Using Team Topologies in Model-Driven Strategic Alignment

Rene Noel[1,2], **Jose Ignacio Panach** [3], **Oscar Pastor** [1]

[1]Valencian Research Institute for Artificial Intelligence - Universitat Politècnica de València
Valencia, Spain

[2]Escuela de Ingeniería Informática - Universidad de Valparaíso
Valparaíso, Chile

[3]Escola Tècnica Superior d'Enginyeria - Universitat de València
Valencia, Spain

rnoe@vrain.upv.es, j.ignacio.panach@uv.es, opastor@dsic.upv.es

Abstract. *Model-driven techniques for designing strategically aligned information systems usually map the goals of multiple and competing actors to business process models through automatic model-to-model transformations and analysis. In previous work, we designed Stra2Bis, a method for designing strategically aligned business processes based on a different approach: mapping the business strategy and organisation structure into the business process model. Stra2Bis and goal-based techniques share an issue: only some organisational level elements actors directly affect the business domain and, thus, the business processes. In this article, we propose to extend Stra2Bis by adding concepts from Team Topologies, an approach for organising business and technology teams. Team Topologies help distinguish the business-relevant organisation units from other supporting units; we exploit these concepts to constrain the model-to-model mappings, avoiding unnecessary analysis and modelling outside the business domain. We formalise the approach by specifying the method's metamodel extension and redefining the model-to-model transformation guidelines. We also discuss how existing goal-based alignment frameworks can exploit this approach.*

1. Introduction

In the past two decades, model-driven initiatives have helped business analysts design business processes aligned with their stakeholders' strategic intentions to design strategically aligned information systems to support those processes. By using goal modelling frameworks such as i* [Yu 2011] and GRL [Amyot et al. 2022], business analysts have addressed the organisational complexity of multiple stakeholders having competing goals, which will drive the design of business processes. Goal models have been used as inputs for different model-to-model mapping techniques, which aim for generating elements of the business process models to ensure its alignment [Ruiz et al. 2015], for the automatic validation of inconsistencies [Gröner et al. 2014], and analysing the impact of business process activities in goal achievement [Guizzardi and Reis 2015], among others.

Recently, organisations that need to accelerate their software delivery, especially software-centric companies, have adopted a different strategic alignment approach. Organisational complexity has been identified as a key factor hindering software development efficiency [Forsgren et al. 2018]. Instead of modelling and analysing organisational complexity, it is

reduced by designing a loosely-coupled organisational structure to drive the design of loosely-coupled business processes and thus, loosely-coupled systems[1]. Hence, organisation units and dependencies are relevant for strategic alignment, setting a challenge for model-driven alignment initiatives, mainly focused on modelling system actors' goals and mapping them to business processes' activities. To tackle this challenge, in previous works, we designed Stra2Bis [Noel et al. 2022], a lightweight, situational modelling method for aligning business process models with business strategy and organisational structure. Stra2Bis proposes modelling the strategic scenario that drives a software development endeavour in terms of the organisational structure and strategic actions and intentions. This model is transformed into loosely-coupled business process models, preserving the organisational structure and dependencies.

Model-driven alignment techniques and Stra2Bis share a common concern: organisational models might describe actors, roles, and intentions which are not relevant for business process re-engineering, though they are needed for analysing the strategy elements to achieve business goals. For instance, a goal for a successful software development endeavour could be to diminish the time needed to hire new developers; since hiring developers does not affect the business domain or the design of business processes, mapping this goal to the business process level might be useless. Even though undesired model-elements can be filtered using model transformation features, models should provide semantically relevant marks to apply such filters.

Identifying organisational actors critical for business domain has been addressed in the industry by a novel approach: Team Topologies (TT) [Skelton and Pais 2019]. TT distinguishes Stream Aligned Teams from other teams for helping to overcome difficulties (Enabling Teams), for developing internal products for improving efficiency (Platform Teams), and from highly specialised teams (Complicated subsystem Teams). TT also define (and constrain) the relationships between teams, fostering them to serve their business value "as a service" to other teams, supporting the design of a loosely-coupled organisational structure.

This paper presents an extension of the Stra2Bis method that integrates TT concepts to scope model-to-model mappings to business-relevant organisational actors. We present extensions for the method's metamodel and transformation guidelines for including TT and discuss how other model-driven alignment methods can exploit this approach. The rest of the article continues as follows: Section 2 presents the related work, and Section 3 presents the Stra2Bis method. In Section 4 we describe the proposal, and in Section 5 we discuss the implications of the approach, while Section 6 presents the conclusions and future work.

2. Related Work

Aligning business strategy and technology has been recognised as a key enabler for organisational agility. On the one hand, model-driven initiatives have supported modelling the relationship of high-level business definitions and technological components through enterprise architecture frameworks [The Open Group 2022]. On the other hand, goal-oriented models have been mapped to business process models in order to ensure that both are aligned with stakeholders' strategic intentions. Among the latter approaches, we distinguish between *generative* initiatives, which take as input goal models and generate business process elements to ensure alignment, and *analytical* initiatives, which check consistence between goal models and business process models. Regarding generative initiatives, in [Kraiem et al. 2014], goals and strategies modelled in MAPs are transformed into activities and sequences in the Business

[1]Conway's law. https://martinfowler.com/bliki/ ConwaysLaw.html

Process Modelling Notation (BPMN). In [Ruiz et al. 2015], strategic dependencies in i* models are mapped as communicative events at the business process level, modelled in Communication Analysis [España et al. 2009], a communication-centred modelling method.

Concerning analytical initiatives, in [Sousa and Prado Leite 2014], i* models are aligned with BPMN models introducing key-performance indicators and an intermediate model to specify roles' activities to achieve goals. Validation rules for the URN method [Amyot et al. 2022] have been proposed to check if traceability links are modelled to connect goal and process models expressed in the Use Case Maps (UCM) notation. In [Gröner et al. 2014], a mapping is proposed to validate the consistency between GRL models and processes modelled in BPMN, while in [Li et al. 2015], BPMN models consistency is validated against UCM models. Other analytical initiatives help analysing the purpose of BPMN activities by mapping them to MAP models [de la Vara et al. 2008]. In [Guizzardi and Reis 2015], a method to reason about the impact of plans in achieving goals is presented, consisting of assigning weights to goals and propagating them to process activities. In [Nagel et al. 2013], a method to check consistency between goals and business processes is proposed for designing systems in a service-oriented architecture.

All the above initiatives rely on goal modelling methods for representing business process relevant goals and actors. However, such methods do not provide modelling guidance or semantics for stating that an organisational actor is relevant for business process alignment, hindering their practical implementation.

3. Background: The Stra2Bis Mehtod

Stra2Bis [Noel et al. 2022] is a modelling method for designing strategically aligned business processes. Stra2Bis proposes 1. To model the strategic scenario and organisational structure that drives the software development endeavour, and 2. Transformation guidelines for generating the initial structure of the business process model from the organisational structure.

The **strategic scenario modelling** is performed with LiteStrat [Noel et al. 2021], a business strategy modelling method designed from assembling concepts from goal modelling and enterprise architecture frameworks to represent business strategy and organisational structure jointly. LiteStrat concepts consider strategic actions and intentions (*strategy* and *tactic*, *goal* and *objective*), and *refinement* relationships to connect them. The organisational structure is modelled through *roles* and *organisation units*, to which the strategic actions and intentions can be *assigned*, and can contain other units and roles. The organisation units are connected by the *influence* relationships, representing that the behaviour of a unit influences another unit. Entities external to the organisation are modelled as *actors* and can influence or be influenced by organisation units.

Figure 1.A presents a model for PetCare, a fictional software-centric company that allows pet owners to hire pet sitters through a web application. PetCare needs to react to a competitor, PetSitting Co., which offers a similar service but with certified pet sitters. Under this scenario, PetCare's goal is to make the pet owners confident about the pet sitters. The primary strategy is to implement a reputation system for pet sitters based on scores given by pet owners. To implement the strategy, the Reputation Team will be created to implement the reputation system in the PetCare app. The Connections Team, responsible for the features for searching and hiring pet sitters, must integrate the reputation information as part of their process. Also, the Recruitment Team must hire an experienced UX professional for the Reputation Team. The expected outcome is to offer reputation-based pet sitters to pet owners.

Stra2Bis proposes **three model-to-model transformation guidelines** to map business

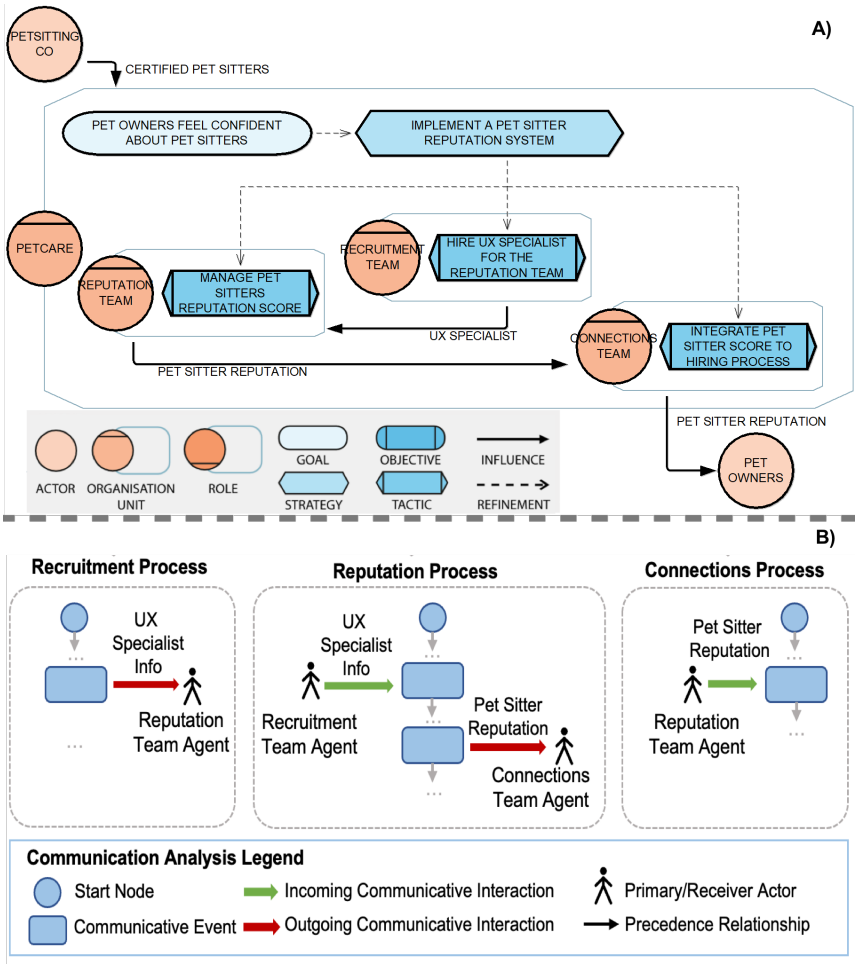


Figure 1. A) Business strategy model and B) Generated business process structure.

strategy models to Communication Analysis (CA) models, a communication-centred business process modelling method. CA shares its focus on events with BPMN's choreography diagrams, but allows specifying the information being shared by process' actors [España et al. 2009]. CA models can be transformed into information system models [España 2011], completing a model-driven development method from requirements to code.

Stra2Bis' transformation Guideline 1 states that each organisation unit is mapped into a business process start node, i.e., units have independent business processes. Guideline 2 proposes mapping the relationships between organisation units into interactions in the business process models, representing external processes as actors and the interactions as events. Finally, Guideline 3 proposes to map objectives to data collection events in the process models to measure the achievement of the objectives. Business analysts are expected to complete process models according to business logic but preserving the elements generated by the guidelines. Figure 1.B depicts the application of the two first guidelines to the model in Figure 1.A. As seen, it would produce three business processes: one for the Connections Team, one for the Reputation Team, and one for the Recruitment Team. However, the recruitment process (including searching, and on-boarding new developers, for instance) is not a business process. In order to distinguish between different types of organisation units, additional concepts are needed.

4. Extending Stra2Bis with Team Topologies

We propose to extend the Litestrat modelling language by applying Team Topologies types as extensions of LiteStrat's organisation units. Also, Team Topologies' interaction modes between teams are considered for extending LiteStrat's influence relationship to specify different dependencies between organisation units. In Figure 2, we propose a metamodel extension for LiteStrat. The definition and notation for the new concepts is detailed in Table 1. It is worth noting that we kept the "stream-aligned" concept to name units since a stream is *a flow of work aligned to a business domain or organisational capability* [Skelton and Pais 2019] and a stream-aligned team (in our case, unit) is expected to be aligned to such flow of work.

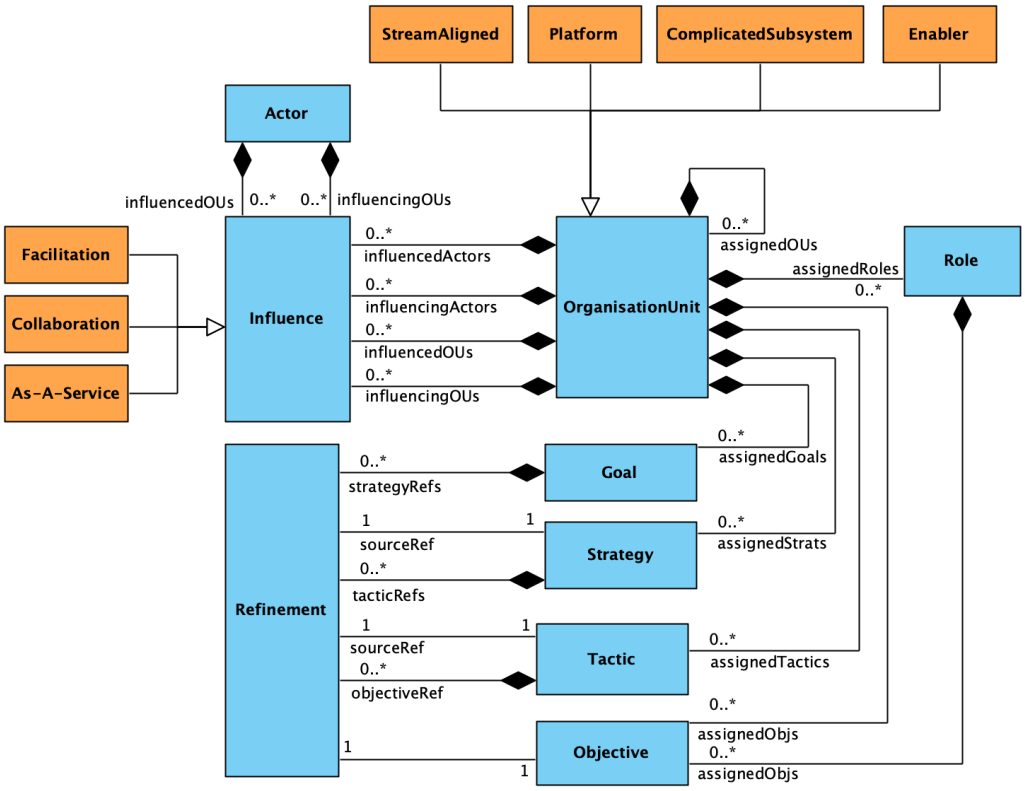


Figure 2. LiteStrat metamodel extension for Team Topologies.

Encompassing the modelling extensions, two extensions for the transformation guidelines are introduced, to constrain the transformations to the stream-aligned units and services, so elements outside the business domain are not generated in the business process model. Below we re-define the guidelines, marking the differences from the original definition.

Guideline 1: For each ***stream aligned*** organisation unit belonging to the overall organisation in the business strategy model, create a new process in the business process model. Add a start event with the unit's name to the new process to make the process visible in the model.

Guideline 2: For each ***X-as-a-Service*** influence between ***stream-aligned*** organisation units in the business strategy model, add events to units' processes to handle the dependency. For the process associated with the influencing unit, add process elements to provide the service to an actor representing the influenced units' process. Similarly, add elements to the influenced unit's process to consume the service from an actor representing the influencing unit's process.

Table 1. Concepts and notation for the Team Topologies extension.

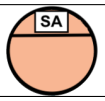
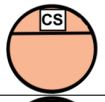
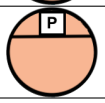
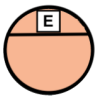
Construct Extension	Definition	Notation
Stream-Aligned Unit (extends Organisation Unit)	Organisational units performing a work of flow that handles a business domain or a part of the business domain.	
Complicated Subsystem Unit (extends Organisation Unit)	Organisational units that concentrate significant technical capabilities (e.g., mathematical models, pattern recognition algorithms, etc.) which are useful for adding business value	
Platform Unit (extends Organisation Unit)	Organisational units that develop internal products to improve the performance of Stream-Aligned Units.	
Enabling Unit (extends Organisation Unit)	Organisational units that help Stream-Aligned Units to improve their performance by researching, testing, and transferring new techniques, tools, methods or anything that helps bridge Stream-Aligned Units' capability gaps.	
Relationship Extension	**Definition**	**Notation**
X-as-a-service (extends influence)	Type of influence between two organisation units where the influencing unit provides something with minimal collaboration to the influenced unit.	
Collaboration (extends influence)	Type of influence between two organisations that temporarily work closely for a specific goal.	
Facilitating (extends Influence)	Type of influence where the influencing organisational unit helps the influenced organisational unit to overcome an obstacle.	

Figure 3 presents the example from Figure 1.A using the extensions. The Reputation Team is characterised as a stream-aligned unit that serves the Pet Sitter Reputation as a service to the Connections Team, another stream-aligned unit. The Recruitment Team is modelled as an enabling unit that facilitates Reputation Team's work. Following the extended transformation rules, the Recruitment Process in Figure 1 will not be mapped, nor is the Recruitment Team Agent and the UX Specialist Info interaction in the Reputation Process. We extended the example including two teams for implementing tactics for analysing customer engagement: the Analytics Team design the engagement research study, modelled as Complicated Subsystem unit, and the Cloud Team, marked as Platform unit for providing the infrastructure for collecting engagement data.

5. Discussion

Extending business strategy modelling with Team Topologies' team types and interaction modes allows to better scope the generation of business process models from business strategy model. The main implication for Stra2Bis is that the model-to-model transformation can now be automatically executed, without needing additional analysis during the process. A limitation of the approach is that it could be hard to apply in traditional organisations since it is expected that stream-aligned teams are cross functional and autonomous [Skelton and Pais 2019].

On the other hand, we think that having TT's types of interactions, particularly the "x-as-a-service", helps analysts to model the strategic scenario under the mindset of *what an unit is serving to others*, which contributes to reduce the coupling between the units. This might help the organisation to from the scientifically demonstrated benefits of low organisational structure coupling [Forsgren et al. 2018]. Other unit types not considered in the current proposal could be exploited through through model-driven techniques, such as eliciting requirements for developing of hiring platform-as-a-service from Platform units, identifying capabilities for

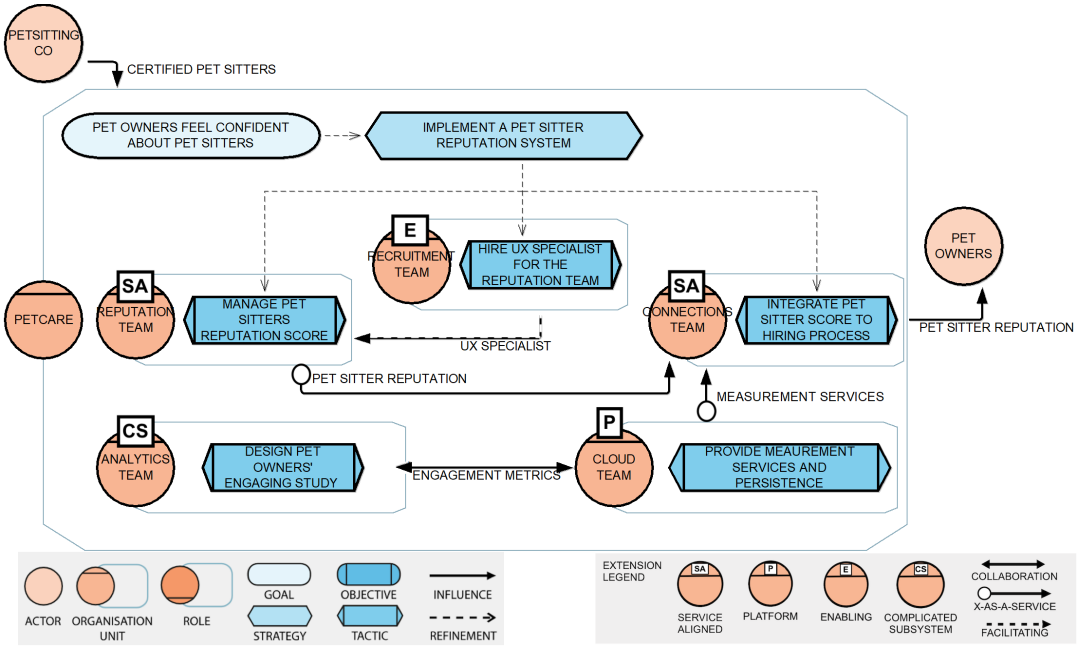


Figure 3. LiteStrat model with the Team Topologies extensions.

Complicates Subsystem units, or scheduling the tasks of Enabling units.

While the formal definition of the proposal is focused to Stra2Bis and its associated notations, a similar approach could be exploited by the alignment approaches discussed in Section 2. In particular, analytical approaches could benefit, since non-business process elements that hinder their practical application, can now be filtered using the TTs marks. TTs can be added to existing goal modelling languages through well defined processes [Goncalves et al. 2020].

6. Conclusions and Future Work

In this article, we presented an extension for Stra2Bis [Noel et al. 2022], a model-driven method for designing strategically aligned business processes. By including a taxonomy of organisation units based on the team types and interaction modes from Team Topologies [Skelton and Pais 2019], we aim to scope the automatic generation of business processes to organisational elements which are business relevant. We proposed an extension for the business strategy modelling language and transformation guidelines. We discussed how other model-driven alignment techniques could benefit from characterising organisational actors through Team Topologies. Future work will focus on applying for the proposed extension in a real-world context to assess the effects and limitations of the proposal empirically.

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