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Integrated architectural approach to designing a digital ecosystem for teacher development using The Open Group framework and domain-driven design

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Abstract

The aim of this study is to develop a conceptual architectural model that integrates The Open Group Architecture Framework (TOGAF) and Domain-Driven Design (DDD) to address fragmentation and structural inconsistency in digital ecosystems for Continuous Professional Development of Teachers (CPDT). In response to the growing complexity of educational platforms, a method is proposed to formalize the connection between business segments and bounded contexts within the domain layer, thereby ensuring architectural scalability and resilience. The architectural modeling was conducted using the TOGAF framework, informed by interviews, observations, and analysis of the legal and regulatory framework. The study was carried out in collaboration with JSC "Orleu," a leading national hub for teacher development in Kazakhstan. Business processes were structured, segmented, and visualized using BPMN notation and mapped to DDD contexts. The resulting model establishes correspondences: TOGAF segment → DDD domain, business function → bounded context, process → use case, application → microservice. This mapping allows the architecture of CPDT systems to be formalized based on domain-driven semantic logic, promoting coherence and design sustainability. The proposed approach may be applied in the development of scalable educational digital platforms and microservice-ready architectures in both public and private sectors.

Keywords: Continuous professional development of teachers (CPDT), Digital transformation, Domain-driven design (DDD), Enterprise architecture, Microservices architecture, Professional learning, The open group architecture framework (TOGAF).

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1. Introduction

The digital transformation of education continues to accelerate, demanding new models for the design, implementation, and development of educational systems. One of the key areas significantly affected by these changes is Continuous Professional Development of Teachers (CPDT). In the context of increasingly complex professional responsibilities and growing demands for flexibility and adaptability, there is a pressing need for scalable and structured digital ecosystems that support the sustainable growth of educators throughout their careers.

Despite ongoing efforts to implement digital tools and platforms for CPDT, existing solutions remain fragmented. Educational institutions, government initiatives, and private EdTech providers often develop isolated applications lacking a unified architectural foundation. This absence of structural design leads to functional duplication, low interoperability, degraded user experience, and high maintenance costs. In many cases, systems evolve reactively to administrative needs rather than through strategic architectural planning.

In academic and applied literature, well-established enterprise-level architectural frameworks such as TOGAF are widely recognized and frequently used in IT governance, particularly in the public sector. In parallel, Domain-Driven Design (DDD) has proven effective in aligning technical implementation with business logic, especially in microservices-based architectures. However, the methodological integration between TOGAF and DDD remains underdeveloped, particularly in the context of designing educational digital platforms.

This study aims to address this gap by proposing a conceptual architectural model that integrates enterprise segmentation via TOGAF with bounded contexts as defined in DDD. The resulting model serves as a foundation for constructing logically coherent, scalable, and domain-oriented CPDT ecosystems.

The central research questions of this study are as follows:

1. How can the architectural principles of TOGAF and DDD be integrated into a unified methodology?
2. What correspondence can be established between enterprise segments, business functions, and domain contexts?
3. How can this model be applied to the design of scalable CPDT platforms?

The scientific novelty of this work lies in the formalization of a unified architecture that connects the strategic vision of the organization with the logic of application-level implementation. This integration enables educational platform designers to maintain coherence across business and technical layers, facilitating the creation of sustainable digital ecosystems that are microservice-ready and capable of continuous growth.

2. Literature Review

2.1. TOGAF in Education and Digital Systems

The Open Group Architecture Framework (TOGAF) has been increasingly adopted in digital education systems to structure and manage complex IT infrastructures. Its layered approach to enterprise architecture enables organizations to align technology with institutional goals, facilitating strategic planning and resource optimization. For instance, Manapova et al. [2] proposed a TOGAF-based framework for designing chemistry education tools, highlighting the benefits of structured digital ecosystems in education. Their work emphasizes that architecture-driven development can improve system coherence, modularity, and long-term scalability.

In a broader educational context, TOGAF has also been used to model organizational-level change, particularly in higher education institutions aiming to digitize and synchronize their administrative and learning environments. Prima et al. [1] demonstrated such use in designing a shared service educational architecture to optimize institutional performance.

Additionally, Amangeldi et al. [3] proposed a conceptual model of methodological training for future vocational educators, emphasizing the value of structured systems thinking in teacher preparation frameworks. Aidos et al. [4] investigated how IT educators perceive their own methodological development, reinforcing the need for digital CPDT platforms to align with domain-specific pedagogical expectations.

2.2. Domain-Driven Design in EdTech and IT Systems

Domain-Driven Design (DDD), originally proposed by Eric [5], provides a methodology for structuring software systems around domain logic. Chunxia [6] applied DDD principles in modular textile pattern systems, demonstrating how business complexity can be isolated in bounded contexts.

Serhii [7] introduced DDD-based principles into distributed control systems design, demonstrating how such approaches can reinforce modularity and reduce interdependencies. XiaoKang et al. [8] explored the implementation of a microservices-based online learning platform, validating DDD-compatible practices in modular educational software architectures.

While these works focus on implementation details, they often lack an architectural bridge to enterprise-level strategy. This disconnect limits their generalizability across larger educational systems.

2.3. Enterprise Architecture vs Application Design

A persistent theme in the literature is the disconnect between enterprise-level architectural planning and application-level implementation. For instance, Pankaj and Sukhjinder [9] applied aspect-oriented principles to e-learning systems but remained focused on modular code design without enterprise integration.

Chuncheng [10] presented an educational management system architecture using the SSH framework, but again, it had a limited focus on software layers, ignoring how such systems reflect or serve organizational objectives.

Silalahi, et al. [11] analyzed the effectiveness of LMS systems through the Zachman framework, contributing insights on layered component representation but not addressing semantic alignment between business and application logic.

These studies, while valuable, reinforce the observation that architectural coherence across all layers remains a challenge in educational IT system design.

2.4. Research Gap: Lack of TOGAF–DDD Integration in Educational IT Platforms

Despite the growing adoption of both TOGAF and DDD in education-related systems, there is a clear methodological gap in the literature concerning their structured integration. No established framework currently maps TOGAF's business segments to DDD's bounded contexts in a way that supports a coherent and scalable educational ecosystem design.

This paper addresses that gap by proposing a unified architectural model that links enterprise segmentation (TOGAF) with domain-driven implementation strategies (DDD), specifically tailored for CPDT platforms. This approach ensures traceability from strategic planning to modular application deployment, offering a bridge between abstract architecture and real-world execution in educational systems.

3. Methodology

This study employs an integrated methodology that combines the principles of TOGAF and the Domain-Driven Design (DDD) approach to develop the architecture of a digital ecosystem for Continuous Professional Development of Teachers (CPDT).

TOGAF (The Open Group Architecture Framework) is a widely adopted enterprise architecture framework that covers all key architectural layers: business, data, application, and technology. Its core component is the Architecture Development Method (ADM), which provides a structured process for the ongoing development of architectural solutions throughout the enterprise lifecycle [12].

Domain-Driven Design (DDD), introduced by Domain [13], focuses on modeling complex software systems through a deep understanding of the business domain. Its key concepts include bounded contexts and domain models, which enable the creation of software solutions that align closely with business logic and the structure of the subject area.

The integration of TOGAF and DDD ensures end-to-end alignment between an organization's strategic goals and the implementation of technical solutions. This approach enables a logical connection between business processes, architectural layers, and software components, ensuring structural consistency, adaptability to change, and scalability of the designed ecosystem.

Thus, the combination of TOGAF and DDD provides a methodological foundation for designing digital educational ecosystems that are capable of sustainable development in the context of rapid changes in science and education.

Figure 1 presents a methodological diagram that illustrates the general approach used to design the CPDT digital ecosystem architecture.

The process comprises two interrelated stages: data collection—which includes regulatory analysis, review of internal documentation, and stakeholder interviews—and subsequent architectural modeling, implemented through the integration of TOGAF and Domain-Driven Design. This structure ensures logical continuity between the analytical foundation and the architectural design of the solution.

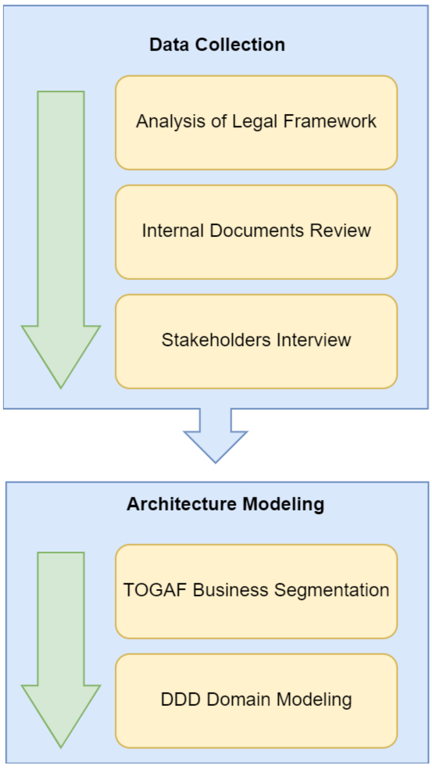

Figure 1.
General methodological approach to developing the architecture of the CPDT digital ecosystem.

3.1. Data Collection

The data collection process was carried out in four sequential stages:

1. Analysis of the legal and regulatory framework of the Republic of Kazakhstan in the field of science and education: this included a review of eight laws, six codes, two government decrees, and twenty-two orders of the Ministry of Education and Science of the Republic of Kazakhstan.
2. Review of internal regulations and processes of JSC "National Center for Professional Development "Orleu": internal policies, methodological materials, and institutional reports related to teacher professional development were analyzed.
3. Stakeholder interviews: Interviews were conducted with heads of sectoral departments, regional branches, teachers, and research staff to identify current needs and challenges in the CPDT domain.

This structured, multi-source approach ensures a comprehensive understanding of the current state and functional requirements of the CPDT system.

3.2. Architecture Modeling

The architecture of the CPDT digital ecosystem was developed through a two-stage methodology that integrates the principles of TOGAF and Domain-Driven Design (DDD).

In the first stage, using the TOGAF framework, key business segments of the system were identified, reflecting its major functional areas. As a result of analyzing the structure and processes of CPDT, four core segments were defined: course planning and development, training management, program effectiveness evaluation, and teacher support and mentoring. Each segment was examined in terms of its specific functions, business processes, and interactions with other components, thereby forming a coherent picture of the ecosystem's operational logic and laying the foundation for deeper architectural modeling.

In the second stage, following the Domain-Driven Design approach, each business segment was further refined into subject areas (domains) and bounded contexts. These bounded contexts were defined based on the logical cohesion of processes and terminology, ensuring internal consistency and clearly delineated areas of responsibility within the ecosystem [14]. Within each context, domain models were developed, including entities, aggregates, and service components that accurately reflected the structure and dynamics of real educational processes. This modeling enabled the transformation of business segments into technically coherent units, ready for implementation within a microservice architecture.

Thus, the integration of TOGAF for formalizing business architecture and DDD for in-depth domain modeling creates a foundation for building a structurally consistent, scalable, and adaptive CPDT digital platform, aligned with the demands of a rapidly evolving educational environment.

3.3. TOGAF–DDD Mapping Logic

The integration of TOGAF and DDD was implemented by establishing direct correspondences between the respective architectural levels of each methodology, as presented in Table 1.

Table 1.
Mapping of TOGAF levels with DDD.

TOGAF	DDD	Description
Business-segment	Domain	CPDT Subject Area
Business-function	Bounded Context	Isolated Logical Context
Business-process	Use Cases	Implemented Processes Within the Context
Application Service	Microservice	Technical Implementation of Functionality

This mapping ensured alignment between the strategic level of the architecture and its implementation, enabling effective complexity management and ensuring the scalability of the CPDT system.

4. Results

4.1. Analysis of Legal and Regulatory Acts

The analysis of legal and regulatory acts of the Republic of Kazakhstan revealed key requirements that define the architectural foundations of the digital ecosystem for Continuous Professional Development of Teachers (CPDT).

The Law "On Education" and the Law "On the Status of a Teacher" establish strategic priorities for the development of teachers' professional competencies and emphasize the need for digital transformation in support and development processes.

The Law "On Science" provides the basis for scientific and methodological support of CPDT, requiring architectural solutions for knowledge and innovation management.

The Labor Code and Civil Code establish the legal framework for structuring HR processes and contractual mechanisms within the functioning of CPDT platforms.

Government Resolution No. 232 and orders issued by the Ministry of Education and Science specify the requirements for the organization of teacher qualification enhancement courses, outlining the structure and methodological principles of educational processes.

Thus, the regulatory framework defines a multi-level legal and content-based foundation for designing CPDT systems, necessitating the integration of educational, legal, and organizational requirements into a unified architectural model based on the principles of TOGAF and DDD.

This legal analysis allows for the formulation of core methodological requirements for the effective architectural implementation of CPDT:

1. Application of TOGAF to structure the educational architecture, ensuring alignment between strategic goals, business processes, and the technological infrastructure of the CPDT system.
2. Use of DDD for modeling domain-specific areas, enabling accurate representation of real business processes, educational scenarios, and the specific features of professional competency development.

The integration of TOGAF and DDD provides a unified architectural foundation that ensures manageable complexity, scalability, and the resilience of the CPDT system to changes in both internal and external environments.

For a more detailed overview of the identified legal requirements and their influence on CPDT architecture design, the following table presents an analysis of the key normative legal acts.

Table 2.
Analysis of the regulatory framework of CPDT in the Republic of Kazakhstan.

№	Legal/Regulatory Act	Summary	Analysis	Conclusion	Source
1	Law of the Republic of Kazakhstan “On Education”	Establishes general principles and the structure of the education system, including requirements for educational programs and teacher qualifications.	Defines the framework for CPDT program development and implementation, requiring a systematic architectural approach.	Supports the use of TOGAF for structuring educational architecture and DDD for domain modeling.	The Law of the Republic of Kazakhstan dated 27 [15]
2	Law of the Republic of Kazakhstan “On the Status of a Teacher”	Defines the rights, duties, and social guarantees of teachers, including requirements for their professional development.	Emphasizes the importance of CPDT and the need for digital solutions to support and manage it.	Necessitates the integration of CPDT into digital platforms in accordance with TOGAF and DDD principles.	Law of the Republic of Kazakhstan dated May 2 [16]
3	Law of the Republic of Kazakhstan “On Science”	Regulates scientific activities, including the training of scientific personnel and research funding.	Establishes the basis for scientific and methodological support of CPDT, requiring architectural solutions for knowledge management.	Supports TOGAF for structuring scientific activities and DDD for modeling scientific processes.	Law of the Republic of Kazakhstan dated December 27 [17]
4	Labour Code of the Republic of Kazakhstan	Regulates labor relations, including recruitment, dismissal, and working conditions for teachers.	Defines the legal framework for HR management in educational institutions, requiring HR process integration into CPDT architecture.	Supports TOGAF for modeling HR processes and DDD for detailed personnel management functions.	Code of the Republic of Kazakhstan dated 23 November [18]
5	Civil Code of the Republic of Kazakhstan	Establishes general principles of civil law, including ownership and contractual obligations.	Provides the legal basis for contract management and asset governance in education, which must be reflected in CPDT architecture.	Supports TOGAF for modeling legal aspects of CPDT and DDD for detailing legal processes.	Enforced by the Decree of the Supreme Council of the Republic of Kazakhstan dated December 27 [19]
6	Government Resolution No. 232 of February 17, 2012	Approves the rules for organizing and conducting teacher qualification enhancement courses.	Defines CPDT standards, including training formats and program requirements, necessitating an architectural approach.	Supports TOGAF for structuring CPDT programs and DDD for modeling educational processes.	Resolution of the Government of the Republic of Kazakhstan dated [20]
7	Order of the Minister of Education and Science “Rules for Organizing and	Establishes the procedures for organizing and conducting teacher training, including content and methodology requirements.	Defines the methodological foundations of CPDT, requiring a systematic approach	Supports TOGAF for structuring methodological processes and DDD for detailing	Order of the Minister of Education and Science of the Republic of Kazakhstan dated January [21]

	Conducting Teacher Qualification Courses”		through architectural modeling.	educational contexts.	
8	Order of the Minister of Education and Science: “Rules for Developing and Approving Educational Programs for CPDT”	Regulates the development, approval, and coordination of CPDT programs.	Establishes standards for program design, necessitating an architectural approach to planning and implementation.	Supports TOGAF for structuring CPDT programs and DDD for modeling educational processes.	Order of the Minister of Education and Science of the Republic of Kazakhstan dated [22]

4.2. Analysis of Internal Regulatory Documents

A detailed analysis of internal documentation is not presented due to confidentiality restrictions. However, the content of these materials was taken into account in the formation of architectural decisions and the development of the CPDT system model.

4.3. Interview Results and Business Process Modeling

As part of the CPDT architecture development project, a comprehensive series of interviews was conducted with key structural divisions of JSC "National Center for Professional Development 'Orleu'" and its regional branch. The aim of this stage was to gain an in-depth understanding of current business processes, identify needs and challenges, and collect data to inform subsequent architectural modeling of the system.

4.4. Objectives of the Interviews

The main objectives of the interviews were as follows:

- To identify and describe existing business processes related to CPDT;
- To determine the needs and expectations of various departments in the context of CPDT;
- To collect information for building the architectural model of the CPDT system using TOGAF and DDD approaches.

4.5. Data Collection Methodology

The data collection process was organized as follows:

1. Preparatory Phase:
   - Identification of relevant departments and the regional branch for interviewing;
   - Development of an interview framework including questions on current processes, IT systems in use, known challenges, and expectations from the future CPDT system.
2. Interview Phase:
   - Conduct of individual and group interviews with representatives from the following units:
     1. Department of Educational and Methodological Work
     2. Department of Educational Process Management
     3. Humanities Laboratory
     4. Leadership and Education Laboratory
     5. Department of Strategy and International Cooperation
     6. Department of Analytics and Research
     7. Department of Quality Assessment
     8. Department of IT Infrastructure Development
     9. Department of Information Systems Administration
     10. Department of Software Development
     11. Regional Branch of JSC “Orleu”
   - Semi-structured interviews were used to obtain both quantitative and qualitative insights.

2.Data Analysis and Systematization:
- Processing and synthesis of the collected information, identification of key processes, problem areas, and system requirements;
- Modeling of business processes using BPMN notation and tools such as Microsoft Visio.

4.6. Interview Results

The interviews yielded the following outcomes:

- A total of 18 key business processes related to CPDT were identified and described;
- The main functional requirements and expectations of various departments were documented;

  A comprehensive dataset was collected to support the construction of the architectural model of the CPDT system based on TOGAF and DDD.

As a result of the interview stage, a Global Segmentation View was developed in accordance with the TOGAF methodology. This model enabled the structuring of business functions and processes while ensuring alignment between the organization's strategic goals and its operational activities.

For visualization and analysis purposes, business processes were modeled using BPMN notation. This provided a clear view of action sequences, interdepartmental interactions, and potential process bottlenecks.

The following artifacts are presented below:

- A Global Segmentation View, reflecting the structure and interrelation of business functions;
- An example BPMN-modeled business process, illustrating a specific CPDT process in practice.

These materials form the basis for the further design and implementation of an effective continuous professional development system for teachers within JSC "Orleu".

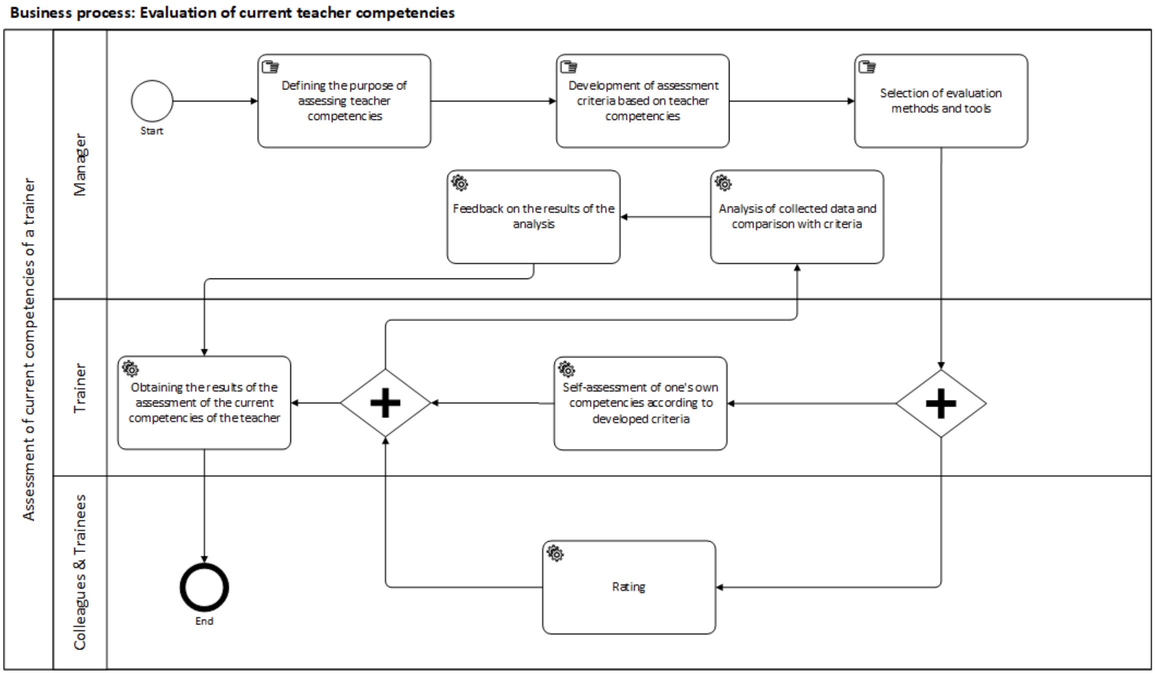

Figure 2.
Example 1 of a visualized business process.

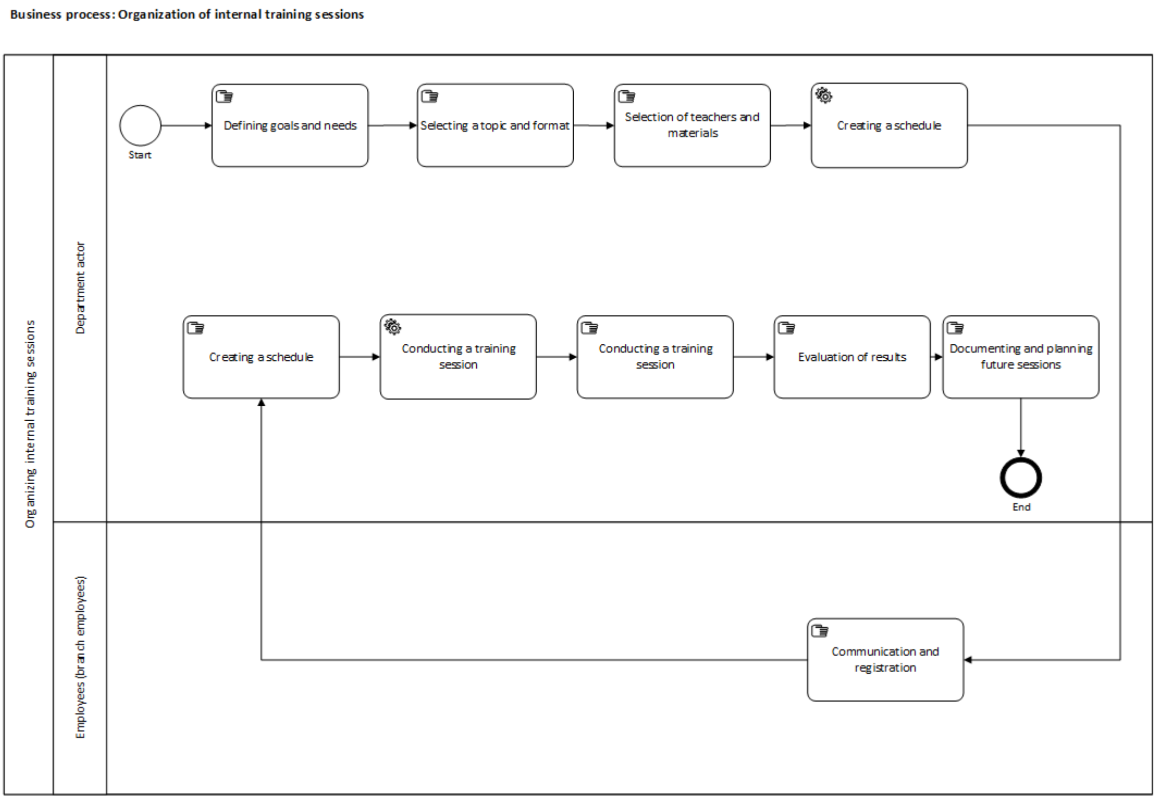

Figure 3.
Example 2 of a visualized business process.

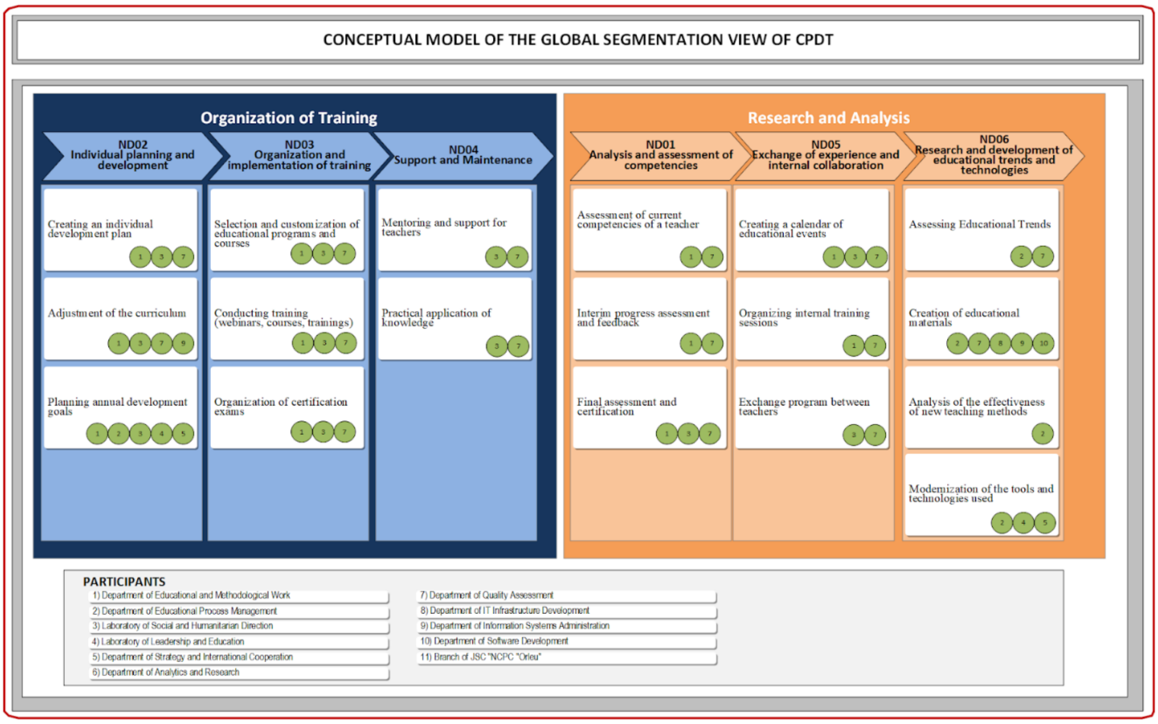

Figure 4.
Global Segmentation View

4.7. Application-Level Architecture

As part of the CPDT architecture design, two core domains were identified:

1. Learning Organization (ND02, ND03, ND04)

This domain encompasses the entire educational activity cycle: from the planning of individual development trajectories to the organization and delivery of training, as well as ongoing teacher support.

2. Research and Analysis (ND01, ND05, ND06)

This domain includes the assessment of teacher competencies, experience sharing, internal collaboration, and the exploration of educational trends and technologies.

4.8. Bounded Context

Bounded context was established based on business functions. Each arrow (representing a business function) defines a separate bounded context. Within each context, only those business processes (white rectangles) that are closely linked by domain logic and naturally group together are included.

Each bounded context is characterized by:

- Clearly defined boundaries of responsibility,
- Its own data models,
- Its own rules for information processing,
- Isolated services.

This fully aligns with DDD principles, ensuring logical independence of contexts and simplifying their individual development.

4.9. Microservices Design

Each bounded context is then mapped to a corresponding microservice.

Rationale for choosing microservices architecture:

- Each business function is encapsulated within a bounded context, which naturally maps to an independent service.
- Microservices provide scalability, development autonomy, and complexity management.
- Individual services can be scaled independently, without impacting on the entire system.
- Deployment, updates, and testing are simplified.
- The risk of cascading system failures is significantly reduced.

Accordingly, the architecture is consistent with TOGAF principles (at the Application Architecture layer) and adheres to contemporary best practices for designing distributed systems.

The microservice design illustrated below is based on Domain-Driven Design (DDD) methodology and structured according to the TOGAF segmentation model.

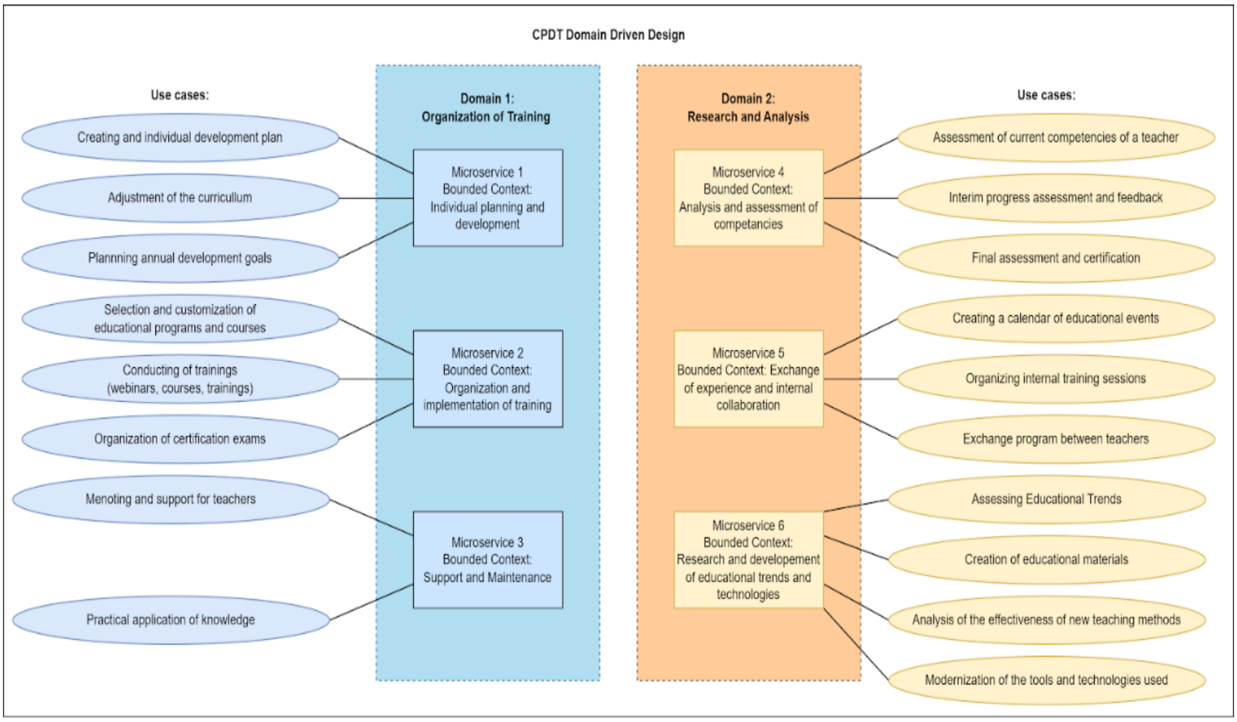

Figure 5.
Domain Driven Design of CPDT processes based on TOGAF.

4.10. Advantages of Integrating TOGAF and DDD
The integration of TOGAF and Domain-Driven Design (DDD) within the design of the CPDT digital ecosystem offers several key technical advantages:

- Scalability: The modular organization through bounded contexts and microservices enables individual components of the system to be extended or modified without requiring a complete architectural overhaul.
- Maintainability: Clear segmentation of business functions and services reduces system complexity, accelerates error resolution, and simplifies system evolution.
- Business Alignment: Business segments are first designed at the TOGAF Business Layer and then precisely reflected in bounded contexts and domain models within the DDD structure, ensuring strong alignment between IT solutions and business logic.
- Risk Reduction: Clearly defined context boundaries minimize interdependencies between subsystems, thereby reducing the risk of cascading failures.
- Innovation Flexibility: New technologies can be implemented in isolation within specific bounded contexts or microservices without affecting the entire architecture.
- Improved Change Management: Any changes to business processes can be more easily tracked and localized due to the strong linkage between architectural layers and application-level logic.

5. Discussion
The proposed approach to integrating TOGAF and Domain-Driven Design (DDD) for the architectural modeling of CPDT ecosystems demonstrates a range of significant advantages in terms of structural integrity, flexibility, and scalability.

First, the suggested architecture provides a high degree of conceptual coherence through clear segmentation of business domains (based on TOGAF's business architecture layer) and their transformation into bounded contexts and microservices (in accordance with DDD principles). This tight alignment between strategic business layers and technical implementation layers ensures that the system remains consistent with the organization's objectives even as it evolves.

Second, the model's scalability and modular evolution are achieved through decomposition into bounded contexts, each mapped to a microservice. Each bounded context encapsulates a distinct business function, allowing for independent development, deployment, and scaling of services. This is particularly important for CPDT ecosystems, which must adapt to evolving educational demands, regulatory changes, and technological developments without disrupting core operations.

Although the model has not yet been technically implemented, the high level of formalization compensates for this limitation. Detailed business process modeling (using BPMN notation), the construction of a global segmentation view, and comprehensive mapping between business and application layers provide a robust foundation for subsequent implementation phases. This degree of formalization reduces ambiguity during the transition from architecture to technical realization.

In terms of applicability, the proposed model demonstrates high versatility. It can serve as a reference architecture for both public CPDT initiatives and private EdTech platforms seeking to build scalable, modular systems for professional development. The separation into "Learning Organization" and "Research and Analysis" domains further supports customization without fragmenting the overall architecture.

While the architectural model presented in this study is theoretically well-developed, its practical implementation and empirical validation remain subjects for future research. The current work focuses on conceptual model development and the exploration of methodological integration between TOGAF and Domain-Driven Design as a unified architectural strategy for digital CPDT ecosystems.

Future research is expected to include empirical testing, including assessments of scalability, fault tolerance, and adaptability, thereby offering the opportunity for practical validation and refinement of the proposed approach.

At the same time, the structural modeling process itself demonstrates the potential of the method. By tightly integrating enterprise architecture frameworks (TOGAF) with modern software design principles (DDD), this approach bridges the traditional gap between strategic planning and domain-oriented system engineering. This opens the way for a more disciplined and business-aligned digital transformation in the field of education.

Thus, despite the need for future empirical validation, the work carried out in this study establishes a solid, methodologically grounded foundation for the design and development of CPDT ecosystems. It offers a consistent and unified path toward building scalable, modular, and resilient educational platforms.

6. Conclusion

This study has developed a conceptual architectural model integrating TOGAF and Domain-Driven Design (DDD) for the design of a digital educational ecosystem focused on the Continuous Professional Development of Teachers (CPDT). The proposed approach represents a new direction in architectural modeling of educational systems, aimed at eliminating fragmentation, improving manageability, and supporting sustainable and scalable platform growth.

The integration of TOGAF as a strategic framework for business architecture and DDD as a methodology for domain-oriented design enables end-to-end alignment between high-level business goals and the practical implementation of digital solutions. This is achieved through the clear identification of business segments and their transformation into domains, bounded contexts, and microservice components of the system.

The resulting architecture ensures the logical integrity of the CPDT platform, facilitates effective complexity management, reduces technical debt, and allows for agile adaptation to changes in the educational environment. This makes the model practically applicable to both public-sector CPDT initiatives and private EdTech platforms.

Based on an analysis of the legal and regulatory framework of the Republic of Kazakhstan, interviews with key stakeholders, business process modeling, and the development of a global segmentation model, a methodologically robust architectural foundation has been established, demonstrating the high applicability of the proposed approach under real-world conditions.

The conceptual framework developed in this study can be adapted for the design of a wide range of digital educational ecosystems aimed at fostering human capital development in the context of digital transformation.

Future research will focus on the practical implementation of the proposed architecture, its empirical validation in real-world projects, and the evaluation of its scalability, fault tolerance, and adaptability in dynamic educational environments.

Thus, the work presented here lays a solid foundation for the further development of both theoretical and practical solutions in the field of educational systems architecture, combining strategic coherence, applied flexibility, and technological resilience.

References

[1] F. Prima, A. N. F. Asti, and F. Widia, "Enterprise architecture for education: A togaf approach to achieve digital transformation and optimal performance a case study of shared service function," *Syntax Literate Jurnal Ilmiah Indonesia,* vol. 9, no. 5, pp. 3225-3235, n.d. https://doi.org/10.36418/syntax-literate.v9i5.15346

[2] S. Manapova, B. Shaikhova, S. Kumarbekuly, I. Mikushina, and I. Afanasenkova, "A set of online tools for teaching chemistry considering a systematic approach to the educational process," *International Journal of Innovative Research and Scientific Studies,* vol. 8, no. 1, pp. 1363-1379, 2025. https://doi.org/10.53894/ijirss.v8i1.4613

[3] Amangeldi, Saipov, M. Kamalov, Y. Kamalov, D. Poshayev, and B. Ortayev, "A conceptual model of the system of methodical training of future teachers for vocational training," *International Journal of Innovative Research and Scientific Studies,* vol. 7, no. 1, pp. 146-158, 2024. https://doi.org/10.53894/ijirss.v7i1.2568

[4] M. Aidos, S. Omirbayev, K. Kassenov, A. Biloshchytskyi, and S. Omarova, "Perception of IT teachers on their methodological development: A case at Kazakhstan universities," *International Journal of Innovative Research and Scientific Studies,* vol. 7, no. 4, pp. 1354-1364, 2024. https://doi.org/10.53894/ijirss.v7i4.3297

[5] E. Eric, "Domain-driven design: Tackling complexity in the heart of software final manuscript," Retrieved: https://fabiofumarola.github.io/nosql/readingMaterial/Evans03.pdf, 2003.

[6] Z. Chunxia, "Creation of a system for designing textile patterns using an iterative function system," *International Journal of Innovative Research and Scientific Studies,* vol. 7, no. 1, pp. 115-126, 2024. https://doi.org/10.53894/ijirss.v7i1.2530

[7] M. Serhii, "Design of distributed control systems based on domain-driven design," n.d. https://doi.org/10.31649/mccs2024.1-07

[8] R. XiaoKang, W. Hong, and C. Tian, "Design and implementation of a microservices-based online learning platform," in *Proceedings of the 2023 2nd International Conference on Educational Innovation and Multimedia Technology (EIMT 2023) (pp.455-460). July 2023. https://doi.org/10.2991/978-94-6463-192-0_60*, 2023.

[9] K. Pankaj and S. Sukhjinder, "Architectural development of e-learning application using aspect-oriented programming (AOP) principles," *International Journal of Computer Applications,* vol. 180, no. 2, pp. 0975 – 8887, 2017.

[10] X. Chuncheng, "The design and implementation of educational management system under the framework of ssh. 21 feb 2018 - destech transactions on computer science," Retrieved: https://scispace.com/papers/the-design-and-implementation-of-educational-management-30m9f42jig, 2018.

[11] F. D. Silalahi, S. A. Nugroho, and B. Hartono, "Framework-driven design: Analyzing the impact of the zachman framework on lms effectiveness," *Journal of Technology Informatics and Engineering,* vol. 3, no. 2, pp. 203-216, 2024. https://doi.org/10.51903/jtie.v3i2.196

[12] Welcome to the TOGAF® Standard, "Version 9.2, a standard of the open group," Retrieved: https://pubs.opengroup.org/architecture/togaf9-doc/arch/, n.d.

[13] L. Domain, "Tackling complexity in the heart of software," Retrieved: https://www.domainlanguage.com/ddd/, n.d.

[14] Bounded Context In Microservices: How does it work?, "Bounded context In microservices: How does it work?," Retrieved: https://www.sayonetech.com/blog/bounded-context-microservices/, n.d.

[15] The Law of the Republic of Kazakhstan dated 27, "№ 319-III. On education," Retrieved: https://adilet.zan.kz/rus/docs/Z07000031, 2007.

[16] Law of the Republic of Kazakhstan dated May 2, "No. 434-IV," Retrieved: https://adilet.zan.kz/rus/docs/Z1100000434, 2011.

[17] Law of the Republic of Kazakhstan dated December 27, "№ 293-VI. On the status of a teacher," Retrieved: https://adilet.zan.kz/rus/docs/Z1900000293, 2019.

[18] Code of the Republic of Kazakhstan dated 23 November, "№ 414-V. Labour code of the Republic of Kazakhstan," Retrieved: https://adilet.zan.kz/rus/docs/K1500000414, 2015.

[19] Enforced by the Decree of the Supreme Council of the Republic of Kazakhstan dated December 27, "Civil code of the republic of Kazakhstan," Retrieved: https://adilet.zan.kz/rus/docs/K940001000, 1994.

[20] Resolution of the Government of the Republic of Kazakhstan dated, "Resolution of the government of the republic of Kazakhstan dated February 17, 2012 No. 232," Retrieved: https://adilet.zan.kz/rus/docs/P1200000232, 2012.

[21] Order of the Minister of Education and Science of the Republic of Kazakhstan dated January, "Registered in the ministry of justice of the republic of Kazakhstan on March 9, 2016 No. 13420," Retrieved: https://adilet.zan.kz/rus/docs/V1600013420, 2016.

[22] Order of the Minister of Education and Science of the Republic of Kazakhstan dated, "Registered in the ministry of justice of the republic of Kazakhstan on April 10, 2020 No. 20361," Retrieved: https://adilet.zan.kz/rus/docs/V2000020361, 2020.