

Semantic Integration of Goal and Business Process Modeling

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Abstract. While business processes and business goals are considered intrinsically interdependent, a comprehensive modeling approach that includes both the business process and the goal perspectives is still lacking. This paper proposes a semantic integration between the domains of goal modeling and business process modeling. We integrate the ARIS framework with the Tropos goal modeling language. While ARIS is widely employed for business process modeling, it offers an overly simplistic set of goal-related concepts. In contrast, Tropos offers a rich set of goal-related concepts (and associated goal analysis methods), while refraining from addressing business process modeling in detail. In order to investigate the relation between the Tropos modeling constructs and the ARIS elements, we propose an ontological account for both architectural domains through the usage of the UFO ontology.

Keywords: *Semantic Integration, Goal Modeling, Business Process Modeling EPC, TROPOS, ARIS*

I. INTRODUCTION

The increasing competitiveness drives organizations to promote change in an attempt to improve the quality of the services and products they offer. In recent years, many of the efforts related to managing change in organizations have been conducted in the scope of Business Process Reengineering (BPR) activities [8][20][21][22]. BPR is based on the assumption that changes in business processes should generate radical improvements in critical performance measures (such as cost, quality, service and speed)[20].

However, predicting how a given enterprise environment should respond to changes by simply adopting a business-process centered view is unfeasible since there are a large number of issues to be considered, such as infrastructure, power and politics, managerial control, organizational culture, among others [35]. Given this multitude of issues, understanding an organizational setting often requires a number of perspectives [35].

Among these perspectives, the domain of “motivation” has been recognized as an important element of enterprise architectures [36] as highlighted in Zachman framework’s motivation column [37]. Goal modeling is the artifact employed for capturing the motivational aspect and strategies behind the organizational practices [35], helping in clarifying interests and intentions from different stakeholders [19]. Moreover, by adopting goal modeling, the organizations can systematically express the choices behind multiple alternatives and explore new possible configurations for an organizational setting. This is essential for business improvement since changes in a company’s strategy and business goals have significant consequences within all domains of the enterprise [23][24].

Since business process and goals are intrinsically interdependent, establishing an alignment between both domains arises as a natural approach. The central idea is to create enterprise models that describe not only the entities in a business context, but also include motivations for those entities [2].

This paper contributes to this vision by proposing a semantic integration between the domains of goal modeling and business process modeling. We integrate the ARIS framework [32] with the Tropos methodology and modeling language [4][5]. While ARIS is widely employed for business process modeling, it offers an overly simplistic set of goal-related concepts. In contrast, Tropos offers a rich set of goal-related concepts (and associated goal analysis methods), while refraining from addressing business process modeling in detail.

Since each modeling language focuses on different architectural domains of the organization (which is manifested through the existence of different sets of concepts in each modeling language), we use an ontological approach for bridging the semantic gap between the two modeling languages. This involves the interpretation of the related concepts in each of these languages and a subsequent harmonization of the languages. For this interpretation, we employ a foundational ontology, i.e., a formal and ontologically sound system of domain-independent categories. In particular, we make use here of the Unified Foundational Ontology (UFO) [16] as our semantic foundation.

This paper is further structured as follows: section 2 presents the relevant fragments of the ARIS and Tropos metamodels; section 3 discusses the interpretation of these metamodels in terms of UFO and presents the integration of both approaches; section 4 presents our conclusions and identifies topics for further investigation.

2 THE ARIS AND TROPOS METAMODELS

Before interpretation, we must identify the relevant language constructs and their relations. This is discussed in this section, which presents fragments of the ARIS and Tropos language metamodels (represented here in Ecore [11]).

The actor diagram also identifies plans which are executed by agents. The relationship between plans and goals rests on the fact that goals represent “a set of states of affairs (i.e. a set of world states)”, while plans “represent, at an abstract level, a way of doing something. The execution of plan can be a means for satisfying a goal or for *satisficing* a softgoal” [5].

Commonly, the actors cannot satisfy their goals in isolation and, as consequence, they engage in dependency relations with other actors. These are relations are also represented in actor diagrams. A dependency represents an agreement between two actors where one actor (the *dependor*) depends on another (the *dependee*) to fulfill a goal, perform a plan or deliver a resource (the *dependum*) [12]. Resources [35] are intentional objects (usually obtained as a finished product from a deliberation process).

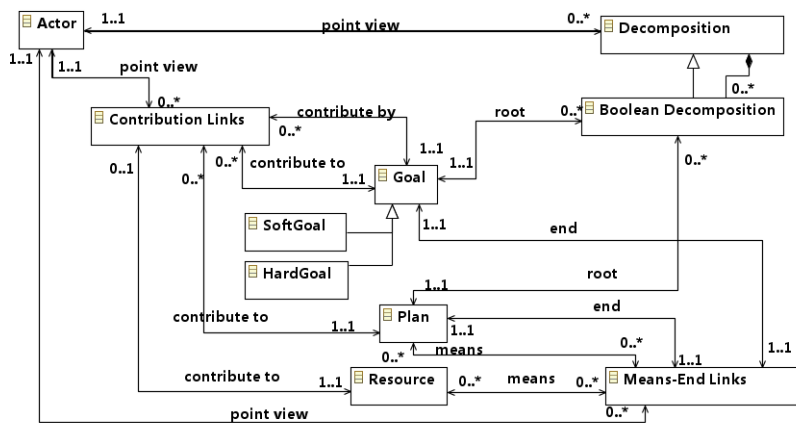


Figure 2. Metamodel of the Goal Diagram [12]

In the Goal Diagram (whose metamodel is depicted in Figure 2), the central concept of goal is represented by the Goal metaclass [12]. Goals can be analyzed, from the point of view of an Actor, by three types of relationships among them: *means-ends links*, *AND/OR decomposition* and *contribution links*. *Means-ends links* aim at capturing which plans and resources provide means for achieving a goal (therefore, a *means-ends link* is a ternary relationship between an Actor, a Goal (the end) and a Plan or Resource (the means) [12]). Further, there are two types of decompositions (specified via an attribute of the metaclass Boolean Decomposition): AND-decomposition and OR-decomposition. An *AND decomposition* supports a goal to be decomposed in a series of sub-goals; while an *OR decomposition* allows modeling alternative ways of achieving a goal. *Contribution links* identify goals that can contribute positively or negatively in the attainment of the goal to be analyzed (thus, it is a ternary relation between An Actor and two goals).

2.2 Metamodels for the ARIS Method

Figure 3 shows a fragment of the metamodel of the business process modeling and goal modeling languages used in the ARIS Method. This fragment was excavated in our earlier work by using the approach described in [30] and defines the abstract syntax of the language as currently supported by the ARIS Toolset. The main metaclasses for business process modeling in this fragment are: *Participant*, *Objective*, *Event*, *Rule* and *Function*. Business processes are modeled in diagrams know as Event-driven Process Chains (EPC). The main metaclasses for objective modeling in this fragment are: *Objective*, *Critical Factor*, *Product/service* and *Function*. These metaclasses are used in an Objective Diagram.

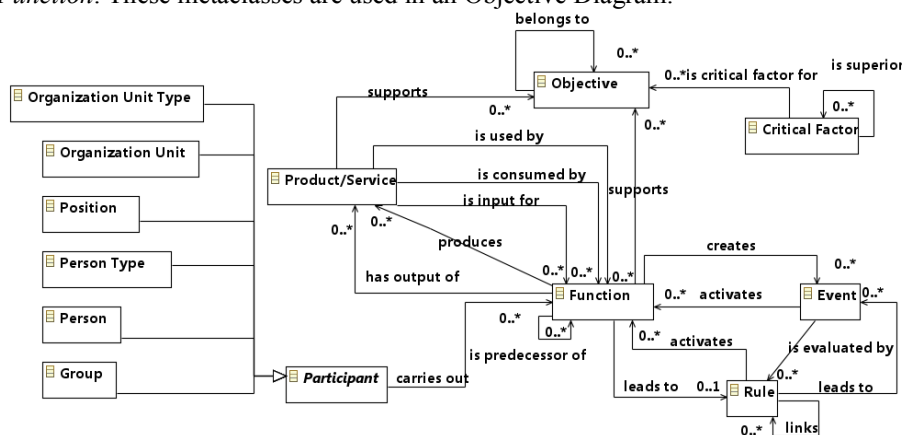


Figure 3. Fragment of the metamodel for Business Processes and Goals in ARIS

The *Participant* abstract metaclass subsumes the following metaclasses: *Organization Unit Type*, *Organization Unit*, *Position*, *Person Type*, *Person*, *Group* and *Employee Variable*. These organization elements belong to the ARIS Organizational diagram and are referenced in an EPC to describe participants in organizational activities. According to [32], the *Organization Unit* metaclass represents an entity that is responsible for achieving organizational goals. The *Position* metaclass represents the smallest organizational unit possible (a particular job position). The *Person* metaclass is used to represent a person who is assigned to organization. The *Person Type* metaclass represents a role performed by one or more persons, positions, groups or organizational units a business process [31][32]. The *Group* represents a group of employees (*Person*) or a group of organizational unit (*Organizational Unit*) that work together to achieve a goal.

The *Function* metaclass is a basic element for EPC process modeling. According to the ARIS documentation, the element Function represents either a technical task or a task performed on some object, with the purpose of achieving one or more business goals [32]. A task can be performed by either a person or an application system [32], and has inputs – such as information or raw material – and outputs, such as new information or products. Furthermore, tasks can consume and create organizational resources during their execution [1]. The *carries out* meta-association between the

Participant and *Function* elements indicates that one or more participants of the business process will be responsible for performing the task. Due to space constraints we refer the reader to [31] for a full treatment of the *Event* and *Rule* metaclasses as well as the *is predecessor of*, *activates*, *creates* meta-associations. For the purposes of this paper, it is sufficient to assume that these modeling elements enable different types of specification of behavior.

An objective diagram “models a hierarchy of business *objectives* along with their *critical success factors* and the *Functions* and *Products* that support achievement of these objectives” [9]. According to the ARIS documentation, “a *product/service* is performed in the course of a value-added process. It is the result of a human act or a technical process. A product/service can represent either a service or a product” [10][32]. The *Critical Factor* metaclass represents the aspects which need to be considered in order to reach a particular objective [32] (and follows the Critical Success Factor definition by Rockart [29]).

The language has opted for modeling the relationship between goals (represented by the *Objective* metaclass) and *Functions* since the execution of functions can be seen as operations applied to objects for the purpose of supporting one or more goals [32]. This relationship is denominated as “*supports of*” relationship. Goals (*Objectives*) and their relationships are also modeled in this view. Goals can be linked with one another with a subordinate goal supporting several overriding goals (through the “*belongs to*” relationship).

3 INTERPRETATION OF ARIS AND TROPOS

3.1 Ontological Foundations

In the sequel, we discuss a fragment of UFO in line with the purposes of this article. For a full discussion regarding this foundational ontology, one should refer to [16][14].

We start with the fundamental distinction between universals and individuals. The notion of universal underlies the most basic and widespread constructs in conceptual modeling. Universals are predicative terms that can possibly be applied to a multitude of individuals, capturing the general aspects of such individuals. Individuals are entities that exist instantiating a number of universals and possessing a unique identity.

Further, UFO makes a distinction between the concepts of Endurants and Events (also known as Perdurants). Endurants are individuals said to be wholly present whenever they are present, i.e., they are in time, in the sense that if we say that in circumstance c1 an endurant e has a property P1 and in circumstance c2 the property P2 (possibly incompatible with P1), it is the very same endurant e that we refer to in each of these situations. Examples of endurants are a house, a person, the moon, a hole, an amount of sand. Events (Perdurants), in contrast, are individuals composed by temporal parts, they happen in time in the sense that they extend in time accumulating temporal parts. An example of an Event is a business process. Whenever an Event occurs, it is not the case that all of its temporal parts also occur. For instance, if we

(e.g., a currency, a language, the Brazilian constitution). Agents can also be further specialized into Human Agent, Artificial Agent and Institutional Agent, which can be represented, respectively, by human beings, computationally-based agents and organization or organizational unit (departments, areas and divisions). Institutional Agents are composed by a number of other agents, which can themselves be Human Agents, Artificial Agents or other Institutional Agents.

Each Institutional Agent has a Normative Description associated to it. Moreover, this Institutional Agent defines a context in which a normative description is recognized (see relationship *recognized by* in Figure 5). We can state then that Normative Descriptions are social objects that create social entities recognized in that context. Examples include Social Roles (e.g., president, manager, sales representative), Social Role Mixins (whose instances are played by entities of different kinds, e.g., customer, which can be played by persons and organizations), Social Agent Universals (e.g., a political party, an education institution), Social Agents (e.g., the Brazilian Labour Party, the University of Twente), Social Object Universals and other Social Objects (e.g., a piece of legislation, a currency) or other Normative Descriptions [1]. A Normative Description that defines social individuals in the context of an institutional agent is termed a Constitutive Normative Description [1].

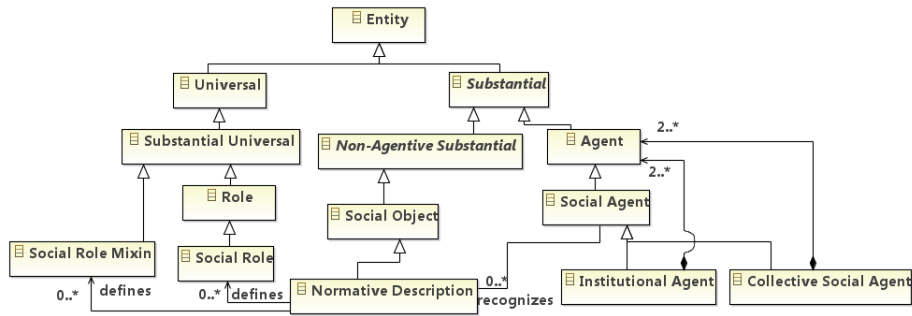


Figure 5. Fragment of UFO with social aspect.

3.2 Ontological Analysis of the ARIS Metamodels

According to [17] and [33], a business process can be defined as a collection of interrelated organizational tasks, initiated in a response to an event, which aim at achieving one or more organizational goals. In other words, a business process describes a type of organizational task that must be performed to achieve one or more organizational goals. Since EPCs are used for business process modeling, we can say that, collectively, the elements of an EPC diagram can be interpreted as a Complex Action Universal of UFO [14]. According to [15][32], a Function can be defined in several abstraction and refinement levels. Therefore, in [31] the Function element was interpreted as Action Universal.

Since organizational units can be decomposed recursively into smaller organizational units [32], we interpret the Organizational Unit metaclass representing a particular kind of substantial, namely, an Institutional Agent. Similarly, the

Organization Unit Type metaclass has been interpreted as an Institutional Agent Universal. The *Position* metaclass does not represent an organization unit, but a Social Role instantiated by a Human Agent (Person) [1].

Person Type is an element to represent a role which can be instantiated by different entities (persons, and, despite the name suggesting the contrary, organizational units). Thus, the *Person Type* element has been interpreted as a Social Role Mixin. It is often used in the scope of a business process to avoid tying specific agents to business processes, differently from *Position* which is a social role defined in the organizational structure.

The *Group* metaclass can be interpreted as a Collective Social Agent or as an Institutional Agent. The first interpretation occurs when *Group* represents a collection of agents playing the same role. The second interpretation occurs when *Group* represents a collection of agents each of which with a different role [16].

The *Objective* element is used to represent a business objective associated with a business process (*Function*) or business product/service (*Product/Service*). While the element's name would suggest a correspondence to the Goal concept in UFO, this interpretation is far from trivial. This is because UFO Goals are necessarily associated with a particular Agent (they are the propositional content of an agent's intention). A viable interpretation is that the (Institutional) Agent which has the Goal is the owner of the business process (*Function*) which *supports* the *Objective* such as, for instance, the Organization (Unit) which (partial) behavior is described by that process universals or, alternatively, a Social Role within an organizational structure which contains that behavior specification as part of its definition. This notion of "owner", however, is not directly modeled in ARIS, although it is implied by Scheer [32] when referring to "corporate goals", which are necessarily present at an organization whenever a business process exists.

The *belongs to* relation between *Objectives* defies a precise definition, since it may refer to a number of different relations, not distinguishing conjunctions or disjunctions of propositions. Further, there is very little explanation in the ARIS literature concerning the role of *Product/Service* in an ARIS objective diagram. Thus, we will refrain from providing a complete interpretation here; instead of adopting the relations in the ARIS Object Diagram metamodel, we will use the richer relations between Tropos *Goals, Agents, Plans* and *Resources* as discussed in the next section.

3.3 Ontological Analysis of the TROPOS Metamodels

We start our ontological analysis with the fragment which considers the specializations of the metaclass *Actor* (the interpretation of this part of the metamodel is based on the interpretation discussed in [18]).

We interpret the metaclasses *Agent* and *Role* in Tropos as the concepts of Agent and Social Role in UFO (respectively). The metaclass *Position* is also interpreted as a Social Role. This interpretation is supported by the fact that Tropos positions are defined solely with the purpose of aggregating different roles. Since an agent role is defined by the set of social moment universals (commitments and claims implied by the role), an aggregation of roles is also a role in itself, i.e., a universal capturing a set of social moment universals [18]. The abstract metaclass *Actor* is introduced to capture general

relations between *Agent*, *Roles*, *Positions* and other modeling elements and, thus, it has no specific interpretation in itself.

We interpret Tropos goals as Goals in UFO. Goals in UFO are sets of intended states of affairs of an agent. The relation between an Actor in Tropos and a Goal (through the meta-association *wants*) is interpreted indirectly by making use of the concept of Intention (or Internal Commitment) in UFO, which is a Mental Moment of an Agent. As previously discussed, UFO contemplates a relation between Situations and Goals such that a Situation (or possibly a number of Situations) may satisfy a Goal. In other words, since a Goal is a proposition (the propositional content of an Intention), we have that a particular state of affairs can be the truthmaker of that proposition. This interpretation choice seems to model directly the intention behind the concept of *hardgoal* in Tropos. For the case of *softgoals*, a different analysis must be conducted.

The concept of softgoals does not have a uniform treatment in the Tropos community. Sometimes, softgoals are taken to represent non-functional requirements [7]. In other times, a softgoal is considered as a fuzzy proposition, i.e., one which can be partially satisfied (or satisfied to a certain degree, or yet, *satisficed*) by Situations [13]. We here take a different stance, namely, that a softgoal is one “subjective to interpretation” and “context-specific”.

As a consequence of this conception, for the case of softgoals, it seems to be impossible to eliminate a judging agent (collective or individual) from the loop. Thus, instead of considering in the ontology a new *satisfices* relation between Situation and Goal which perhaps should contemplate a fuzzy threshold of satisfaction, we take a different approach. We consider the relation of satisfaction as a ternary relation that can hold between an agent, a goal and situation. An instance of this relation is derived from the belief of an agent that *a particular situation satisfies the goal at hand*. Now, in this view, different agents can have different beliefs about which sets of situations satisfy a given goal. In fact, it is exactly this criterion which seems to capture the aforementioned notion of softgoals and its differentiae w.r.t. hardgoals: (i) a goal G is said to be a hardgoal iff the set of situations that satisfy that goal is necessarily shared by all rational agents; (ii) a goal G is said to be a softgoal iff it is possible that two rational agents X and Y differ in their beliefs to which situations satisfy that goal.

The mapping of the Plan concept from Tropos to some UFO concept is established in a direct manner. In section 2.1, we stated that a Plan in Tropos is a specific way of doing something to satisfy some Goal (or *satisficing* some Softgoal). From the UFO ontology (section 3.1), we have that an Action (instance of an Action Universal) is an intentional event performed by agents with the purpose of achieving goals. Consequently, the Tropos *Plan* construct can be interpreted as an Action Universal.

The metamodel includes a relation of *means-end* between a Plan and a Goal. We call attention to the *point of view* relation in the metamodel of Figure 2. As one can observe, in the Tropos metamodel, the means-end relation is a ternary relation indexed to an Agent’s (subjective) point of view. The form of this relation in the metamodel seem to corroborate our interpretation of goals just discussed. Thus, in general, the *means-end* relation between a *Plan* and a *Goal* can be interpreted in the following manner: a *Plan* P is a *means-end* to a *Goal* G in the point of view of *Agent* A iff one or more executions of that *Plan* produce a post-situation which A believes to satisfy G. The concept of *Resource* has been interpreted as a resource in UFO, i.e., as

a Non-agentive Substantial (or Object) which participates in a Complex Action. The relation of *means-end* can also be defined between a Resource type, a Plan and an Agent, or between a Resource type, a Goal and an Agent. The former mode of this relation can be interpreted as follows: a Resource type R is a means-end to a Goal G in the point of view of Agent A iff every Action which satisfies that Goal (according to A) has as part a participation of a resource of that type. In contrast, the means-end relation between Resource type and Plan should be interpreted as: a Resource type is a means-end to a Plan iff every Action instance of that Plan has as part a participation of a resource of that type. Now, notice that the latter rendering of relation is actually Agent-independent! If a Plan is taken to be an Action universal, this relation reflects the structure of Plan and not the belief of a particular agent regarding the structure of a Plan. In (apparent) opposition to this idea, one could argue that a Plan should not then be interpreted as an Action universal but as an Intention to execute a particular Action universal. Even if this view is taken, the correct alternative interpretation would be that a Plan is an intention to instantiate a particular specialization of that Action Universal in which resources of that type are essential participants. Still, this would only refine the reference to a particular subtype of that Action universal. The participation of that resource in instances of that (now more specific) Action universal would still reflect the structure of those actions, not an Agent's subjective point of view.

In Tropos, goals can be further structured by using different types of relations, namely, AND-decomposition and OR-decomposition. Since Goals are taken here to be propositions, if we have that goals $G_1 \dots G_n$ AND-decompose goal G_0 , this relation should be interpreted as: $(G_0 \leftrightarrow (G_1 \wedge G_2 \wedge \dots \wedge G_n))$. In an analogous manner, and OR-decomposition $G_1 \dots G_n$ of goal G_0 should be interpreted as: $(G_0 \leftrightarrow (G_1 \vee G_2 \vee \dots \vee G_n))$. Here once more, these relations reflect logical relations between propositions and, accordingly, are independent of an Agent's point of view (contra Figure.2).

Finally, Tropos includes a relation of *contribution* that can be defined between a hardgoal and a softgoal, or between a plan and a softgoal. The idea is that a hard-goal or plan can positively or negatively "*contribute to*" a soft-goal. Since soft-goals involve subjective judgments of agents, the relation of contribution must be agent-indexed. Thus, one should not state that "*G' contributes positively to G*" but that "*Agent X believes that G' contributes positively to G*". One should notice that the Tropos metamodel (Fig.2) takes this relation as a ternary one indexed to an Agent's point of view. Further, the contribution relation can be used between a Resource and a Goal, in the sense that the Resource is a *means* to a plan that the Agent believes that contributes positively to the Goal. A fuller interpretation of this relation requires an elaboration of the propositional content of beliefs, which is outside the scope of this paper.

Having clarified the semantics of the modeling constructs through interpretation in terms of UFO, we establish the correspondence between the constructs in each of the identified fragments of Tropos and ARIS in Table 1.

Table 1. Interpretation ARIS and TROPOS.

Tropos	Ontological concept (from UFO)	ARIS
<i>Agent</i>	<u>Agent</u>	<i>Person</i>
	<u>Institutional Agent</u>	<i>Organization Unit and Group</i>
	<u>Collective Social Agent</u>	<i>Group</i>
<i>Role or Position</i>	<u>Social Role</u>	<i>Position and Person Type</i>
<i>Goal</i>	<u>Goal</u>	<i>Objectives</i>
<i>HardGoal</i>	A <u>Goal</u> such that the set of situations that satisfy that goal is necessarily shared by all rational agents;	
<i>SoftGoal</i>	A <u>Goal</u> such that <u>Agents</u> can differ in their beliefs to which situations satisfy it.	
<i>Plan</i>	<u>Action Universal</u>	<i>Function</i>
<i>Resource</i>	<u>Non-Agentive Substantial</u>	<i>Product/Service</i>
<i>Dependency</i> ¹	<u>Dependency</u> or <u>Delegation</u>	N/A
<i>Means-ends (Plan and Goal)</i>	One or more executions of that <u>Plan</u> produce a post-situation that satisfies the <u>Goal</u> .	Included in the scope of <i>supports</i> relation between <i>Function</i> and <i>Objective</i>
<i>Means-ends (Resource and Goals)</i>	Every <u>Action</u> which satisfies that <u>Goal</u> has as part a participation of a <u>Resource</u> of that type	included in the scope of <i>supports</i> relation between <i>Product/Service</i> and <i>Objective</i>
<i>Means-ends (Resource and Plan)</i>	Every <u>Action</u> instance of the <u>Plan</u> has as part a participation of a <u>Resource</u> of that type.	included in the scope of <i>input for and is consumed by</i> relationship between <i>Product/Service</i> and <i>Function</i>
<i>Negative Contribution (Plan, SoftGoal)</i>	<u>Agent</u> believes that an execution of the <u>Plan</u> contributes negatively to <u>Goal</u>	N/A
<i>Positive Contribution (Plan, SoftGoal)</i>	<u>Agent</u> believes that an execution of the <u>Plan</u> contributes positively to <u>Goal</u>	Included in the scope of <i>supports</i> relation between <i>Function</i> and <i>Objective</i>
<i>Negative Contribution (Resource, SoftGoal)</i>	The <u>Resource</u> is a means to a <u>Plan</u> that the <u>Agent</u> believes contributes negatively to <u>Goal</u>	N/A
<i>Positive Contribution (Resource, SoftGoal)</i>	The <u>Resource</u> is a means to a <u>Plan</u> that the <u>Agent</u> believes contributes positively to <u>Goal</u>	Included in the scope of <i>supports</i> relation between <i>Product/Service</i> and <i>Objective</i>
<i>Negative Contribution (Goal G1, SoftGoal G2)</i>	<u>Agent</u> believes that the <u>Goal</u> G1 contributes negatively to <u>Goal</u> G2	N/A
<i>Positive Contribution (Goal G1, SoftGoal G2)</i>	<u>Agent</u> believes that the <u>Goal</u> G1 contributes positively to <u>Goal</u> G2	Included in the scope of <i>belongs</i> relation between <i>Objectives</i>
<i>AND decomposition</i>	The propositional content of the composed <u>Goal</u> is the conjunction of the component <u>Goals</u>	
<i>OR decomposition</i>	The propositional content of the composed <u>Goals</u> is the disjunction of the component <u>Goals</u>	

¹ An ontological analysis of the relation of Dependency in Tropos was performed elsewhere [40] and we refrain from this discussion here due to space constraints.

4 CONCLUSIONS AND FUTURE WORK

Although Zachman's framework has recognized the importance of the goal domain in its "motivation" column, Zachman did not define basic concepts for this column, justifying that "there is a scarcity of good examples in the people, time, and motivation columns" and stating that "the *why* column would be comprised of the descriptive representations that depict the motivation of the enterprise, and the basic columnar model would likely be ends-means-ends, where ends are objectives (or goals) and means are strategies (or methods)" [34]. So far (18 years later), no comprehensive enterprise modeling approach has addressed the why column with significant expressiveness while relating it to the other columns with strong semantic underpinnings.

This work has contributed towards filling this gap by proposing a semantic integration between the Tropos goal modeling language and the ARIS framework. As an outcome of the semantic analysis, we were able to provide a correspondence between subsets of these languages, in addition to clarifying the semantics of the main goal-related constructs of these languages. We have concluded that the relations between goals and between the goal domain and the business process domains as currently addressed in the ARIS method are overly simplistic and have opted to employ the Tropos concepts to address this deficiency. The use of the ontology has influenced heavily the definition of correspondences between the elements of both approaches and also has revealed a significant difference in the notions of *Objective* (ARIS) and *Goal* (Tropos), and their relations with respect to *Functions* (ARIS) and *Agents* (Tropos). Further, we have been able to provide an initial account for the notions of hard- and softgoals as well as the for relations between goals.

As future work, we intend to analyze the ARMOR language which extends ArchiMate enterprise architecture modeling language with i*/Tropos concepts [28]. In addition, we intend to enrich the semantic foundation with other goal relations to provide a precise account for the notion of goal conflicts. Moreover we will address the relations between goals and other elements of an enterprise architecture which are not currently covered in Tropos (nor ARMOR). In an exploratory case study that we have conducted at a Hospital (in which Tropos and ARIS have been used, respectively, for goal and enterprise modeling), we have concluded that the goal domain has complex relations with a number of domains in Enterprise Modeling beyond the business process and resource aspects as addressed in Tropos (and reported in [6]). For example, there are relations between goals and organizational norms (business rules, business policies as identified in the Business Motivation Metamodel (BMM)), goals and the organizational structure, goals and agent's skills or capabilities, goals and agent's beliefs, goals and properties of resources, among others.

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