

Towards Agile IT/Business Alignment at BizDevOps

Guillermo Fuentes-Quijada¹^a, Francisco Ruiz-González¹^b and Angélica Caro²^c

¹*Institute of Technology and Information Systems, University of Castilla-La Mancha, Ciudad Real, Spain*

²*Computer Science and Information Technologies Department, University of Bio-Bío, Chillán, Chile*

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

Abstract: BizDevOps extends DevOps with an additional business cycle that incorporates non-IT stakeholders. This additional cycle focuses on IT/Business alignment to better respond to the needs of organizations, but, so far, does not consider the challenge of agility. This can lead to a bottleneck in the software lifecycle, causing agility to be lost in the overall software lifecycle, even though the development and operations cycles, typical of DevOps, are agile. This position paper sets out a discussion of the problem and its relevance, the associated difficulties and possible approaches to a solution proposal. The difficulties identified correspond to four dimensions: stakeholders, processes, information, and resources. Among the most promising proposals to address the problem is Enterprise Architecture, but including agile practices, as included in the recent version 10 of the industry standard TOGAF.

1 INTRODUCTION


New software development approaches have been proposed in order to respond to the ever-changing needs of organizations (Gokarna & Singh, 2021). Some of these incorporate features to promote communication and collaboration between IT and business teams. BizDevOps is one of them and considers three continuous and integrated cycles (business, development and operations) to carry out the implementation of the organization's software requirements (Gruhn & Schäfer, 2015). BizDevOps has its origins in DevOps, which places special emphasis on aligning software development and operations teams with the goal of streamlining software production and delivery (Al-Zahrani & Fakieh, 2020; Hart & Burke, 2020; IEEE, 2021; Wiedemann, Wiesche, Gewalt, & Krcmar, 2020). BizDevOps extends DevOps with a third cycle, which incorporates the business perspective into software development (Drews, Schirmer, Horlach, & Tekaar, 2017). This approach, with its business cycle, aims to strengthen the involvement of business areas in IT processes, as this provides better aligned responses to the changing needs of organizations (Sanjurjo,


Pedreira, Garcia, & Piattini, 2020). This IT/Business alignment is one of the most challenging activities in IT management and governance for technology leaders, according to Kappelman, Johnson, Torres, Maurer, and McLean (2019).


One of the tools to facilitate and support IT/Business alignment is the Enterprise Architecture (EA) descriptions (Lankhorst, 2017). According to Lankhorst, an EA description is a coherent set of principles, methods and models that are used in the design and realization of an enterprise's organizational structure, business processes, information systems and infrastructure, which provide a holistic view of the organization.

Moreover, the integration between development and operations has already been favorably addressed with DevOps and agility (Almeida, Simões, & Lopes, 2022; Hemon, Lyonnet, Rowe, & Fitzgerald, 2020; Raj & Sinha, 2020; Snyder & Curtis, 2018). This is advantageous because there is an early detection of faults, improved team communication, less resource consumption (time, money) and improved software quality (Raj & Sinha, 2020).

Consequently, in the BizDevOps approach it could also be advantageous to incorporate agility in

^a <https://orcid.org/0000-0002-0798-5186>

^b <https://orcid.org/0000-0002-4923-7848>

^c <https://orcid.org/0000-0002-2066-7131>

the third cycle, thereby facilitating the inclusion of business-associated continuous engineering activities such as ‘Continuous Planning’ and ‘Continuous Budgeting’ (Fitzgerald & Stol, 2017). This would allow consideration of continuous IT/Business alignment proposals (Hinkelmann et al., 2016) in BizDevOps. However, being a more recent approach, it is still an open challenge.

With the above in mind, our motivation is to explore ways in which organizations can achieve IT/Business alignment while ensuring agility when using the BizDevOps approach. This would entail identifying or devising proposals to ensure that IT/Business alignment is achieved by following agile practices, and in turn is consistent with agile DevOps practices. This position paper aims to discuss the challenge, its difficulties and possible ways to address it.

The structure of this paper is as follows: Section 2 details the background to this work. Section 3 discusses the problem and possible ways to address it. Section 4 presents related work. Finally, Section 5 outlines the conclusions and future work.

2 BACKGROUND

Some of the main concepts related to this work are outlined next.

2.1 BizDevOps

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



Figure 1: BizDevOps cycles.

This approach emerges as an extension of DevOps, and seeks to integrate business stakeholders (Lohrasbinasab, Acharya, & Colomo-Palacios, 2020). DevOps is defined as a set of principles and

practices that enable better communication and collaboration among relevant stakeholders in order to specify, develop and operate software and systems products and services, and continuous improvements in all aspects of the lifecycle (IEEE, 2021).

In Gruhn and Schäfer (2015) BizDevOps is defined from three perspectives, each associated with one of the cycles (see Figure 1) to which the concept is linked. This definition indicates that:

- A BizDevOps approach allows people in the business departments to express and review requirements in a hands-on manner and thus reduces the necessary knowledge transfer from business to IT and provides fastest possible feedback cycles (the ‘Biz’ in BizDevOps).
- A BizDevOps approach allows IT departments to govern the whole application development process to ensure high quality of the software artifacts (the ‘Dev’ in BizDevOps).
- A BizDevOps approach provides an integrated and automated tool chain integration to allow as much automation and thus development pace (the ‘Ops’ in BizDevOps).

According to (Gruhn & Schäfer, 2015), BizDevOps ‘reinforces the collaboration between business, development, and operation stakeholders in the organization in order to enhance the software lifecycle’. One characteristic of BizDevOps is that of proposing that the stakeholders in the business areas play an active role in SW creation efforts and the fact that this approach seeks to quickly reflect changes in requirements in the SW products, with the objective of improving Time-to-Market (Gruhn & Schäfer, 2015). Strengthening the involvement of the business areas provides faster and better aligned responses to organizations’ changing needs, but the implementation of BizDevOps in an organization must take into account IT services and infrastructures, along with tasks, processes and roles (Sanjurjo et al., 2020).

2.2 Enterprise Architecture

EA allows us to protect the core of the organization while simultaneously having great flexibility and adaptability (Lankhorst, 2017). A good EA practice could help to achieve success in the organization (Lankhorst, 2017). The useful aspects of EA for software developers and researchers have been summarized in (Pérez-Castillo, Ruiz, Piattini, & Ebert, 2019). For example, it can be used as a tool to monitor technical resources and thus avoid

redundancies; it can also be used to control and share knowledge in a modular manner.

One of the main notations for Enterprise Architecture modeling is ArchiMate (Rouhani, Mahrin, Nikpay, Ahmad, & Nikfard, 2015). The ArchiMate notation, which is now in its version 3.2 (The Open Group, 2022a), is service-oriented and has 6 layers for modelling. Of these layers, three are of clear interest for BizDevOps initiatives. These are the business, application and technology layers.

2.2.1 TOGAF and Agility

One of the main de-facto standards employed for the EA practice is TOGAF (The Open Group Architecture Framework) (Kornysheva & Barrios, 2021; Simon, Fischbach, & Schoder, 2013; The Open Group, 2022c). TOGAF states that the purpose of EA *'is to optimize across the enterprise the often-fragmented legacy of processes (both manual and automated) into an integrated environment that is responsive to change and supportive of the delivery of the business strategy'*. Some of its main benefits are the following (The Open Group, 2022c): more effective and efficient business operations; more effective and efficient Digital Transformation and IT operations; better return on existing investment, reduced risk for future investment, and, faster, simpler and cheaper procurement.

TOGAF incorporates guidelines and methods to help those in charge of enterprise architectures to understand and integrate agile practices in the establishment of the first architecture of the organization and in its evolution. This framework leverages agile practices such as sprints with short iterations, which are useful for obtaining early stakeholder feedback and results. This enables enterprise architects to deliver value earlier and iteratively, either in a planned or emergent manner (The Open Group, 2022c).

3 DISCUSSION

Our focus is to study how to achieve IT/Business alignment while ensuring agility, in organizations using the BizDevOps approach in the context of software development. In this section, we discuss the various difficulties associated with this challenge and the solutions that have been presented in the literature; we then discuss possible ways to address this challenge.

3.1 Difficulties and Specific Solutions

Part of this study focused on understanding what the main difficulties of the Biz cycle are (see Figure 1) and how they affect organizations. So far, we have identified some difficulties in 4 dimensions, by means of a systematic mapping of the literature:

- **Stakeholders:** in the BizDevOps domain we can clearly identify two groups of stakeholders: business stakeholders and IT stakeholders (development and operations teams) (Lohrasbinasab et al., 2020). These stakeholders have a different culture, a different way of seeing and doing things. More importantly, they communicate differently (models, diagrams, etc.). In addition, business stakeholders are not familiar with many of the stages of the software development lifecycle. This creates barriers between teams when collaborating and communicating.
- **Processes:** In the development and operations cycles, the processes adopted by teams follow continuous engineering trends, which results in streamlining the software development lifecycle (Fitzgerald & Stol, 2017). On the other hand, in the business cycle, despite not being alien to agile practices (Oprins, Frijns, & Stettina, 2019), they are still far from being the *de facto* way to operate. It is common to use hierarchical and bureaucratic organizational structures and processes or worse, guided by poor and misapplied agility (Denning, 2020). On the other hand, there is a constant need to improve the time-to-market of organizations (Díaz, Almaraz, Pérez, & Garbajosa, 2018; Fitzgerald & Stol, 2017; Gruhn & Schäfer, 2015). But often the lack of alignment of the teams prevents them from achieving rapid responses to the demands of the organizations (Díaz et al., 2018).
- **Information:** in this dimension, works such as that of Hart and Burke (2020) have shown that one of the weaknesses of organizations is not having indicators that allow them to evaluate the performance of IT/Business alignment.
- **Resources:** in BizDevOps cycles, organizational needs must be met as quickly as possible. For this reason, software and infrastructure resources that facilitate and automate tasks have already been identified as critical to DevOps success (Azad, 2022). In the third cycle of BizDevOps, identifying tools that help or support IT/Business alignment tasks is an open challenge.

In the literature reviewed, different types of proposals describe ways to address these difficulties. Some of these proposals are presented below.

In terms of processes, the work of Samarawickrama and Perera (2017) proposes the use of SCRUM practices to standardize agile processes in DevOps. SCRUM (Sutherland, 2020) is a framework that helps solving complex problems in an agile way and its domain is not only related to software development. It should be remembered that we could use this framework to build a bridge or help business stakeholders to introduce agile practices into their processes. In addition, works such as Fitzgerald and Stol (2017) propose continuous engineering practices to improve time-to-market. In the field of development and operations, the practices of ‘Continuous Integration’ and ‘Continuous Deployment’ are proposed, while ‘Continuous Planning’ is proposed for the business field.

Regarding the stakeholders, BizDevOps describes values and principles for bridging gaps between IT and business teams. The work of Lohrasbinasab et al. (2020) describes the adoption of the values of the CAMS model (Culture, Automation, Measurement and Sharing) and principles such as ‘Value stream and process mapping’ among others, with the aim of establishing multidisciplinary teams sharing the same culture.

In the information dimension, particularly in terms of metrics and indicators, we have not identified proposals associated with BizDevOps. However, there are proposals associated with DevOps to measure the performance of ongoing tasks (Forsgren & Kersten, 2018; Sallin, Kropp, Anslow, Quilty, & Meier, 2021). Implementing an approach such as BizDevOps in an organization is risky in the absence of information such as indicators and/or metrics to assess its contribution.

In terms of resources, for *Biz* cycle we have not identified proposals, which is not the case for *Dev* and *Ops* cycles. The work of Kersten (2018) describes many tools that support the ongoing tasks associated with the development and operations cycles to facilitate the integration of these two teams.

3.2 Proposals for Agile Alignment of IT and Business

As already mentioned, the literature presents some ways of resolving the difficulties associated with the problem that motivates this work. However, tackling them individually does not solve the problem described. That is why it makes sense to seek holistic approaches to the problem.

In order to address the challenge presented and its difficulties, we believe that there are different ways of proceeding that allow us to generate proposals for solutions. One of these ways is to consider the use of enterprise architectures, as this was designed to facilitate the alignment of the ITs with the business since it considers business, systems and technology aspects in a holistic manner (Lankhorst, 2017). Besides, recent proposals such as TOGAF version 10 (The Open Group, 2022b) can be used to address this alignment with agility. This framework describes the use of SCRUM practices to adopt agility while exercising enterprise architecture practices. These agile practices could allow multidisciplinary teams (such as those established in BizDevOps with business, development and operations profiles) to achieve alignment without hindering the software development lifecycle. In addition to all this, in the practice of enterprise architecture, there are notations such as ArchiMate (The Open Group, 2022a), which allows us to communicate, analyze, share and agree on ideas, requirements and concerns in multidisciplinary teams. The idea is to take advantage of the fact that this visual language can be handled and understood by all the stakeholder profiles involved. The proposal is reinforced if we consider that, in the practice of enterprise architecture, communication, values and principles are part of its central axis (Lankhorst, 2017). This is similar to BizDevOps, where some of its pillars are the communication, values and principles it promotes (Lohrasbinasab et al., 2020).

In turn, the proposed solution can consider the use of artefacts such as reference architectures to specify how to implement this alignment in an agile way. A reference architecture is a kind of generic architectural template that provides guidelines and options for decision making in the development of more specific architectures and implementation of solutions (The Open Group, 2022c). In the context of BizDevOps, it could be the means to consider the key aspects of the approach and support to resolve IT/Business alignment in an agile way, while implementing solutions. Another useful artefact in this context could be the viewpoints (ISO/IEC/IEEE, 2011), which allow us to analyze and share the concerns and interests of each type of stakeholder, thereby supporting IT/Business alignment and establishing a standard form of communication in BizDevOps teams.

Despite this, it is easy to think (in the agile/IT context) that the concept of ‘enterprise architecture’ is synonymous with excessive documentation generation and rigid practices. This is at odds with

what BizDevOps and agile practices promote. We are aware of this concern and know that proposed solutions to this challenge must be an enabler of the process and not a new bottleneck. For this reason, the design of any solution will be designed with the objective of making the alignment process more flexible and agile.

It is also interesting to complement the toolkit inherited by BizDevOps to consider the tasks associated with alignment since in DevOps there are many tools that support the continuous tasks associated with this approach (Kersten, 2018). Nevertheless, it is necessary to have tools that facilitate the tasks associated with the third cycle of BizDevOps. Therefore, it makes sense to establish a toolkit that complements what already exists for DevOps and considers the Biz cycle.

Additionally, the inclusion of indicators and/or metrics associated with the agile alignment of IT/Business should be considered for BizDevOps. These should allow to feed back into the Biz cycle and make decisions about the process. This can be done by adapting proposals beyond the context of this approach, for example as proposed by Imgharene, Doumi, and Baina (2020), or by specifying new indicators and/or metrics that could include aspects associated with agile EA practice and allow us to evaluate and analyze whether alignment is taking place.

As already stated, there are several ways of proceeding and generating proposals to address the problem and its difficulties. The challenge of achieving agile IT/Business alignment in the context of BizDevOps is interesting considering that the use and the list of benefits of DevOps has increased over the last two decades (Faustino, Adriano, Amaro, Pereira, & da Silva, 2022).

4 RELATED WORK

We are not aware of proposals that address BizDevOps in conjunction with agile and EA practices. We have however identified proposals that address part of the challenge or consider partially useful solutions.

Considering the use of EA in the context of DevOps, Hadar and Hadar (2016) describe a reference architecture, with the authors concluding that the use of EAs '*cultivates knowledge reuse, harvests information, reduces misinterpretation and contributes to professional community cohesion*'. Austel et al. (2015) propose an enterprise architecture that specifies a holistic view of solutions enabling the

integration of development at the operations level. In Shahin, Rezaei Nasab, and Ali Babar (2021), descriptions of conceptual enterprise architectures are presented to guide how software is developed with DevOps. This type of SW development approach is not unrelated to the use of enterprise architectures and is a useful way to address certain issues such as communication and transmission of knowledge and concerns. It is worth mentioning that these proposals do not address IT/Business alignment.

Among the proposals that include software development and the use of EA practice is the one by Alzoubi and Gill (2020). In this proposal, the authors suggest that agile enterprise architecture has positive effects on active communication, on-budget completion, functionality and quality of software development. Hanschke, Ernsting, and Kuchen (2015) present a proposal for creating enterprise architecture deliverables when implementing an agile software project, using SCRUM and Serum (Software Engineering Risk: Understanding and Management). They also describe how enterprise architects can collaborate with agile software development teams. These proposals that consider the use of EA are not alien to agile practices. However, they do not consider BizDevOps and IT/Business alignment.

In the context of IT/Business alignment and BizDevOps, there are two interesting proposals. Gruhn and Schäfer (2015) describe a proposal to enable end-users to participate in the creation of applications and even to have at their disposal the necessary tools that allow them to create their own applications. The authors indicate that this helps to bridge the gap between the business and the IT department. However, we believe that this scenario is not the most frequent in organizations because end users are often not involved in software development. Our target scenario is where experts from each domain (business, development and operations) collaborate to realize the organization's software requirements.

In Forbrig (2018) a way to represent knowledge using a formal BPM-based notation, called S-BPM, is proposed for use in BizDevOps environments. This knowledge representation allows domain experts to express their ideas, make them understandable and visible, in a cross-cutting way, to all actors in the organization. This proposal aims to contribute to the alignment and, in particular, to the transversal communication of knowledge. Yet, formal notations require specific training, which means that not all business profiles can benefit from this proposal.

5 CONCLUSIONS

The study by Kappelman et al. (2019) shows that IT/Business alignment is in the top 10 of IT leaders' concerns. In addition, the same study details that among the top 10 practices associated with information technology in which organizations should invest more, is the practice of enterprise architecture. Considering these two facts, it is interesting to study agile enterprise architecture practices to address IT/Business alignment in software development projects using the BizDevOps approach.

Furthermore, the literature associated with BizDevOps has only presented ideas on how to address IT/Business alignment, but no concrete proposals have been specified to perform this task and certainly not on how to ensure agility. Therefore, it makes sense to think that, by presenting concrete solutions to the described problem, BizDevOps could be consolidated as a very beneficial replacement of DevOps for organizations.

Our paper has presented the discussion of the described problem, addressing four dimensions of difficulties encountered (stakeholders, processes, information and resources) and discussing some proposals addressing them. Then, we have discussed different ways to generate proposals for solutions that address the problem or part of it, being the use of enterprise architectures one of the most complete proposals for this purpose. This is so since it describes interesting characteristics, such as helping to address IT/Business alignment, providing a holistic description of the organization and, in addition, the ability to perform an agile practice of it. We believe these characteristics are suitable for solving the potential business cycle bottleneck and addressing alignment activities in BizDevOps.

As future work we intend to further explore this challenge, as well as specify and validate the solution proposals to assist in the IT/business alignment task of the third cycle of BizDevOps.

ACKNOWLEDGEMENTS

This work has been supported by 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”.

REFERENCES

- Al-Zahrani, S., & Fakieh, B. (2020). How DevOps Practices Support Digital Transformation. *International Journal of Advanced Trends in Computer Science and Engineering*, 9(3), 2780-2788. doi:10.30534/ijatcse/2020/46932020
- Almeida, F., Simões, J., & Lopes, S. (2022). Exploring the Benefits of Combining DevOps and Agile. *Future Internet*, 14(2). doi:10.3390/fi14020063
- Alzoubi, Y. I., & Gill, A. Q. (2020). An Empirical Investigation of Geographically Distributed Agile Development: The Agile Enterprise Architecture is a Communication Enabler. *IEEE Access*, 8, 80269-80289. doi:10.1109/access.2020.2990389
- Austel, P., Chen, H., Mikalsen, T., Rouvellou, I., Sharma, U., Silva-Lepe, I., & Subramanian, R. (2015). *Continuous Delivery of Composite Solutions*. Paper presented at the Proceedings of the 2nd International Workshop on Software-Defined Ecosystems, Portland, Oregon, USA.
- Azad, N. (2022, 18-18 May 2022). *Understanding DevOps critical success factors and organizational practices*. Paper presented at the 2022 IEEE/ACM International Workshop on Software-Intensive Business (IWSiB).
- Denning, S. (2020). The quest for genuine business agility. *Strategy & Leadership*, 48(1), 21-28. doi:10.1108/SL-11-2019-0166
- Díaz, J., Almaraz, R., Pérez, J., & Garbajosa, J. (2018). *DevOps in Practice: An Exploratory Case Study*. Paper presented at the Xp '18.
- Drews, P., Schirmer, I., Horlach, B., & Tekaath, C. (2017). *Bimodal Enterprise Architecture Management: The Emergence of a New EAM Function for a BizDevOps-Based Fast IT*. Paper presented at the IEEE 21st International Enterprise Distributed Object Computing Workshop (EDOCW), Quebec City, QC, Canada.
- Faustino, J., Adriano, D., Amaro, R., Pereira, R., & da Silva, M. M. (2022). DevOps benefits: A systematic literature review. *Software: Practice and Experience*, 52(9), 1905-1926. doi:10.1002/spe.3096
- Fitzgerald, B., & Stol, K.-J. (2017). Continuous software engineering: A roadmap and agenda. *Journal of Systems and Software*, 123, 176-189. doi:10.1016/j.jss.2015.06.063
- Forbrig, P. (2018). *BizDevOps and the Role of S-BPM*. Paper presented at the Proceedings of the 10th International Conference on Subject-Oriented Business Process Management, Linz, Austria.
- Forsgren, N., & Kersten, M. (2018). DevOps metrics. *Communications of the ACM*, 61(4), 44-48. doi:10.1145/3159169
- Gokarna, M., & Singh, R. (2021). *DevOps: A Historical Review and Future Works*. Paper presented at the International Conference on Computing, Communication, and Intelligent Systems (ICCCIS), Greater Noida, India.
- Gruhn, V., & Schäfer, C. (2015). *BizDevOps: Because DevOps is Not the End of the Story*. Paper presented at the Intelligent Software Methodologies, Tools and Techniques. SoMeT 2015. Communications in Computer and Information Science.

- Hadar, E., & Hadar, I. (2016). *CURA: Complex-system Unified Reference Architecture - Position Paper: A Practitioner View*. Paper presented at the Proceedings of the 11th International Conference on Evaluation of Novel Software Approaches to Software Engineering, Rome, Italy.
- Hanschke, S., Ernsting, J., & Kuchen, H. (2015). *Integrating Agile Software Development and Enterprise Architecture Management*. Paper presented at the 2015 48th Hawaii International Conference on System Sciences.
- Hart, M., & Burke, J. (2020). An Exploratory Study on the DevOps IT Alignment Model. *Interdisciplinary Journal of Information, Knowledge, and Management*, 15, 127-154. doi:10.28945/4595
- Hemon, A., Lyonnet, B., Rowe, F., & Fitzgerald, B. (2020). From Agile to DevOps: Smart Skills and Collaborations. *Information Systems Frontiers*, 22(4), 927-945. doi:10.1007/s10796-019-09905-1
- Hinkelmann, K., Gerber, A., Karagiannis, D., Thoenssen, B., van der Merwe, A., & Woitsch, R. (2016). A new paradigm for the continuous alignment of business and IT: Combining enterprise architecture modelling and enterprise ontology. *Computers in Industry*, 79, 77-86. doi:10.1016/j.compind.2015.07.009
- IEEE. (2021). IEEE 2675: 2021 IEEE Standard for DevOps. *IEEE Standard for DevOps*, 92-92. Retrieved from <https://standards.ieee.org/standard/2675-2021.html>
- Imgharene, K., Doumi, K., & Baina, S. (2020, 29 June-2 July 2020). *Agility metrics model for Business IT Alignment*. Paper presented at the 2020 7th International Conference on Control, Decision and Information Technologies (CoDIT).
- ISO/IEC/IEEE. (2011). ISO/IEC/IEEE 42010:2011 - Systems and software engineering — Architecture description. *Architecture description*, 37. Retrieved from <https://www.iso.org/standard/50508.html>
- Kappelman, L., Johnson, V., Torres, R., Maurer, C., & McLean, E. (2019). A study of information systems issues, practices, and leadership in Europe. *European Journal of Information Systems*, 28(1), 26-42. doi:10.1080/0960085X.2018.1497929
- Kersten, M. (2018). A Cambrian Explosion of DevOps Tools. *IEEE Software*, 35(2), 14-17. doi:10.1109/ms.2018.1661330
- Kornysheva, E., & Barrios, J. (2021). Process-oriented Knowledge Representation of the Requirement Management Phase of TOGAF-ADM: an Empirical Evaluation. *Procedia Computer Science*, 192, 2239-2248. doi:10.1016/j.procs.2021.08.237
- Lankhorst, M. (2017). *Enterprise Architecture at Work* (4 ed.). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Lohrasbinasab, I., Acharya, P. B., & Colomo-Palacios, R. (2020). *BizDevOps: A Multivocal Literature Review*. Paper presented at the Computational Science and Its Applications -- ICCSA 2020, Cagliari, Italy.
- Oprins, R. J. J., Frijns, H. A., & Stettina, C. J. (2019, 2019//). *Evolution of Scrum Transcending Business Domains and the Future of Agile Project Management*. Paper presented at the Agile Processes in Software Engineering and Extreme Programming, Cham.
- Pérez-Castillo, R., Ruiz, F., Piattini, M., & Ebert, C. (2019). Enterprise Architecture. *IEEE Software*, 36(4), 12-19. doi:10.1109/MS.2019.2909329
- Raj, P., & Sinha, P. (2020). Project Management In Era Of Agile And Devops Methodologies. *International Journal of Scientific & Technology Research*, 9, 1-1.
- Rouhani, B. D., Mahrin, M. N. r., Nikpay, F., Ahmad, R. B., & Nikfard, P. (2015). A systematic literature review on enterprise architecture implementation methodologies. *Information and Software Technology*, 62 (February 2016), 1-20. doi:10.1016/j.infsof.2015.01.012
- Sallin, M., Kropp, M., Anslow, C., Quilty, J. W., & Meier, A. (2021, 2021//). *Measuring Software Delivery Performance Using the Four Key Metrics of DevOps*. Paper presented at the Agile Processes in Software Engineering and Extreme Programming, Cham.
- Samarawickrama, S. S., & Perera, I. (2017). *Continuous scrum: A framework to enhance scrum with DevOps*. Paper presented at the Seventeenth International Conference on Advances in ICT for Emerging Regions (ICTer), Colombo, Sri Lanka.
- Sanjurjo, E., Pedreira, O., Garcia, F., & Piattini, M. (2020). *Process Reference Model for BizDevOps*. Paper presented at the 15th Iberian Conference on Information Systems and Technologies (CISTI), Seville, Spain.
- Shahin, M., Rezaei Nasab, A., & Ali Babar, M. (2021). A qualitative study of architectural design issues in DevOps. *Journal of Software: Evolution and Process*. doi:10.1002/smr.2379
- Simon, D., Fischbach, K., & Schoder, D. (2013). An Exploration of Enterprise Architecture Research. *Communications of the Association for Information Systems*, 32, 1-72. doi:10.17705/1CAIS.03201
- Snyder, B., & Curtis, B. (2018). Using Analytics to Guide Improvement during an Agile-DevOps Transformation. *IEEE Software*, 35(1), 78-83. doi:10.1109/ms.2017.4541032
- Sutherland, J. S., Ken. (2020). *Scrum Guide*. Retrieved from <https://scrumguides.org/index.html>
- The Open Group. (2022a). ArchiMate® 3.2 Specification. Retrieved from <https://pubs.opengroup.org/architecture/archimate32-doc/>
- The Open Group. (2022b). *Enabling Enterprise Agility*. Retrieved from <https://pubs.opengroup.org/togaf-standard/guides/enabling-enterprise-agility/index.html>
- The Open Group. (2022c). TOGAF® Standard, Version 10. *TOGAF® Standard, Version 10*. Retrieved from <https://www.opengroup.org/togaf/10thedition>
- Wiedemann, A., Wiesche, M., Gewalt, H., & Krcmar, H. (2020). Understanding how DevOps aligns development and operations: a tripartite model of intra-IT alignment. *European Journal of Information Systems*, 29(5), 458-473. doi:10.1080/0960085X.2020.1782277