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## USE CASES FOR BPMN AND UML TOOLS

ALEKSANDRA NIKOLOVA, ALEKSANDAR VELINOV AND ZORAN ZDRAVEV

**Abstract:** Business Process Model and Notation (BPMN) and Unified Modeling Language (UML) are two widely adopted tools for modeling in business and software engineering respectively. This paper explores the use cases for both BPMN and UML tools, highlighting their respective applications, differences, and synergies. By examining their features and specific scenarios where each tool excels, this research provides insights into how organizations can effectively leverage these tools for optimal outcomes.

### 1. Introduction

BPMN was created in 2004 by the Object Management Group (OMG) [5] to provide a clear way for modelling business processes and improving communication among different people, like managers and analysts. It allows organizations to see and enhance their processes more easily. Currently, a lot of companies use BPMN in their daily work, showing its importance in various industries such as finance, IT and manufacturing.

UML was developed in the 1990s by Grady Booch, Ivar Jacobson, and James Rumbaugh and became an official standard in 1997. Its main goal is to create a common language for modeling software systems, which improves communication among developers and stakeholders. UML is widely used, with many development teams incorporating it to design software architectures. Many schools also teach UML in their programs, highlighting its essential role in training future developers and adapting to changing technology.

BPMN is now the recognized standard for business process diagrams [5]. UML does not define a methodology, which is a sequence of steps to follow in the application development process. Instead, it offers a set of notational conventions that developers can use to describe or model an application [6]. While BPMN focuses on the visualization and improvement of business processes, UML provides a comprehensive framework for designing and documenting software systems. Understanding the distinct roles and applications of these tools is essential for organizations aiming to optimize their processes and develop robust software solutions.

This paper outlines the key aspects of BPMN and UML tools, their use cases and differences, offering a comprehensive view of how these tools can be applied in various scenarios. The paper is structured as follows. Section 2 reviews studies that investigate the application and integration of these tools, emphasizing their effectiveness in improving communication and process representation. Section 3 describes the features and functionalities of BPMN tools like Camunda and Bizagi Modeler, as well as UML

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**Key words:** BPMN tools, UML tools, Camunda, Bizagi Modeler, Lucidchart, StarUML, Enterprise Architect, Visual Paradigm, ArgoUML;

tools such as Lucidchart and Enterprise Architect, showcasing their usefulness in business process management and software design. Section 4 provides examples of how BPMN is applied for workflow optimization and task automation, while UML is used for software design and analysis, highlighting their influence on system architecture and stakeholder communication. Section 5 explores the distinct purposes, target audiences, complexity levels, and adaptability of the tools, emphasizing the unique roles they have in process modeling and software design. Section 6 is a conclusion of our work and it highlights how BPMN and UML tools work well together and encourages using both to improve overall efficiency and effectiveness in organizations.

## 2. Related Work

Several studies have examined the application and effectiveness of BPMN and UML tools.

Hernández et al. in [7] present the Use Processes approach, which uses BPMN and UML Use Case Diagrams to gather requirements and increase stakeholder involvement in software development.

Nicolae et al. in [8] describe the creation of clear meaning of BPMN by using UML models to improve its use in business process management. The authors propose a framework that connects BPMN and UML to improve understanding and communication of business processes.

The conversion of BPMN models into UML activities is explored in [9]. The goal is to create a clearer link between the two modeling languages to improve the representation of business processes.

Geambaşu in [10] compares BPMN and UML activity diagrams for modeling business processes. It evaluates the strengths and weaknesses of each approach to help practitioners choose the most suitable method for their needs. The findings aim to enhance understanding and effectiveness in business process modeling.

The usability of BPMN and UML activity diagrams is compared from the perspective of business users by Birkmeier et al. in [11]. They assess how easy each diagram is to understand and use in practice. Their findings aim to guide organizations in selecting the most effective modeling tool for their business processes.

Badura in [12] explores how to model business processes in logistics using BPMN and UML diagrams, highlighting their effectiveness in this field. The research highlights how these diagramming techniques can improve clarity and efficiency in logistics processes. The findings aim to provide insights into better process management in the logistics sector.

## 3. BPMN and UML Tools

BPMN and UML tools are essential for their respective purposes - BPMN tools for optimizing and documenting business processes, and UML tools for designing and managing software systems.



### 3.1. BPMN tools

The main objective of BPMN is to provide a notation that is easily understandable by all business users, including business analysts who create the initial process drafts, technical developers responsible for implementing the technology, and business professionals who manage and monitor those processes [1].

Some of the most commonly used BPMN tools are:

Camunda is an open-source platform based on Java, mainly utilized for automating BPMN processes [2]. It allows organizations to streamline their operations, improve efficiency and enhance collaboration among teams. With its user-friendly interface and robust integration capabilities, it is suitable for both developers and business users, making it a popular choice for companies looking to optimize their processes.

Bizagi Modeler is a tool for modeling and documenting business processes. It can be used for the creation of visual diagrams and document processes using the industry-standard BPMN [3]. With a simple drag-and-drop interface, both technical and non-technical users can work together easily. Bizagi Modeler also has features for sharing and exporting diagrams, making it a great choice for improving how organizations manage their workflows.

Lucidchart [4] is a diagramming tool for creating a wide range of diagrams, including BPMN diagrams. With real-time collaboration as one of the features of Lucidchart, teams can work together seamlessly, making it easy to share ideas and get feedback.

### 3.2. UML tools

Some of the more significant UML tools are:

Lucidchart [4] is a web-based diagramming application that allows users to create UML diagrams and collaborate in real time. It provides a range of templates and symbols for creating UML diagrams, including class diagrams, use case diagrams, and sequence diagrams.

StarUML [13] is a sophisticated UML modeling tool that supports a wide range of UML diagrams, allowing detailed design and analysis of software systems. With its customizable features, StarUML enables users to effectively visualize and organize complex systems, enhancing their development processes.

Enterprise Architect [14] is a comprehensive modeling tool that provides support for UML, BPMN and other standards, facilitating project management and design in software development. It offers a wide range of features, including code generation, requirements management and simulation capabilities, making it suitable for complex projects.

Visual Paradigm [15] is an integrated modeling tool that supports UML and BPMN, providing features for software development, requirements management and team collaboration. Its user-friendly interface allows users to create a variety of diagrams easily, enhancing visualization and understanding of complex systems.

ArgoUML [16] as an open-source UML modeling tool which users can use to create standard UML diagrams, focusing on usability and flexibility. It supports all UML diagram types, making it suitable for various software design tasks.

## 4. Use Cases

Use cases illustrate how BPMN and UML tools are applied in various scenarios to enhance business processes and software development.

### 4.1. BPMN Use Cases

BPMN is a vital tool for organizations seeking to optimize their workflows and overall efficiency. By mapping out business processes, BPMN helps identify inefficiencies and make necessary improvements. Additionally, BPMN plays a crucial role in compliance and documentation, as it provides a structured way to document processes, ensuring adherence to industry regulations and standards. Furthermore, BPMN diagrams facilitate clear communication between business stakeholders and process designers, promoting a shared understanding of workflows and fostering better collaboration in the design and implementation of processes.

BPMN tools help organizations automate tasks that were traditionally performed manually, which is especially important as many people now work remotely. It provides a clear way to visualize and manage workflows, allowing teams to automate notifications, assignments, and decisions while still handling human tasks. These tools are effective in modern software environments, ensuring that critical business processes across different services are monitored and coordinated. They also help integrate robotic process automation (RPA) by improving visibility and control over automated tasks [17].

Figure 1 is an example of an automated BPMN model for payment processing. It outlines a structured workflow that begins with the customer initiating a payment and progresses through key tasks such as selecting a payment method, processing the payment, sending a confirmation email, and updating transaction records. This model emphasizes the importance of automated tasks in BPMN, enhancing operational efficiency by reducing manual intervention, minimizing errors, and accelerating processing times.

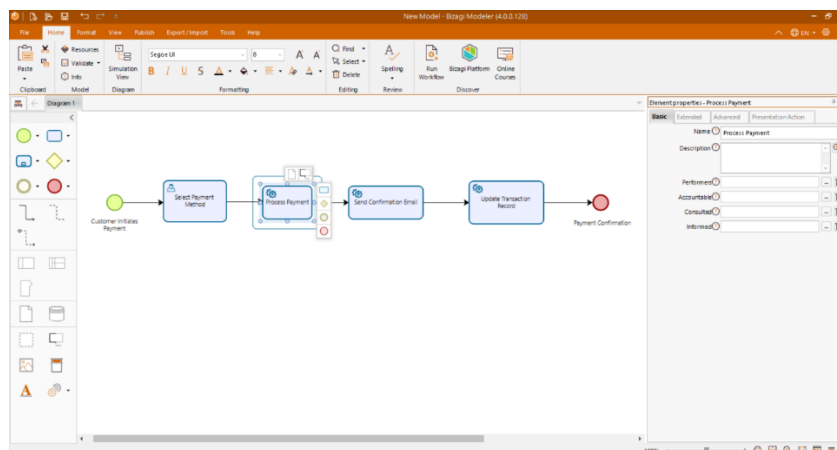


Figure 1. Example of BPMN automated task

Many financial services organizations struggle with outdated systems, making it difficult to provide a good customer experience while meeting compliance needs. BPMN tools help companies improve their processes, resulting in cost savings and more revenue. In the insurance sector, firms use BPMN to enhance workflows and better serve customers. Telecommunications companies rely on BPMN to update old systems and improve teamwork between business and IT. Public sector organizations use BPMN to make services more efficient and reduce costs. Media companies also use BPMN for process automation to drive growth. Overall, BPMN tools enable various industries to work more efficiently and adapt to changing demands [18].

#### 4.2. UML Use Cases

UML is a tool in software development, offering a comprehensive framework for both designing and analyzing software systems. It plays a crucial role in software design by providing visual representations such as class diagrams for structuring components and sequence diagrams for detailing interactions among them. In system analysis, UML helps in understanding and documenting requirements, leading to the creation of robust software architectures that address user needs effectively. Additionally, certain UML tools enhance productivity by supporting code generation, which allows developers to automatically translate UML diagrams into executable code, thereby streamlining the development process and reducing manual coding efforts.

UML tools illustrate the functional requirements of a system by depicting actors, which can be users or other systems, and the specific use cases that represent the tasks or services. UML use case tools enable designers to visualize complex processes across various sectors, including banking, online shopping, and healthcare. In Figure 2, the ATM use case diagram created in ArgoUML illustrates the interactions between customers and technicians for functions such as checking balances and performing maintenance.

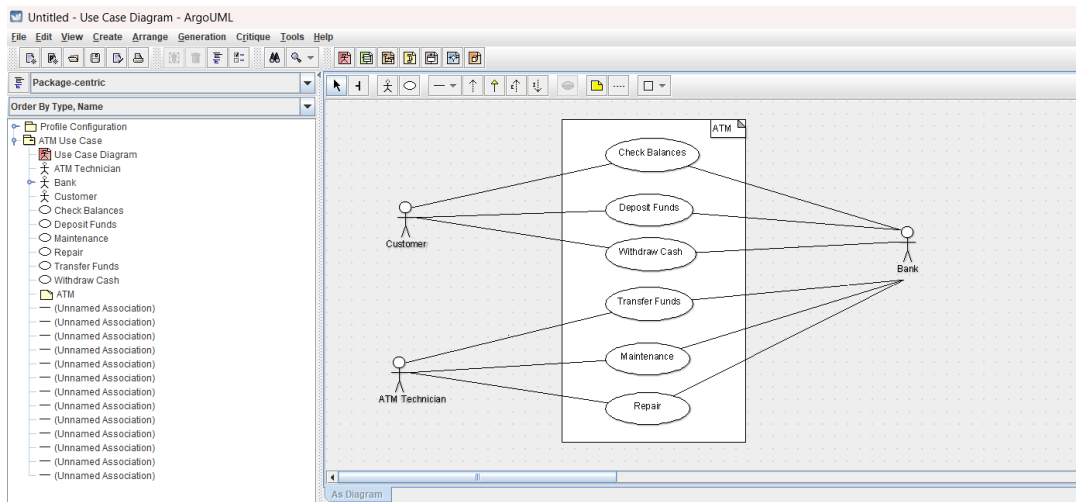


Figure 2. Example of UML Use case diagram

Similarly, these tools can illustrate scenarios in airport check-ins or restaurant operations, highlighting essential tasks such as purchasing tickets and managing reservations. By effectively documenting these interactions, organizations can enhance understanding and improve system design. By employing UML use case tools, organizations can effectively document user requirements, identify system functionalities, and enhance communication among stakeholders, ultimately leading to improved system design and user satisfaction [19].

### 5. Differences Between BPMN and UML Tools

The differences between BPMN and UML tools are presented in Table 1, highlighting their distinct features and functionalities. It categorizes the tools based on key aspects such as:

- **Purpose:** Defines the main function of the tools.
- **Diagram types:** Outlines the specific types of diagrams each tool utilizes.
- **Target audience:** Describes the primary users of each tool.
- **Complexity:** Indicates the level of difficulty associated with using the tools.
- **Standardization:** Refers to the organization that manages the standards for each tool.
- **Integration with other tools:** How well the tools can work with other software or systems.
- **Use cases:** Describes the practical applications of each tool.
- **Visualization:** Highlights how each tool represents information visually.
- **Adaptability:** Assesses how each tool can be applied across different contexts.
- **Learning curve:** Indicates the ease of learning and using each tool.

Table 1. Comparison of BPMN and UML Tools

	<b>BPMN tools</b>	<b>UML tools</b>
<b>Purpose</b>	Modeling business processes and workflows	General-purpose modeling for software design and architecture
<b>Diagram types</b>	Flowcharts, event-driven processes, business process diagrams	Class diagrams, use case diagrams, sequence diagrams, activity diagrams
<b>Target audience</b>	Business analysts, process managers, stakeholders	Software developers, architects, system analysts
<b>Complexity</b>	Generally straightforward, business-friendly	Can be complex with a steeper learning curve
<b>Standardization</b>	Governed by the Object Management Group (OMG)	Also standardized by OMG

<b>Integration with other tools</b>	Integrates with workflow automation and BPM tools	Integrates with software development environments
<b>Use cases</b>	Visualizing and automating business processes, process optimization	System architecture design, object-oriented modeling, software documentation
<b>Visualization</b>	Focuses on the flow of tasks and processes	Provides detailed views of software systems, including object relationships
<b>Adaptability</b>	Adapted for various industries, specifically tailored for business processes	Versatile, applicable across different domains
<b>Learning curve</b>	Easier for business users to learn and apply	Requires more technical knowledge and familiarity with software concepts

BPMN and UML tools serve different but complementary purposes, each with its own focus and scope.

BPMN is specifically designed to model business processes and workflow logic. It provides diagrams like process diagrams, collaboration diagrams, and choreography diagrams that emphasize the flow and interaction of business activities. In contrast, UML covers design, analysis and documentation of software systems. UML features a variety of diagrams such as class diagrams, use case diagrams, and activity diagrams, each catering to different aspects of software design and system behavior.

While BPMN is optimized for visualizing and improving business processes, UML is tailored to the needs of software architects, developers and engineers working on system design and implementation.

BPMN tools are user-friendly and straightforward, making them accessible to business users, while UML tools are more complex and require a steeper learning curve. Both tools are standardized by the OMG. BPMN tools integrate effectively with workflow automation and BPM solutions, whereas UML tools work seamlessly with software development environments. BPMN visualizes the flow of business processes, while UML provides detailed views of software systems and object relationships. Additionally, BPMN is tailored for various industries, specifically focusing on business processes, while UML offers versatility across different domains in software design.

Figure 3 illustrates the number of characteristics in the comparison of BPMN tools and UML tools across the categories: purpose, diagram types, target audience and use cases.

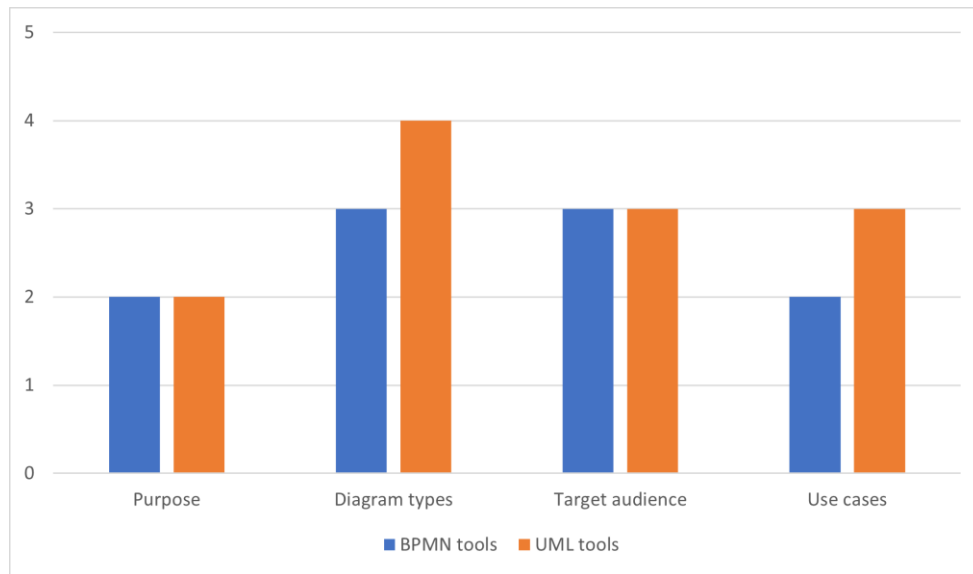


Figure 3. Comparison of BPMN and UML Tools

## 6. Conclusion

BPMN and UML tools each play unique but complementary roles in business and software modeling. BPMN is great for mapping out and improving business processes, while UML is useful for designing and documenting software. By knowing what each tool is best at and how they differ, organizations can use them effectively to improve both business processes and software development. Combining BPMN and UML provides a complete approach to making sure business processes and software work well together, which boosts overall efficiency and effectiveness.

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