

An Architectural Viewpoint for Managing BizDevOps Software Projects

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Keywords: Enterprise Architecture, IT-Business Alignment, Software Development, BizDevOps, Viewpoint.


Abstract: BizDevOps extends the DevOps approach by integrating a business cycle that encompasses stakeholders beyond the realm of information technology, aiming to support the alignment between IT and business while also fulfilling organizational objectives. This approach could be augmented with the use of enterprise architecture descriptions and customized architectural viewpoints, which facilitate the analysis, communication, and management of team-specific concerns. This study introduces BizDevOps-VP, proposing a viewpoint designed to enhance communication and decision-making within BizDevOps teams, focusing on their concerns, with the goal of supporting IT/business alignment without compromising agility.


1 INTRODUCTION


Numerous innovative software (SW) development approaches have been proposed to address the ever-evolving requirements of organizations (Gokarna & Singh, 2021). Many of these approaches emphasize fostering communication and collaboration between Information Technologies (IT) and business teams. Among these methodologies, one noteworthy approach is BizDevOps, which comprises three seamlessly integrated cycles: business, development, and operations cycle. These cycles collectively aim to implement an organization's software requirements effectively (Gruhn & Schäfer, 2015). BizDevOps has evolved from the well-established DevOps methodology, which primarily focuses on aligning software development and operations teams to optimize software production and delivery processes (Hart & Burke, 2020; IEEE, 2021). However, BizDevOps takes a step further by introducing a third cycle that incorporates the business perspective into SW development (Gruhn & Schäfer, 2015). The primary goal of this approach, coupled with its dedicated business cycle, is to enhance the participation of business units in IT processes, facilitating better alignment with the dynamic needs

of organizations (Sanjurjo, Pedreira, Garcia, & Piattini, 2020). Achieving alignment between IT and business is a substantial challenge in the realms of IT management, a point underscored by Kappelman, Johnson, Torres, Maurer, and McLean (2019). However, BizDevOps does not account for a favorable handling of agility in the business cycle, as is done in the development and operations cycles. This can create a bottleneck in the software development lifecycle and lead to a loss of overall agility. This problem is detrimental to the organization as it misses out on the benefits that agility brings in DevOps. Some of these benefits include early error detection, improved team communication, reduced resource consumption (time, money), and enhanced software quality (Raj & Sinha, 2020).

On the other hand, descriptions of Enterprise Architectures (EAs) allow for controlling and sharing the knowledge and concerns of different stakeholders in an organization, which can be important in medium or high complexity software engineering projects (Pérez-Castillo, Ruiz, Piattini, & Ebert, 2019). An enterprise architecture is a set of principles, methods, and models used in designing and implementing the organizational structure, business processes,

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information systems, and IT infrastructure of a company (Lankhorst, 2017). The descriptions of EAs can be represented through models based on different viewpoints, which enable managing concerns in various contexts and for different stakeholders (Pérez - Castillo, Caivano, Ruiz, & Piattini, 2021).

In Fuentes-Quijada, Ruiz-Gonzalez, and Caro (2023), it is indicated that a viewpoint (VP) could be a very useful artifact since they allow the analysis and sharing of concerns and interests of each type of stakeholder, thus promoting alignment between IT/Business and establishing a standardized communication approach within BizDevOps teams. This type of artifact has already been successfully used to support software development approaches like DevOps, in which the concerns of the DevOps team are analyzed and shared through a viewpoint (Pérez-Castillo et al., 2019).

The motivation of this effort is guided by the following research question:

“Could a viewpoint prove beneficial in managing software projects that employ BizDevOps?”

To address this question, we have employed the Design Science Research (DSR) Methodology (Hevner & Chatterjee, 2010) and the ArchiMate "Viewpoint mechanism" (The Open Group, 2022) to design, develop, and initially evaluate a viewpoint aimed at enhancing the communication of concerns, needs, and requirements within the BizDevOps team. This viewpoint is called BizDevOps-VP (Viewpoint for managing BizDevOps SW projects). This artifact is specifically designed to facilitate the management of SW projects within the BizDevOps approach while ensuring alignment between IT and the business, all without compromising agility throughout the process.

The structure of this paper is as follows: Section 2 details the background to this work. Section 3 details the viewpoint specification. Section 4, present an initial validation of the viewpoint. Finally, Section 5 outlines the conclusions and future work.

2 BACKGROUND

The following section presents the key concepts addressed in this study.

2.1 BizDevOps

The concept of BizDevOps represents the active and joint participation of business, development and operations roles (see Figure 1) for the purpose of developing software (Gruhn & Schäfer, 2015).

BizDevOps is a natural extension that organizations using DevOps as a software development approach can undertake. This extension includes activities aimed at facilitating IT/business alignment and involvement of business stakeholders.



Figure 1: BizDevOps cycles from (Fuentes-Quijada et al., 2023).

2.2 Viewpoint

The ISO 42010 standard (ISO/IEC/IEEE, 2022) establishes that a viewpoint is a set of agreements for constructing, interpreting, using, and analyzing an architectural view, with a focus on the concerns of a stakeholder.

In terms of ISO 42010 standard, ArchiMate is an Architecture Description Framework (ADF) used to describe, analyze, and communicate many of the concerns of enterprise architectures as they change over time (ISO/IEC/IEEE, 2022). This standard provides us with a set of entities and relationships along with their corresponding icons for representing architecture descriptions (The Open Group, 2022). Considering the above, the generic concepts of viewpoint and view from the ISO 42010 standard are realized in ArchiMate as follows:

- **An ArchiMate viewpoint** is a relevant subset of the entities and relationships defined in the ArchiMate metamodel.
- **An ArchiMate view** is a set of one or more models representing a portion of an architecture, using the concepts and relationships of the corresponding viewpoint.

ArchiMate provides a mechanism, which is aligned with the ISO 42010 standard (ISO/IEC/IEEE, 2022), for specifying a viewpoint. This mechanism requires the specification of the following elements. (The Open Group, 2022):

- **Stakeholders:** it should be established for which stakeholders the viewpoint is specified.
- **Concerns:** the concerns or concerns that are intended to be communicated through the viewpoint should be identified.

- **Purpose:** The establishment of the viewpoint's purpose is crucial, and ArchiMate categorizes them into three distinct types: (Design) Design viewpoints support architects and designers in the design process from initial sketching to detailed design; (Decide) Decision-support viewpoints assist managers in the decision-making process by providing information on cross-domain architectural relationships; and, (Inform) Informative viewpoints help inform any stakeholder about Enterprise Architecture to achieve understanding, obtain commitment, and persuade opponents.
- **Scope:** the scope of the viewpoint should be established. In ArchiMate, this corresponds to the layers and aspects to be used, and in standard ISO 42010, it relates to the perspectives of stakeholders and aspects.
- **Elements:** The notation elements that are part of the viewpoint should be detailed.

3 BizDevOps-VP

In this section, a specific viewpoint is defined to communicate the concerns of the BizDevOps team.

3.1 Concerns

The concerns of this viewpoint focus on managing software development projects with BizDevOps while aligning IT with the business objectives and attempting to preserve the agility of the software development process intact.

3.2 Rationale

The viewpoints delineated within the ArchiMate specification range from being excessively broad, as detailed in the document (available online¹) that we have compiled, where the scope of each viewpoint described by this standard is elaborated in terms of ArchiMate elements. Considering this and the concern outlined in the previous subsection, we maintain that a specialized viewpoint could prove beneficial for the BizDevOps team.

3.3 Scope

Considering the above subsection, the scope of this viewpoint is solely the management of SW

development projects; therefore, governance aspects such as the organization's strategy are not considered.

To mitigate stakeholder distraction from ArchiMate's broad notation in enterprise architecture modeling, we employed a top-down strategy to establish the BizDevOps-VP scope. This approach facilitates precise refinement of architectural components. By initially identifying stakeholder viewpoints and then detailing specific aspects, we align with ArchiMate's structured layers and facets. This ensures our application is both focused and impactful, faithfully adhering to its original purpose. This is detailed graphically shown in Figure 2.

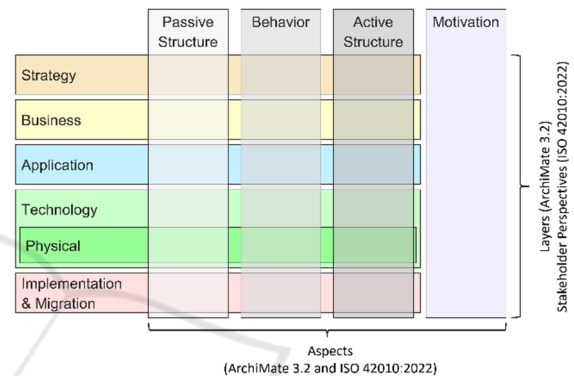


Figure 2: Stakeholder Perspective and Aspect compliance in ArchiMate 3.2, adapted from (ISO/IEC/IEEE, 2022; The Open Group, 2022).

Considering the stakeholders and concerns for BizDevOps-VP, the following decisions have been derived regarding the ArchiMate layers:

- **Strategy:** This layer is used to model the organization's strategic direction and choices concerning their impact on architecture. This layer can be used to express how the company intends to create value for its stakeholders, the capabilities it needs, and the resources required to support these capabilities (The Open Group, 2022). Considering the above and that the scope of this viewpoint is solely SW project management, the ability to communicate the company's capabilities and how it creates value is not useful for this viewpoint. Therefore, this layer is excluded.
- **Business:** this layer is used to model the operational organization of a company independently of technology. It also allows representing business services offered to customers, which materialize in the organization through business processes carried out by

¹ https://alarcos.esi.uclm.es/bizdevops-ea/?page_id=215

business actors (The Open Group, 2022). Considering that this viewpoint encompasses business roles, it's highly beneficial for them to have the ability to communicate their concerns, for instance, regarding business services and processes that IT elements need to support. This layer should be included in the viewpoint.

- **Application:** this layer is used to model application services that support the business and the applications that materialize them, as well as to describe the structure, behavior, and interaction of the company's applications (The Open Group, 2022). The concern of this viewpoint is the management of SW development projects with BizDevOps, and such software can be represented through this layer. Additionally, this viewpoint's concern considers the need for aligning IT/Business and maintaining agility during the process. Therefore, both elements from this layer and the business layer should be visible. For this reason, it is necessary to include this layer in the viewpoint.
- **Technology:** this layer is used to model both IT and operational technologies. This includes technologies such as processing, storage, and communication supporting the application and business layers. It also allows modeling physical or tangible elements like facilities, equipment, materials, and distribution networks (The Open Group, 2022). The BizDevOps team may also consider IT operations roles; therefore, it is appropriate to include this layer. Furthermore, as indicated, it allows modeling technologies supporting the application and business layers, which could be essential for maintaining agility or achieving alignment. However, physical elements that can be modeled are not part of the BizDevOps team's concern. Taking all of this into account, the technology layer is included, excluding physical layer components.
- **Migration and Implementation:** this layer is used to model elements that support the implementation and migration of architectures. This includes modeling implementation programs and projects to support program, portfolio, and project (The Open Group, 2022). Considering the focus of this layer and the objective of this viewpoint being the management of SW development projects and not the implementation and/or migration of architectures, this layer is excluded.

Based on the previous analysis, the layers that are useful for this viewpoint are: Business, Application, and Technology. Now, let's identify the aspects that

are useful for the BizDevOps-VP objective. This analysis is carried out considering the order in which the aspects are presented in Figure 2.

- **Passive Structure:** This aspect is used to model objects upon which behavior is performed; typically, these are information objects in the business layer and data objects in the application layer, but they can also be used to represent physical objects (The Open Group, 2022). The elements of this aspect could be useful to express the "what" regarding the concerns of the BizDevOps team. Therefore, this aspect is included.
- **Behavior:** This aspect is used to model elements that describe behavior (processes, functions, events, and services) performed by actors (The Open Group, 2022). These elements could be of great utility for the viewpoint when describing the "how" related to the concerns of the BizDevOps team. This aspect is included in the viewpoint.
- **Active Structure:** This aspect is used to model structural elements (business actors, application components, and devices that exhibit real behavior; in other words, the 'subjects' of activity) (The Open Group, 2022). The elements of this aspect could be very useful to establish "who" or "what" performs some behavior in the context of software project management. This aspect is included in the viewpoint.
- **Motivation:** This aspect is used to model the motivations or reasons that guide the design or change of an Enterprise Architecture (The Open Group, 2022). The elements of the motivation aspect could be useful when establishing the "why" of the concerns of the BizDevOps team. Additionally, it could be useful when communicating the drivers and objectives related to IT/Business alignment, thus facilitating the understanding of the BizDevOps team.

3.4 Element Selection

The analysis presented below delves deeper, down to the level of the elements that ArchiMate includes in each layer-aspect combination. Below are the elements that were not selected because they are not relevant to the purpose of the BizDevOps-VP and may degrade the team's ability to facilitate BizDevOps communication.

In Table 1, the not selected elements are presented along with their corresponding layer and aspect, along with the justification for that decision.

Table 1: Justification for not selecting ArchiMate elements.

Layer	Aspect	Element	Justification
Business	Passive Structure	Representation	The audience for this VP should not have the need to model representations of a business object.
	Behavior	Business Interaction	The interactions that occur in the business layer are not of interest to the entire audience of this VP and it could be confusing for IT stakeholders.
		Business Event	The events that occur in the business layer are not of interest to the entire audience of this VP and it could be confusing for IT stakeholders.
	Active Structure	Business Actor	For audience of this VP, it is not of interest to know which specific actor can carry out an activity.
		Business Collaboration	Business collaborations can be confusing for stakeholders outside the business area. Therefore, this element would not be useful for the VP.
Application	Behavior	Application Function	The behaviors that an application component may describe are not of interest to the entire audience of this VP because they are specific to IT stakeholders
		Application Interaction	The collective behaviors of an application may not be of interest to the entire audience of this VP because they are specific to the IT area's analysis.
		Application Process	The sequence of behaviors that describe an application is not of interest to the entire audience of this VP because it is specific to the IT area's analysis.
		Application Event	The change of state of an application is not of interest to the entire audience of this VP because it is specific to the analysis of the IT area.
	Active Structure	Application Collaboration	The aggregation of elements in the active structure of the application layer to represent collective behavior is of interest only to the IT audience of this VP.
Technology	Passive Structure	Artifact	The representation of data artifacts used or produced in a SW development process is of interest only to the IT audience of this VP.
	Behavior	Technology Function	The representation of behaviors specific to the active structure of the technology layer is of interest only to the IT audience of this VP.
		Technology Process	The representation of a sequence of behaviors in the technology layer is of interest only to the IT audience of this VP.
		Technology Interaction	The collective behavior of elements in the active structure of the technology layer is of interest only to the IT audience of this VP.
		Technology Event	A change of state in the technology layer is not of interest to the entire audience of this viewpoint because it is specific to the analysis of the IT area.
		Node	The representation of computational and/or physical resources in the technology layer is of interest only to the IT audience of this VP.
	Active Structure	Device	The representation of physical IT resources in the technology is of interest only to the IT audience of this VP.
		System Software	The representation of software systems in the technology layer is not of interest to the entire audience of this viewpoint because it is specific to the analysis of the IT area.
		Technology Collaboration	The representation of collective behavior in the technology layer is not of interest to the entire audience of this viewpoint because it is specific to the analysis of the IT area rather than the business area.
		Technology Interface	The access points to the technological layer services are of interest only to the IT audience of this VP.
		Path	The links between elements of the active structure in the technological layer are not of interest to the entire audience of this viewpoint.
		Communication Network	The connection structure of elements in the technology layer is not of interest to the entire audience of this viewpoint.
Generic	Motivation	Outcome	The outcome of a certain situation is not of interest to represent because the BizDevOps approach is a cyclic approach, and there is no final state.
		Value	The relative value of a concept is not useful to represent in this viewpoint because it has no utility in the SW project management process with BizDevOps.

3.5 Viewpoint Specification

Considering the specification requirements set by the ‘Viewpoint Mechanism’ of ArchiMate 3.2 (The Open Group, 2022), BizDevOps-VP is detailed in Table 2.

Table 2: BizDevOps-VP Specification.

Elements	Specification
Stakeholders	The BizDevOps team, composed of the following roles: Product Owner, Agility Manager (or ‘SCRUM Master’ if following SCRUM), and Other DevOps roles ⁵ .
Concerns	Managing a software project with BizDevOps while aligning IT/Business attempting to preserve the agility.
Purpose	Decide: The BizDevOps team needs to make decisions based on this perspective to align, maintain agility, and manage projects effectively. Inform: The BizDevOps team aims to ensure clear communication of software project management among all members.
Scope	In summary, it is multi-layered and multi-aspect, and in detail: (i) layers: Business, Application, and Technology (excluding the physical layer), and (ii) aspects: Passive and Active Structure, Behavior, and Motivation.
Element	The elements for this viewpoint are: <ul style="list-style-type: none"> ▪ Business Layer: Business Object, Contract, Product, Business Role, Business Interface, Business Process, Business Function, Business Service ▪ Application Layer: Data Object, Application Component, Application Service. ▪ Technology Layer: Technology Service ▪ Motivation Aspect: Assessment, Constraint, Driver, Goal, Meaning, Principle, Requirement, Stakeholder ▪ Location ▪ Grouping

4 VALIDATION

To validate the applicability of the viewpoint, we have chosen one case study from the company Arnia Software⁶, and we have conducted a proof of concept.

⁵ As developers, testers, designers, operations managers, among others (ISACA, 2020).

4.1 Case Study: Prepaid Card

The selected case study⁷ is related to the finances of an organization and require a software solution.

The company needed to implement an efficient way to manage corporate expenses through prepaid cards. The company developed a versatile product accessible through web and mobile interfaces, backed by a unified set of RESTful web services. This developed system was required to ensure high availability, zero downtime during maintenance and updates, and compliance with PCI DSS standards.

Key features of the solution include issuing prepaid cards, tracking and reporting on transactions, configuring and managing expense limits, enabling monitoring and approval by accounting departments, secure PCI-compliant storage of credit card information, and comprehensive transaction and balance management, including authorization acceptance and decline, as well as payments and virtual card capabilities.

From the outset of each project, the company leverages the benefits of Scrum and Kanban methodologies. Development team, based at the company's headquarters, consists of six members: three backend developers, one frontend developer, and two quality assurance specialists. The company maintain close collaboration with the Customer Service team and the infrastructure team, which includes project managers, sales, marketing experts, and specialized designers. The company Arnia Software approaches all projects with agility and flexibility, conducting daily Scrum meetings with sprints and delivering demonstrations every two weeks.

The architecture of the solution implemented by the company follows a client-server model with multiple clients, including a Single Page Application (SPA) for web browsers developed in Angular, as well as mobile applications for iOS and Android. The backend acts as a server and provides REST services written in Java 7 using the vert.x framework. The back office is kept completely isolated with separate frontend and backend components, accessible through a dedicated VPN. The solution was designed as a Software as a Service (SaaS) platform and supports multiple organizations within the same application cluster. The technologies used in the frontend include Angular, Grunt, and Bootstrap. Development tools encompass Jira, Jenkins, Github, and Ansible.

⁶ <https://www.arnia.com/about-us/>

⁷ <https://www.arnia.com/case-studies/banking-finance/>

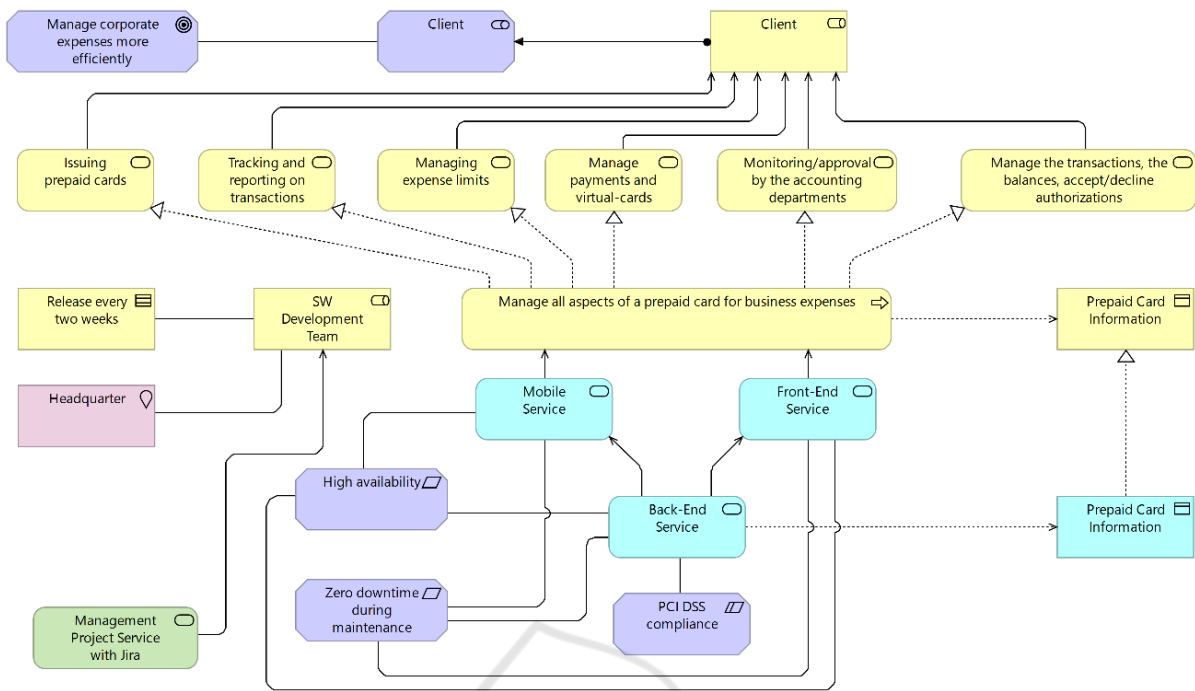


Figure 3: Result of Proof of Concept for the applicability of BizDevOps-VP to the case study.

4.2 Proof of Concept: Using BizDevOps-VP

An EA model has been created using BizDevOps-VP applied to the case study. The results can be seen in Figure 3. Using the components comprising BizDevOps-VP, we successfully captured all pertinent aspects of the case study. Certain elements within the application layer, as described in the case study, were intentionally excluded from the modeling to avoid potential distractions for non-IT team members. Nevertheless, fostering familiarity among business-oriented team members with IT concepts is a valuable goal. To illustrate, we included models of Back-end and Front-end services to emphasize the presence of software-related elements offering internal services.

The modeled case study currently employs an agile methodology based on Scrum and DevOps, as it has proven challenging to secure a real-world case where BizDevOps is already in practice. However, we contend that this is not a hindrance, given that BizDevOps is essentially an organic extension of DevOps, incorporating a business cycle. This presents an opportunity for us to validate its applicability.

By leveraging this model, we are confident that it will enhance communication among team members involved in business, development, and operations.

This benefit arises from the adoption of a comprehensive notation, filled with elements that enable a thorough description of the critical aspects they need to consider when managing the project.

Figure 3 illustrates an architectural view using the specified viewpoint, which emphasizes its potential to strengthen the software project management process. This potential is evident in how the development team can model and visualize internal agreements, constraints, and requirements within the team. Additionally, they can outline the services provided by various areas (business, development, and operations), understand the project's goals, and identify the involved stakeholders. Such an approach greatly facilitates a comprehensive understanding and management of the project, aligning the multifaceted aspects and the teams involved.

With the extensive descriptive capabilities of BizDevOps-VP, the team can amass information and make informed decisions regarding software project management, and likewise, effectively communicate their concerns.

In turn, the BizDevOps team can graphically illustrate how software services and components correspond with business requirements. This approach could considerably simplify the process of aligning IT with business strategies.

5 CONCLUSIONS AND FUTURE WORK

In this study, we introduce BizDevOps-VP, which is potentially beneficial for the management of software projects. BizDevOps-VP is promising in improving communication and decision-making within project teams, effectively fulfilling its designated goals.

Our proposal aims to support individuals responsible for overseeing BizDevOps initiatives who may not have prior experience with enterprise architecture practices. By utilizing architectural models with standardized notations, such as ArchiMate, we can improve comprehension of all facets that influence SW development with this approach.

We posit that BizDevOps-VP can assist in two crucial areas: (i) managing the inherent complexity associated with transitioning from DevOps to BizDevOps, and (ii) ensuring the proper balance between DevOps agility and alignment of software with the business. In this context, the proof of concept represents an initial step demonstrating the feasibility of our proposal. However, we think it's crucial to thoroughly validate our work. In the future, we plan to carry out detailed case studies in different organizations and survey field experts.

ACKNOWLEDGEMENTS

This work has been supported by the OASSIS project (PID2021-122554OB-C31, funded by MCIN / AEI / 10.13039/501100011033 / FEDER, EU), Grant PRE2019-087303, funded by MCIN/AEI/ 10.13039/501100011033, and by “ESF Investing in your future”.

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