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**Conference Paper** in Lecture Notes in Business Information Processing · June 2015

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# Aligning Enterprise Architecture with Strategic Planning

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**Abstract.** Strategic planning improves both the financial and behavioral performance of an enterprise. It helps the enterprise set priorities, focus capabilities and resources, strengthen operations, ensure that stakeholders are working toward common goals and assess and adjust the enterprise's direction. Strategic planning is currently not explicitly represented in EA, although it motivates enterprise architecture choices. This paper studies strategic planning approaches and discusses their potential relation with EA. The paper focuses on how EA can contribute to strategic planning, discussing requirements on EA extensions to support strategic planning and pointing to solutions. A general approach to support strategic planning using EA should mutually benefit the practices of strategic planning and EA.

**Keywords:** enterprise architecture, strategic planning, strategy, capability, goal.

## 1 Introduction

Strategic planning is an organizational management activity that is used to set the priorities of an enterprise. It defines what an enterprise wants to achieve in the future and outlines how it is supposed to achieve it. Accordingly, it establishes where the enterprise should focus its energy and resources, and which operations it needs to strengthen. It also helps stakeholders work toward common goals and assess how to achieve those goals [1]. Empirical studies have shown that strategic planning can improve the financial and behavioral performance of an enterprise, as well as the alignment between its operations towards common goals [2], [3], [4] and [5].

Strategic planning consists of intentionally setting goals (i.e., choosing a desired future) and developing a plan to achieve those goals. The plan focuses on decisions about what to do, why to do it, and how to do it. These strategic level plans provide an initial direction for the Enterprise Architecture (EA) and motivate choices on the EA. A change in the enterprise's strategy affects the enterprise as a whole. It affects the products and services the enterprise is delivering and also how they are delivered inside the organization. EA aims to have the complete enterprise aligned and integrat-

ed [6]. These changes usually imply in reconfiguring the activities that support the delivery of products and services, and thus, in the EA. An explicit relation between strategic planning and EA is therefore desirable. With such a relation, whenever there are changes on the strategic planning, the EA would accordingly change to support the provision of enterprise's products and services. The planning of EA would also benefit from this relation with strategic planning. A strategic plan can be seen as requiring various EAs at different points in time, requiring a sequence of EA transformations, which, by its turn, would benefit from the previous knowledge of the products and services to be supported.

Further, strategic planning can also benefit from EA. Strategists frequently want to analyze possible impacts triggered by changes in strategic planning, and EA, which provides a common view on the whole enterprise, can be used to support this analysis. Additionally, according to the Forbes management magazine [7], one of the main reasons strategic planning implementation fails is the lack of monitoring. EA, as middle ground between enterprise's operations and strategy, could support this monitoring.

There are efforts in EA to address (part of) the motivational aspect of an enterprise as an attempt to address these concerns [8]. Despite that, little effort has been made to explicitly represent strategic planning in EA. Most enterprise architectures do not deal with the strategic planning of organizations [8].

In this paper, we study strategic planning approaches and discuss their potential relation with enterprise architecture, with special interests in how strategic planning impacts in EA transformations over time and how EA can contribute to improve the support for strategic planning and the subsequent monitoring of its execution. We observed gaps in this area of enterprise architecture and we outline a research agenda on the incorporation of strategic planning into EA. EA could support strategic planning description, implementation and monitoring, both in the achievement of enterprise's low-range and mid-term goals, as, most importantly, in the achievement of enterprise's long-term goals. We describe the gaps that EA needs to overcome and point to required extensions to explicitly address strategic planning description, implementation, monitoring and management.

This paper is organized as follows: Section 2 describes management theories in strategic planning and strategic planning models in order to recognize what is required to represent strategic planning. Section 3 presents the current support for motivational aspects in EA, including strategic planning. Section 4 discusses requirements to support strategic planning in EA and how EA approaches could contribute to strategic planning, pointing to solutions to fulfill these requirements and Section 5 presents our conclusions and future work.

## **2 Strategic Planning**

A variety of perspectives, models and approaches has been used in strategic planning [9], [10], [11]. Strategic planning often focuses on an entire enterprise, although a strategic plan can also be made for a specific part or department of an enterprise. The

outcomes and the way in which a strategic plan is developed depend on the nature of the enterprise and on the nature of the challenges the enterprise is facing.

## 2.1 Strategic Planning Theories

Two main categories of theories are used to support strategic planning in the management area: *prescription theories*, also known as deliberate strategies; and *description theories*, also known as emergent strategies [12].

*Prescription theories* are based on a clear distinction between the design of the strategic plan and its implementation. On the design part, one or more executives and consultants define the strategy to be followed in the enterprise. The strategy can be unique and tailored to a specific enterprise, or it can be defined from a generic one, after some analysis of the enterprise in its particular circumstances and selecting the strategy that should fit the enterprise best [10] [11]. After the strategy is completely designed in terms of the goals the enterprise wants to achieve, when and how, the strategy is then communicated to the enterprise and the defined plan is implemented.

In contrast, *description theories* assume that the realm of strategies is too complex and that the design approach underestimates it, so that it is not possible to define what goals to achieve and how to achieve them a priori. Description theories assume the strategy to be designed during its implementation. According to these theories, strategy does not emerge from planning, it emerges within an enterprise taking a series of actions repeatedly. Once recognized as recurrent, these series of actions might be made formally deliberate and, then, guide the overall behavior, as an enterprise's pattern of behavior. These patterns of behavior are called the enterprise strategy and are not initially anticipated or intended [12]. Additionally, since there is no a priori design, description theories state that changes are easily accommodated.

Few, if any, strategies are purely prescriptive, just as few are purely emergent. Pure prescriptive strategic planning would imply in no adaptation and pure emergent strategic planning would imply in no control. Strategy in the real world invariably involves both planning on the future and adapting the plan during the operation. Most companies pursue a strategy informally termed as 'umbrella strategy', in which there is a mix of deliberate and emergent strategies [12]. In this case, the general guidelines are deliberated and the details are left to be deliberated (or emerge) later in the process [12]. Effective strategists mix prescriptive and emergent strategies to reflect the conditions at hand, notably the expectation to deal with unknown elements, as they need to handle partial knowledge of future matters and to react to unexpected events.

## 2.2 Strategic Planning Models

Although strategic planning depends on the theory used (prescriptive or descriptive), it is essentially defined in a few types of models [9], [13]. The most common model of strategic planning is the Goal-Based, also called Vision-Based. The models described here are mainly based on descriptions in [9], [12] and [13].

### 2.2.1 Goal-based Strategic Model

The *Goal-Based* strategic model is related to the prescriptive theories and the ‘umbrella strategy’. To describe the *Goal-Based* strategic model, it is necessary to express the enterprise mission, vision and its planned goals.

The planned enterprise goals are among the most important elements of the *Goal-based* strategic model. Goals should be accomplished in timing constraints. Usually, the first goals described are to be achieved on the long-term (e.g. five years from ‘now’). They encompass the enterprise’s mission and vision. Further, it is common that intermediate goals or milestones are described, as well as short-term goals (e.g., one year or less). Each of these goals can be related to other goals, usually to facilitate their achievement, in a decomposition, refinement or contribution type of relation. In a decomposition relation, goals are decomposed, in the sense that achieving the low level goals defined in the decomposition guarantees the achievement of the higher-level goals. In the refinement, the achievement of each (or all) of the underlying goals contributes to the achievement of the higher-level goal, without guaranteeing its achievement. Each of the goals might have one or more possible decompositions or refinements, and the usage of one decomposition or refinement does not entail that other decompositions or refinements might not be possible as different forms of achieving the same goal; usually to increase the probability of success or decrease risks during strategy implementation.

Further, goals might have a precedence order or might need to be accomplished before or after a certain date. Additionally, goals might require a time window in which they should be addressed and achieved (e.g. because of regulatory compliance; in the case of perishable products).

Goals might also be treated by the enterprise individually or in a bundle and might influence one another. Particularly, it should be assessed whether goals being planned are compatible with previously defined goals. In case a goal contradicts a previously defined goal, one of them should be revised. Goals can be the responsibility of specific departments, of individuals or the whole enterprise.

In addition, organizations need to plan how its goals should be achieved. For short-term goals, it might be relevant to describe which are the operations required to realize them. It also might be relevant to describe their required capabilities and resources. For mid-term and long-term goals, although the same approach can be applied, the enterprise might prefer not to detail the achievement of the goal, or might choose to refer only to the capabilities and resources required for achievement, in a strategy as capability-based planning [14].

In some organizations the strategic planning is separately performed into different departments as well as different management levels, in which each department and management level has different responsibilities on the strategic planning. For example high-level managers may describe the strategic part of the strategic planning and releases it to lower-level managers, which refine the plan and describe how that plan should be implemented.

### 2.2.2 Other Models

The *Issue-based* strategic planning model [9] defines how to overcome issues the enterprise is facing, instead of defining and planning on a future state in terms of goals. The issue-based model is concerned with a shorter period of time (e.g., a one-year plan) and is usually performed when the enterprise faces difficulties. To express the approach, it is necessary to express the perceived issues as well as their solution requirements. The Issue-based strategic planning is similar in its conceptualization to the goal-based strategic planning model, if we consider “solving an issue” as a goal.

The Alignment model is useful for enterprises that need to find out why their strategies are not working [9]. The overall steps of this model consists of: (i) outlining the enterprise’s mission, programs and resources; (ii) identifying what is working well and what needs adjustment; (iii) identifying how these adjustments should be made and; (iv) include these adjustments in the strategic plan.

The Scenario Planning model [13] is usually used in conjunction with other strategic planning models to enhance strategic thinking. It assists in identifying strategic issues and goals using different views. Scenario planning consists of selecting several external forces and devising changes related with each of them, which might influence the organization (e.g., change in regulations, competition, new products or services included in the market). For each force, it discusses different future organizational scenarios (usually best, worst and reasonable cases), which might result from a change. Then, potential strategies to each of these scenarios are identified. With that information, enterprises usually detect common strategies that can be employed to respond to multiple possible scenarios. The review of the worst cases usually identifies enterprise’s weaknesses and motivates changes in the enterprise.

In order for the enterprise to achieve its results and improve its business it is necessary to implement and monitor the strategic planning [15]. The reasons why enterprise’s strategic planning fails includes the lack of monitoring on the strategic planning achievement and implementation, and the lack of adaptation after the strategic plan is defined [7]. EA could be used to support overcome these problems, as well as to support the description, implementation, monitoring and management of strategic planning.

## 3 Current Support for Strategic Aspects in EA

The importance of enterprise strategy for Enterprise Architecture was recognized at least two decades ago with the addition of the Motivation column to the Zachman framework [16]. However, most EA approaches are still struggling with the goal domain and its modeling, and are not yet designed to deal with enterprise’s high-level concerns, such as enterprise strategy and strategic planning [8]. In this section we analyze the frameworks: Zachman, MoDAF, DoDAF, ISO RM-ODP, TOGAF and its ArchiMate modeling language, ARIS and the OMG BMM according to its strategic aspects concerns.

The concept of mission was not introduced in any EA framework. The concept of vision is present in the MoDAF and DoDAF frameworks, in which the vision concept

can be related to, *desired effects* and *goals*, respectively. However, the MoDAF framework adds two more concepts to describe the strategic aspect of enterprises and the possible relations in the framework, namely that *Enterprise Phase has vision Enterprise Vision* and *Enterprise Vision has tasks Enterprise Tasks*. The DoDAF framework, in turn, adds the *desired effect* concept. The existent relations are to represent that *vision is realized by desired effect*. There is also an *activity* concept, used to relate the *desired effect* to activities, in which a *desired effect directs an activity*.

The concept of *strategy* is supported by the Zachman framework [16], together with the concept of *objective*. The concepts can be related by means-ends-relations between *objectives* and *strategies*. There is also a *conflict* relation in the framework that can be used between *objectives*.

The concept of *goal*, sometimes called *objective*, which is a crucial concept for strategic planning, also appears in the ARIS, ISO RM-ODP and the TOGAF (ArchiMate) frameworks. In the ARIS framework, the concept can *belong to* another *objective* and might be supported by a *function*. In the ISO RM-ODP, an *objective* can be *refined* into other *objectives*. This concept can be related to *process*, *community* or *roles*. Possible relations are that a *community has an objective*, which might represent ownership, and *refined goals* can be *assigned* to both *processes* or *roles*. The *goal* concept appears in TOGAF in its ArchiMate modeling language. In ArchiMate, a *goal* can be *influenced* by another *goal*. ArchiMate also defines concepts such as *Driver*, *Assessment*, *Requirement* and *Principle*, which all can *influence* a *goal* or one another. The relation between these concepts and the EA is indirect through the *requirement* concept, in which its instances need to have *requirements* in order for the *requirements* to be related to an enterprise structure concept.

The OMG BMM framework, in its turn, uses the concepts of *means*, *ends*, *assessment* and *influencer*. These concepts can be related by *means-ends* relations. The OMG BPMN notation, which can be used in conjunction with BMM, introduces concepts, such as *Organizational Unit*. The *Organizational Unit* defines *Ends*, *establishes Means*, *makes Assessments*, *recognizes Influencers*, *may be defined by a Strategy* and *may be responsible for Business Processes*. *Business Processes* might be *guided* by a *Business Rule*, which is derived from a *Business Policy*.

None of the frameworks supports the explicit representation of strategic planning concepts and its relations as described in Section 2. There are not enough concepts to represent strategic planning in any of the EA approaches. EA frameworks need to be able to express goal relationships and its properties, such as specifying when each goal should be accomplished, as well as to address precedence and priority between goals. Further, the frameworks do not express different opportunities to achieve a goal. Plans (and consequently EA projects) are made under assumptions about circumstances that might not be under enterprise's control, usually referred to as enterprise's context. The enterprise may use scenario planning to overcome those risks and the frameworks should support planning a proper EA based on the prospected scenarios. We summarize the limitations we identified for strategic planning in EA frameworks as follows:

- Limited support for expressing goal relationships as stated in Section 2;

- Limited support for context modeling and how context can affect strategic planning and long-term EA;
- Limited support for the planning of different scenarios and the description of what strategy to follow in which scenario;
- Limited support for partial planning of the enterprise strategy, leaving details to emerge and have the EA support for that set of strategic goals;
- Limited support for linking strategy with the EA;
- Limited support for relating strategic planning goals to enterprise architecture elements, allowing the specification of required elements for each goal.
- No support for stating when a goal or milestone should be achieved, including precedence between goals.

## **4 EA Required Extensions for Strategic Planning**

This section discusses how EA can contribute to strategic planning, by identifying requirements for EA to support strategic planning and pointing to general solutions to address these requirements. All proposals on this section are subject to further work as a research agenda. A general approach to support strategic planning description, implementation, monitoring and management using EA should mutually benefit the practices of strategic planning and EA.

### **4.1 Strategic Planning Representation**

Limited support is available for describing enterprise's strategic planning in EA. EA frameworks need to be extended to express goal relationships and its properties requirements, such as specifying when each goal should be accomplished, address precedence, priority, express different opportunities to achieve a goal and express context and its possible impacts. We believe that a graph-based notation could address some of the limitations described in Section 3 and could provide a useful visualization of strategic plans. Goal-based languages, such as i\*/Tropos [17] and Kaos [18], could also be used as a starting point to develop a notation for strategic planning, provided their limitations concerning timing, scenario planning and support to context description are addressed.

### **4.2 Capabilities, Resources and their Relation with Strategic Planning**

The importance of capabilities and resources for business strategy has been recognized in the management literature ([19], [20], [21], [22]). Achieving a planned goal on strategic planning requires the availability of capabilities and resources. Organizational capabilities and resources are related to strategic planning in enterprises in order to support and maintain competitive advantage [19], [20], as well as to improve performance, quality and to reduce costs [21] [22].

According to capability-based theories ([19], [20], [21], [22]), the enterprise needs to know the capabilities it wants to leverage in order to plan to acquire resources and



abilities in an intended manner. The emphasis is on adapting, integrating, and re-configuring internal and external organizational skills, resources, and functional competences toward a changing environment. Accordingly, the transition from enterprise's current state towards the goal-state can indicate that superfluous capabilities and resources should be abandoned while new capabilities and resources should be acquired. Further, modeling the transition from enterprise's current EA baseline towards the target EA would benefit from capability-based modeling, in a similar manner as presented in [23]. The paper presents an ArchiMate extension proposal which allows the enterprise to consider the required capabilities and resources to achieve a desired state (e.g., a planned goal), without actually having to pursue a complete and extended view on the business processes and tasks that are necessary to realize that state. The extension proposed in [23] could be extended once more in order to properly address strategic planning concerns.

### **4.3 Capabilities and Operations**

The capability concept denotes the ability to bring about a desired outcome. This ability should be understood in a broad sense. Capabilities are used to state a broad range of behaviors, which can be assumed to inhere in an enterprise or in a specific individual. We argue that modeling resources and capabilities for decision making purposes at strategic level must simplify models and hide the complexity of architecture models which is of no relevance at that abstraction level, where decision makers are mostly interested in means (i.e., resources & capabilities) and goals (i.e., motivation). In contrast, resources and capabilities can be linked to the architecture fragments that implement their behavior, thus enabling an end-to-end traceability from strategic decisions to implementation and architecture change. An initial approach to this has been presented in [23], which captures the notions of capabilities and resources in ArchiMate, focusing on how capabilities are related to enterprise's resources, behavior and structural elements. This could support analysis on what becomes irrelevant or important on the strategic planning follow up. Further, an enterprise could even combine capability with planning analysis models to plan on which area to allocate investments [24].

### **4.4 EA Transformations Over Time**

The strategic plan states on a continuum of the enterprise, describing multiple states that the enterprise is expected to achieve over time. It states the enterprise long-term, through the envisioned period. Thus, strategic planning is not related to an enterprise specific snapshot. A strategic plan thus requires various EAs at different points in time. To obtain these EAs it requires a sequence of EA transformations. The EA transformation over time should be planned to assure that the EA supports the provisioning of enterprise's products and services by the time they are required, in order to support the achievement of enterprise's goals.

Figure 1 illustrates various EAs over time related to the accomplishment of different goals of the strategic planning. Figure 1 also illustrates the EA transformations

that are necessary, which are represented by the arrows between EAs. When the EA is implemented, the organization is at some state, represented as S1 in Figure 1. The EA is then implemented and targeted to support the organization as it is at that specific moment, or to support the enterprise in its transformation to achieve its next goal or set of goals (e.g., improve efficiency, support new service, support new process), illustrated as G1 in Figure 1. Therefore the EA needs to provide the requirements for achieving G2 in time. Further, different transformation should be defined to address different scenarios, as the enterprise has unknown future on the strategic planning time and could adopt different goals depending on the context it is required to deal. Figure 1 represents this in the branch leading to G2'.

Enterprise architecture frameworks must not be concerned with a single snapshot of the enterprise. They must be concerned with the controlled and continuous change of the EA in order to properly support strategic planning and its implementation.

#### 4.5 Strategic Planning Revisions

Strategic planning is usually reviewed after some period of time (e.g., each year). The revision usually verifies if the strategic planning goals are still relevant to the enterprise. Further, based on monitoring, the enterprise assesses if the strategy to achieve the goal is to be maintained, or should be changed or adapted. The support for strategic planning revision within EA can allow the assessment of change impacts. An approach to strategic planning and enterprise traceability as discussed in Sections 4.2 and 4.3 using capabilities could be used to support that task.

#### 4.6 Strategic Planning Monitoring

An enterprise should be instrumented to enable the collection of enterprise data. The collected data can be related to Key Performance Indicators (KPI) or milestones, defined in terms of the strategic plan goals. Two outcomes are possible due to the monitoring: (i) indication that goals are to be achieved 'as is' or (ii) indication that the goals will not be achieved under the current circumstances. If the monitoring indicates that goals are to be achieved, the enterprise should keep on performing as planned and

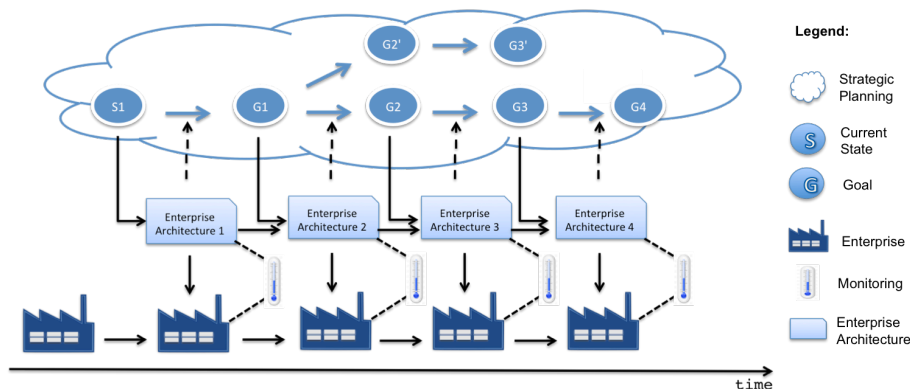


Figure 1 - General Approach

continue to monitor and analyze its results. However, if the analysis indicates that goals might not be achieved, the enterprise needs to (i) change its operations in order to achieve the desired effect or, (ii) change its strategic plan properties (e.g., change a goal or its expected time realization), in order to adapt it to the current reality.

In case of (i), EA could support the analysis of which part of the enterprise might be responsible for enterprise's underperformance and, hence, help enterprise reorganization. In both cases, any change might trigger EA changes. The effort to understand which parts are required to change in the EA should be facilitated, since EA elements would be related and traced to both enterprise's operations and strategic planning.

Additionally, on the trajectory between goals, the collected data should be used to analyze if enterprise's subsequent goals are going to be achieved, triggering corrections enterprise's operation, if necessary, or triggering adaptations in enterprise's strategy, if the planned goals are not achievable from current state. Further, the analysis can be also relevant to decisions on which goals to pursue, if a scenario planning approach has been applied. Figure 1 illustrates the monitoring of the enterprise (as a thermometer), which is related to the EA and then, to the strategic planning.

#### **4.7 Coherent Architectural Descriptions**

A main challenge related to the alignment of strategic planning and EA is in the identification of a precise conceptualization for these notions. Without a precise conceptualization, rigorous definition of the semantics of the proposed elements is problematic, and modeling and communication problems arise [25]. In particular, we point to the usage of foundational ontologies for semantically anchoring concepts definitions. A foundational ontology defines a system of domain-independent categories and their relations, which can be used to articulate conceptualizations of reality. The use of foundational ontologies aims to ensure ontological correctness of the language and the models described within the language. In particular, we point to the works developed in [23] and [26], in which an ontological foundation has been used to define the semantics of concepts of an EA modeling language. The introduction of strategic planning concepts to EA frameworks should have a precise conceptualization in order to avoid ambiguity and communication problems.

## **5 Conclusions**

In this paper, we have presented general requirements towards the extension of enterprise architecture frameworks to express and align it with strategic planning. We argue that there is a limited support for describing enterprise's strategic planning in EA and that the usage of EA for strategic planning should be mutually beneficial to the practices of strategic planning and EA.

We list several limitations of the current frameworks and identify requirements to align strategic planning with EA. In particular, we state that EA frameworks should not be concerned with single snapshots of the enterprise and must be concerned with the controlled transformations of EA over time. We argue that the planning of EA

transformations could be enhanced if aligned with strategic planning. We have also outlined an initial approach for extending EA to achieve an end-to-end traceability between strategic planning, EA and enterprise's operations based on the concept of capabilities, as introduced in [23].

Nevertheless, we also focus on how EA can improve enterprise's strategic planning monitoring and management. EA can be used as a middle ground between enterprise's operations and enterprise's strategic planning. EA can also be used for strategic planning on design time for the verification of change impact.

The required extensions are intended to model enterprise's strategic planning and to relate it to the whole enterprise, including its operation. The introduction of the requirements into EA and its usage should improve the traceability between the enterprise's strategic planning and EA choices. The continuous transformations from baseline EA to target EA could benefit from this approach, in which the EA transformations are planned in accordance to the goals each EA version has to support.

Additionally, on the trajectory between goals, EA could help predict if enterprise's subsequent goals are going to be achieved, triggering corrections on the operation or revisions on the strategic planning of the enterprise. Further, the analysis can be relevant on decision-making whenever a scenario-based approach has been performed.

In our future efforts, we intend to further detail on how to overcome the identified limitations and to implement the extensions proposed in this paper. We intend to integrate these results with our results of [23] and [26], which addresses capabilities and some motivational concepts for EA. We also intend to interpret new proposed modeling concepts using the Unified Foundational Ontology [27] [28], in an effort to have coherent and aligned enterprise models.

## Acknowledgments

This paper is partially funded by FAPES (grant number 59971509/12) and CNPq (grants number 310634/2011-3, 485368/2013-7 and 201495/2014-7).

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