is a value

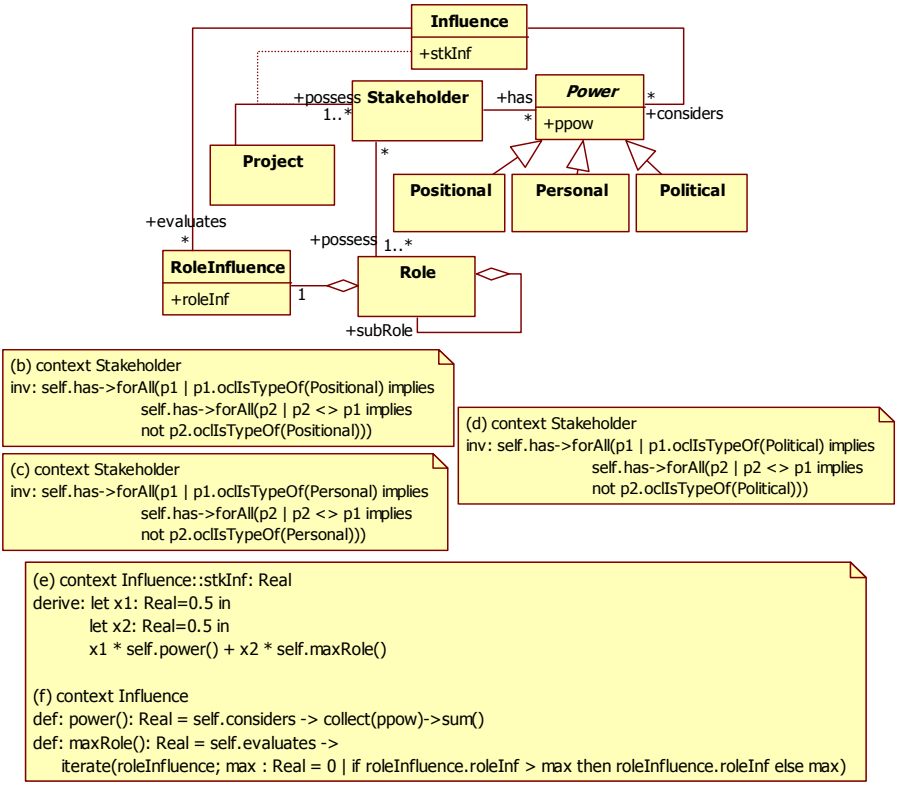

Fig. 5. Power and Influence Model

indicating the importance assigned to each power source by the project manager. OCL restrictions (b), (c), and (d) indicate that any stakeholder can be associated with a unique occurrence of each power source type.

According to the model, the *influence* of a particular *stakeholder* on the *project* is obtained from a weighting function applied over stakeholder *power* sources and influence values of each assigned role (*roleInfluence*) (see (e) OCL restriction in Fig. 5). The weight assigned to each attribute depends on its importance and on the criteria adopted by the project manager in order to consider both or not to assess the influence. In this way, influence values will be obtained from (**1**), where **Power** is the addition of *ppow* values of each stakeholder associated power type and **Max(roleInfluence)** is the maximum value of all *roleInfluence* values of *roles* associated to the *stakeholder* (see (f) OCL restriction in Fig. 5). Another mathematical function might be used instead of maximum, for example, average. Thus, a concrete value for representing a stakeholder influence is obtained considering, not only the value of the roles assigned (*roleInflouence*) –which is independent from the individual, group or organization selected as stakeholder-, but also a value given by the analysis of the specific individual, group or organization selected as stakeholder (*power*), independently from their assigned roles.

$$\text{Influence} = x1*\text{Power} + x2*\text{Max}(\text{roleInfluence}) \ . \quad \text{Where: } 0 \leq x1 \leq 1,\ 0 \leq x2 \leq 1, \text{ and } x1+x2=1. \tag{1}$$

On the other hand, **dimension** is a significant concept for IO environments. In traditional environments, stakeholders dimension is determined by considering if stakeholders belong to the organization under study or not, classifying them as internal or external. However, in IO environments a new dimension must be generated, the interorganizational one. Thus, stakeholders may exist in three possible dimensions: internal or organizational (whose stakeholders represent the interests of a particular organization), interorganizational (stakeholders pursue ION goals and may pertain or not to an ION participant organization), and external (representing interests from ION external entities).

Fig. 6 considers that a stakeholder may have one or more dimensions. Particular stakeholders might be selected to represent their organization (*organizational dimension*), and at the same time, the ION (*interorganizational dimension*) where the organization takes part, considering the interorganizational interests. Also the same stakeholder may represent more than one ION organization, thus having also their dimensions associated.

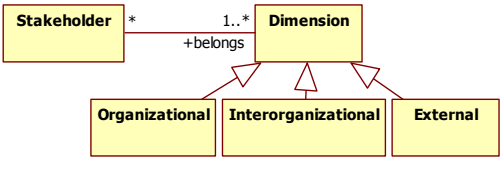

Fig. 6. Dimension Model

This information is very important to determine requirements contexts, when they are modelled in relation to stakeholders. Thus, organizational, interorganizational or external requirements might be discovered when analyzing the dimensions of their source stakeholders.

Thus, considering on the one hand stakeholder concept and properties previously described, and, on the other hand, the execution of activities associated with roles, Fig. 7 proposes a model for stakeholders.

Interest and *influence* concepts are critical due to their dynamism. They might also be affected by the variation of *roles* for a specific *stakeholder* during the project. They may change over time due to diverse factors: political, cultural, etc. Thus, they must be analyzed, for example, when prioritizing and managing requirements and when conflicts between stakeholders requirements exist.

The inclusion of stakeholder *dimension* enables organizational, interorganizational and external stakeholders modelling, the management of requirements is improved and they may be also grouped through these dimensions.

Following Gonnet et al. [20] idea for design process modelling, each *stakeholder* may have *interests* which express intentions and particular desires. Also, those interests promote in some manner project goals which are directly related to requirements. Also stakeholders are directly related to them. Thus, the subsequent requirements management and analysis will give information regarding which

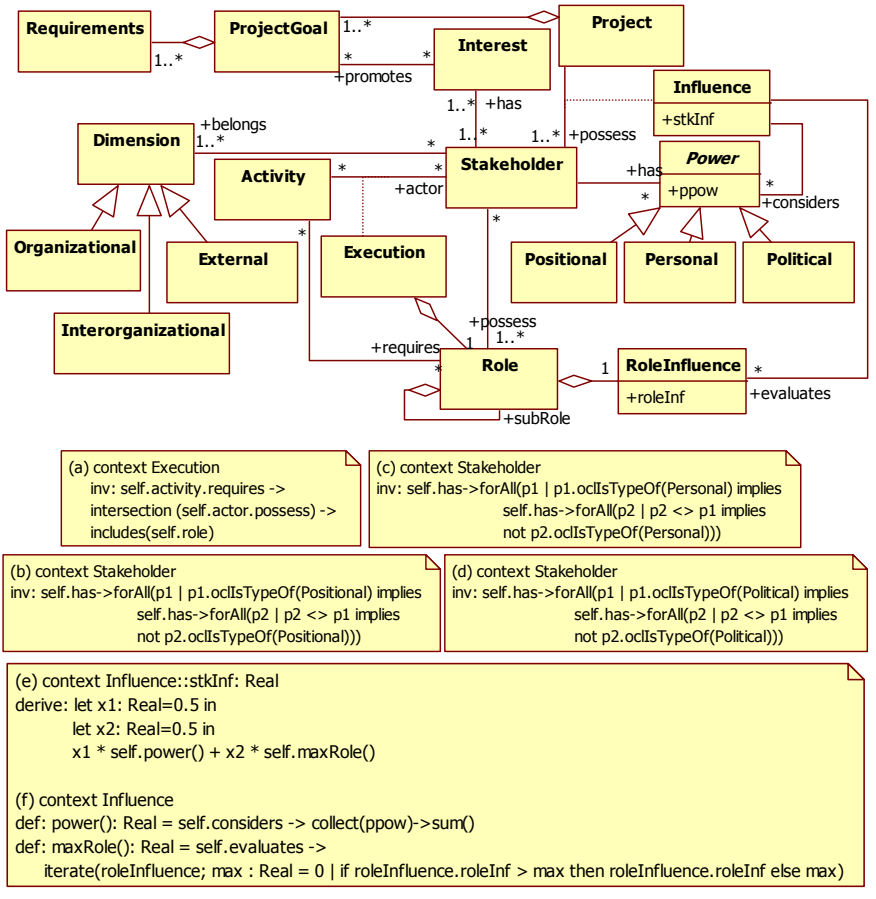

Fig. 7. Stakeholders Representation Model

requirements helps to attain project goals and in which manner. This information will help in deducing which stakeholders interests are being considered when satisfying some requirement.

5 Example

In the Public Health Area of an Argentinian province, in order to satisfy health primary needs and manage medicines and drugs distribution to health centers, an ION was created, which is shown in Fig. 8.

- Medicines Producer Laboratory (MPL) elaborates generic medicines at a low cost, to be provided to the population in health centres. Its unique customer is the Central Pharmacy.
- Central Pharmacy (CP) depends on the Provincial Health Department. Its goals are to plan, coordinate and control the supply of medicines and other elements required

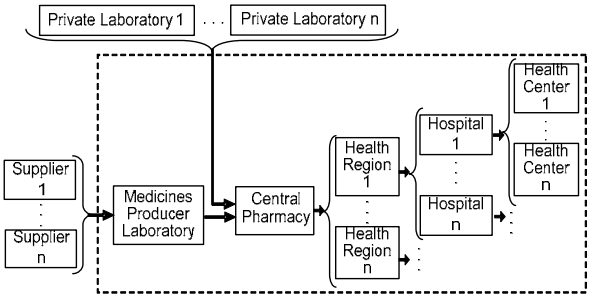

Fig. 8. ION for Medicines Production and Distribution

by health centers. The MPL is one of its principal suppliers. Private laboratories also provide medicines to the CP.

- Regional Health Areas. The province is divided in 9 health regions, each one responsible for medicines distribution in hospitals and centres depending on them.
- Hospitals and Health Centers.
- At external level, drugs suppliers, patients, other government areas.

The need of information integration has accelerated an IOS development and implementation for managing the wide set of interactions that cover generation, movement and access to medicines and information all around the state. The main goal is the transformation of the current model of separated organizational systems into a globalizing model over the ION described.

Diverse stakeholders were identified through the application of the approach proposed by Ballejos and Montagna [19]. Some of them and their attributes are described in Table 3, where the last column describes the type of power each stakeholder has.

As is shown in Table 3, diverse stakeholders can be selected from the case study. They are associated with diverse roles and predominant power types.

The next step is to average the influences of each stakeholder roles. Table 4 presents the results for each stakeholder. Also some value or importance degree must be assigned to different power types by project manager. For example, in a project where positional power is more important than personal power and this last one is more important than political one, values like 3, 2 and 1 can be assigned respectively. All of them can be assigned the same value if they are equally important.

Then, the project manager must decide on specific weights for both **power** types and the influence arisen from stakeholders roles respectively, in order to determine each stakeholder influence in the project. Thus, for example, if the same importance is given to both, the calculus must use the function: **Influence = 0.5*Power + 0.5*Max(roleInfluence)**, and a table like the one presented in Table 5 is the result for the example, where Influence values range from 0 -indicating the lowest degree of influence to 3 –indicating the highest degree of influence-.

Diverse object-models can be derived with the information of the example. An instantiation from the model in Fig. 7 is presented in Fig. 9 for the stakeholder “Central Pharmacy Director”.

Table 3. Stakeholders attributes for the example

Stakeholder	Dimension	Role/s	Power
Central Pharmacy Director	Organizational Interorganizacional	• Political Benefic. • Decision-Maker • Responsible	Positional Political
Pharmacy Department Employees from each Hospital	Organizational	• Functional Benefic. • Operator	--
Central Pharmacy Purchase Manager	Organizational	• Operator • Functional Benefic.	Personal
Central Pharmacy Operative Staff	Organizational	• Operator • Functional Benefic.	Personal
Administrative Employees from each Health Center	Organizational	• Operator • Negative	--
Provincial Health Department	Interorganizacional	• Political Benefic. • Financial Benefic. • Regulator	Political
Health Region Coordinator	Interorganizacional	• Political Benefic. • Responsible	Positional Personal
Patients	External	• Functional Benefic.	--

Table 4. Stakeholders and their roles influences for the example

Stakeholder	Roles	Role Influence
Central Pharmacy Director	• Political Benefic.	2
	• Decision-Maker	3
	• Responsible	2
Pharmacy Department Employees from each Hospital	• Func. Benefic.	1
	• Operator	1
Central Pharmacy Purchase Manager	• Operator	1
	• Funct. Benefic.	1
Central Pharmacy Operative Staff	• Operator	1
	• Funct. Benefic.	1
Administrative Employees from each Health Center	• Operator	1
	• Negative	2
Provincial Health Department	• Political Benefic.	2
	• Financ. Benefic.	2
	• Regulator	3
Health Region Coordinator	• Political Benefic.	2
	• Responsible	2
Patients	• Funct. Benefic.	1

In Fig. 9, "Central Pharmacy Director" stakeholder belonging to "organizational" and "interorganizational" dimensions is associated with "Reduce Time and Costs" interest. Also the corresponding influence is calculated through the previously described power and role influences values of his associated roles. In this case, the stakeholder has the highest influence value.

"Reduce Time and Costs" interest promotes "Reduce Operation Costs" and "Optimize Medicines Distribution Times" project goals, which are directly associated with "Support Orders Management" and "Manage Medicines Delivery Schedules" requirements for the IOS.

Table 5. Stakeholders Influence for the example

Stakeholder	Max (RoleInfluence)	Power	Influence
Central Pharmacy Director	3	(3+1) 4	3,5
Pharmacy Department Employees from each Hospital	1	0	0,5
Central Pharmacy Purchase Manager	1	3	2
Central Pharmacy Operative Staff	1	3	2
Administrative Employees from each Health Center	2	0	1
Provincial Health Department	3	3	3
Health Region Coordinator	2	(3+2) 5	4,5
Patients	1	0	0,5

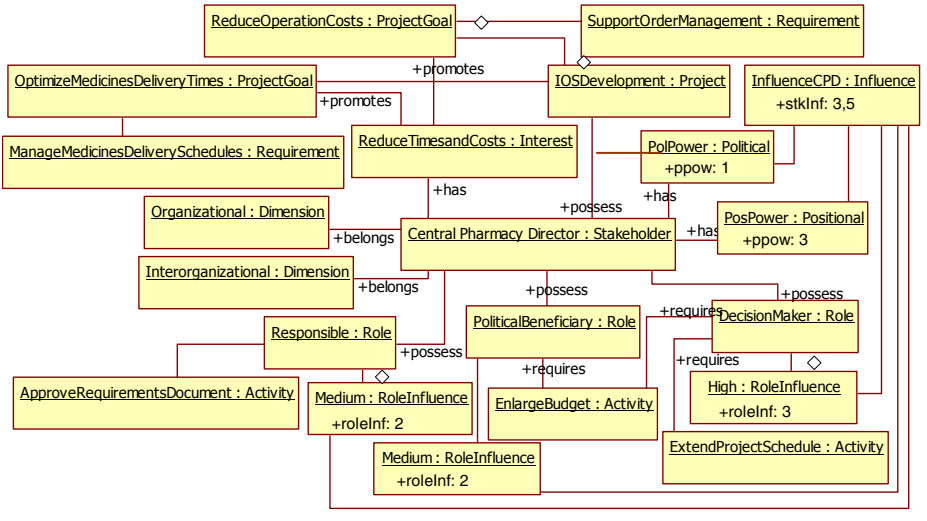

Fig. 9. Object model for "Central Pharmacy Director" stakeholder

In this way, the model describes roles, power and influence assigned to the selected stakeholder. It also associates influences for each played role. In stakeholder management, diverse activities might also be associated to certain roles, in order to have control over activities execution in design processes. Also, possible conflicts in stakeholders interests may be assessed with the instantiation of the complete model with the information of all existing stakeholders. Also, requirements management effects over stakeholders might be analyzed. So, the proposed model allows not only a better understanding of the situation underlying requirements and their source stakeholders in interorganizational environments, but also the execution of diverse evaluations, useful in managing stakeholders and requirements throughout the software development process.

6 Conclusions and Future Works

This article has merged two important areas in information systems engineering: on the one hand, the development of information systems with the latent need of involving stakeholders in the process, on the other hand, the current and constant emergence of interorganizational relationships needing to be technologically supported. This is a first step towards reducing the existing gap between stakeholders needs (problem domain) and system requirements (solution domain) by proposing a model for representing stakeholders and their needs, in order to include them in the requirements model. The model also considers diverse stakeholders properties which have incidence in their management and in requirements analysis also. It allows a complete understanding of the environment through the modelling of their principal stakeholders interests. Thus, not only requirements could be clearly managed, but also conflicts between stakeholders can be detected and handled.

Design models arise from closed requirements specifications. However, there are no models for analyzing the rationale after the design, where diverse stakeholders decisions and activities derive in the requirements specification, and main source of information for design stage. Thus, the proposed model integrated with the requirements model will constitute the basis for future research towards the analysis of the rationale behind the requirements management stage in interorganizational information systems development. It will also enable influences analysis, thus obtaining a more reality-adjusted model of the underlying knowledge.

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References

1. Bittner, K., Spence, I.: Establishing the Vision for Use Case Modeling, Use Case Modeling. Addison Wesley Professional, Reading (2003)
2. Pouloudi, A., Gandecha, R., Papazafeiropoulou, A., Atkinson, C.: How Stakeholder Analysis can Assist Actor-Network Theory to Understand Actors. In: A Case Study of the Integrated Care Record Service (ICRS), UK National Health Service Eltrun Working Paper Series, WP 2004-002 (2004)
3. Sanders, E.B.N.: From User-Centered to Participatory Design Approaches. In: Frascara, J. (ed.) Design and the Social Sciences, Taylor & Francis Books Limited, Abington (2002)
4. Mostashari, A., Sussman, J.: Engaging Stakeholders in Engineering Systems Representation and Modeling. In: Engineering Systems External Symposium, Massachusetts Institute of Technology (2004)
5. Carpenter, S.: Choosing Appropriate Consensus Building Techniques and Strategies. In: Susskind, L., McKearnan, S., Thomas-Larmer, J. (eds.) The Consensus Building Handbook: A Comprehensive Guide to Reaching Agreement, pp. 61–97. Sage Publications, Thousand Oaks (1999)
6. Kotonya, G., Sommerville, I.: Requirements Engineering: Processes and Techniques. J. Wiley & Sons(eds.) (2003)

7. Pouloudi, A.: Aspects of the Stakeholder Concept and their Implications for Information Systems Development. In: 32th Annual Hawaii International Conference on System Sciences (1999)
8. Sharp, H., Finkelstein, A., Galal, G.: Stakeholder Identification in the Requirements Engineering Process. In: Database & Expert System Applications, DEXA Workshop 1999, pp. 387–391. IEEE Press, New York (1999)
9. Pfahl, D.: An Integrated Approach to Simulation-Based Learning in Support of Strategic and Project Management in Software Organisations. PhD Thesis. Fraunhofer-Institut für Experimentelles Software Engineering (Fraunhofer IESE), Kaiserslautern (2001)
10. van Welie, M., van der Veer, G.C., Eliëns, A.: An Ontology for Task World Models. In: Markopoulos, P., Johnson, P. (eds.) DSV-IS 1998. LNCS, pp. 57–71. Springer, Viena (1998)
11. Rabentós, R., Cabot, J.: Conceptual Modelling Patterns for Roles. In: Spaccapietra, S., Atzeni, P., Chu, W.W., Catarci, T., Sycara, K.P. (eds.) Journal on Data Semantics V. LNCS, vol. 3870, pp. 158–184. Springer, Heidelberg (2006)
12. Kueng, P., Kawalek, P., Bichler, P.: How to compose an Object-Oriented Business Process Model? In: IFIP TC8, WG8.1/8.2 working conference on Method engineering: principles of method construction and tool support, UK, pp. 94–110. Chapman & Hall, Ltd., London (1996)
13. Lu, S.C.Y., Cai, J., Burkett, W., Udwadi, F.: A Methodology for Collaborative Design Process and Conflict Analysis. CIRP Annals-Manufacturing Technology 49(1), 69–73 (2000)
14. Zhang, H., Chen, D.: Developing a Multidisciplinary Approach for Concurrent Engineering and Collaborative Design I. In: Shen, W., Lin, Z., Barthès, J.-P.A., Li, T. (eds.) CSCWD 2004. LNCS, vol. 3168, pp. 230–241. Springer, Heidelberg (2005)
15. Macaulay, L., Fowler, C., Kirby, M., Hutt, A.: USTM: A New Approach to Requirements Specification. Interacting with Computers 2(1), 92–118 (1990)
16. Kirby, M.: Custom Manual, Technical Report DPO/STD/1.0, HCI Research Centre, University of Huddersfield (1991)
17. Robertson, S.: Project Sociology: Identifying and involving the stakeholders. The Atlantic Systems Guild Ltd (2000)
18. Alexander, I., Robertson, S.: Understanding Project Sociology by Modeling Stakeholders. IEEE Software 21(1), 23–27 (2004)
19. Ballejos, L., Montagna, J.M.: Stakeholders Selection for Interorganizational Systems: A Systematic Approach. In: Avison, D., Elliot, S., Krogstie, J., Heje, J.P. (eds.) The Past and Future of Information Systems: 1976–2006 and Beyond, vol. 214, pp. 39–50. Springer, Boston (2006)
20. Gonnet, S., Henning, G., Leone, H.: A model for capturing and representing the engineering design process. Expert Systems with Applications 33(4), 881–902 (2007)
21. Harzallah, M., Vernadat, F.: IT-based competency modeling and management: from theory to practice in enterprise engineering and operations. Computers in Industry 48(2), 157–179 (2002)
22. Ellis, C.A., Wainer, J.: A conceptual model of groupware. In: 1994 ACM conference on Computer supported cooperative work, pp. 79–88. ACM, New York (1994)
23. Applegate, L.M.: Stakeholder Analysis Tool. Harvard Business Online (2003)
24. Smith, L.W.: Project Clarity Through Stakeholder Analysis. The Journal of Defense Software Engineering (2000), http://www.stsc.hill.af.mil/crosstalk/2000/12/smith.html
25. Bourne, L., Walker, D.H.T.: Visualising and Mapping Stakeholder Influence. Management Decision 43(5), 649–660 (2005)
26. Yukl, G.: Leadership in Organizations. Prentice Hall International Inc., USA (2001)