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## COMPARATIVE ANALYSIS OF BPMN TOOLS

ALEKSANDRA NIKOLOVA, ALEKSANDAR VELINOV AND ZORAN ZDRAVEV

**Abstract.** This paper presents a comparative analysis of prominent BPMN (Business Process Model and Notation) tools, including Camunda, Bizagi Modeler, bpmn.io, ProcessMaker, and Lucidchart. We evaluate these tools based on key criteria such as features, functionality, usability, integration capabilities and cost. By examining their strengths and limitations, we aim to provide a comprehensive overview that assists organizations in selecting the most suitable tool for their business process modelling needs. The analysis includes practical insights into each tool's effectiveness in facilitating process design, simulation and execution, offering valuable guidance for practitioners and decision-makers.

### 1. Introduction

Business Process Model and Notation (BPMN) is a widely recognized language that provides both a metamodel and a notation to define and illustrate business process models [1]. BPMN is a graphical representation for specifying business processes.

BPMN was developed in the early 2000s to standardize the graphical representation of business processes. Initially created by the Business Process Management Initiative (BPMI), it gained traction when BPMI merged with the Object Management Group (OMG) [12] in 2005. The first official specification was released in 2004, followed by updates like BPMN 1.1 in 2008 and the major BPMN 2.0 in 2011, which introduced executable processes and improved XML serialization.

BPMN is used to visualize and analyze business processes, allowing identification of inefficiencies and areas for improvement. It supports process design for automation with workflow management systems, ensures compliance with regulatory standards, and facilitates inter-organizational collaboration. Additionally, BPMN models are employed to simulate processes, enabling performance analysis and outcome prediction.

A key benefit of a process modelling standard is that it facilitates understanding across different tools. The interpretation is established by the standard itself, not by individual tools [2]. Selecting the appropriate BPMN tool can impact the process efficiency and collaboration.

This paper aims to conduct a comparative analysis of leading BPMN tools, evaluating their functionalities, usability, integration capabilities and overall effectiveness. It offers insights into the capabilities and suitability of BPMN tools for different organizational needs. The rest of the paper is structured as follows. In Section 2, previous studies on BPMN tools are reviewed, highlighting their evaluations of tool adherence to BPMN standards and identifying a gap in comprehensive tool analysis. In Section 3, the paper introduces key tools like Camunda, Bizagi Modeler, bpmn.io, ProcessMaker, and

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**Keywords:** BPMN tools, Camunda, Bizagi Modeler, bpmn.io, ProcessMaker, Lucidchart.

Lucidchart, detailing their features, usability, and integration options for process modelling and automation. Section 4 provides a side-by-side comparison of these tools based on features, usability, integration capabilities, and cost, summarized in a table to help readers understand the trade-offs. Finally, in Section 5, the paper emphasizes the importance of selecting a BPMN tool based on organizational needs such as complexity, budget and integration, offering recommendations for the most suitable tools for different use cases.

## 2. Related work

Snoeck et al. in [8] evaluate various BPMN tools to determine how well they adhere to modelling guidelines. The study focuses on practical applications and effectiveness in supporting the BPMN standards, contributing to a better understanding of tool performance in enterprise modelling.

The improvements of BPMN 2.0 are discussed in [1]. The authors proposed both methodological and tool-based extensions to improve the functionality of the standard. Their work focuses on advancing BPMN to better support complex modelling requirements.

The study of Yan et al. evaluates various BPMN modelling tools, analyzing their features and performance in supporting BPMN standards [9]. The study provides understanding of the advantages and disadvantages of these tools, helping users choose the most suitable option for their needs.

The simulation capabilities of current BPMN tools are investigated by Pereira and Freitas in [10] focusing on how well these tools support the execution and analysis of BPMN process models. Their study highlights both advancements and limitations in tool functionalities for process simulation.

An analysis of the support for process simulation in BPM tools is given in [11], with a focus on BPMN. They evaluate how well these tools enable users to simulate and optimize business processes, highlighting the effectiveness and gaps in simulation features.

Kannengiesser in [13] examines various BPMN tools, assessing their capabilities in modelling, usability, and support for BPMN standards. The paper provides insights into the strengths and limitations of different BPMN software tools, helping users select suitable tools for business process modelling.

Detailed characterization of BPM tools is provided in [14], focusing on their capacity to simulate BPMN models with attention to factors such as accuracy, usability, and effectiveness in process analysis. These insights offer valuable guidance for organizations seeking BPM tools with strong simulation capabilities to enhance process management and optimization efforts.

The reviewed studies collectively underscore the importance of robust BPMN tool capabilities in supporting effective business process modelling, simulation and optimization. Each paper examines key aspects of BPMN tools. In summary, while existing studies provide useful insights into BPMN tools, there is a clear lack of comprehensive analysis. Specifically, more research is needed to evaluate BPMN tools



across important areas such as usability, simulation, integration, and performance. This paper aims to fill this gap by offering a complete assessment of BPMN tools, helping users choose the right options that meet both basic and advanced needs in enterprise modelling.

### 3. BPMN tools

BPMN is significantly used for process modelling, leading to the development of various BPMN tools designed to facilitate process modelling, documentation, and automation.

Camunda is a Java-based framework for workflow and process automation that utilizes BPMN models. It offers a comprehensive set of tools for designing, executing, and automating business processes [3]. Notably, Camunda supports BPMN, Case Management Model and Notation (CMMN), and Decision Model and Notation (DMN), featuring a robust execution engine and extensive integration options, making it well-suited for complex, large-scale applications. As shown in Figure 1, the Camunda dashboard includes an example BPMN login process that emphasizes the tool's effectiveness in automating workflows, with clearly defined tasks and decision gateways that showcase its capabilities in process management.

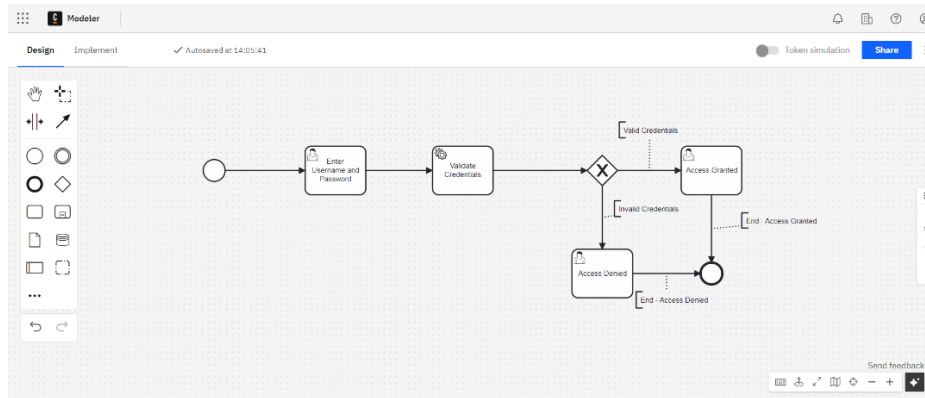


Figure 1. Example of BPMN in Camunda

Bizagi Modeler is a tool for business process modelling and documentation. It allows you to create and visualize diagrams, as well as model and document business processes using the industry-standard BPMN [4]. As shown in Figure 2, the Bizagi Modeler dashboard offers a user-friendly environment that emphasizes simplicity, featuring a collaborative workspace with access to templates. This design ensures teams can efficiently document and visualize their processes.

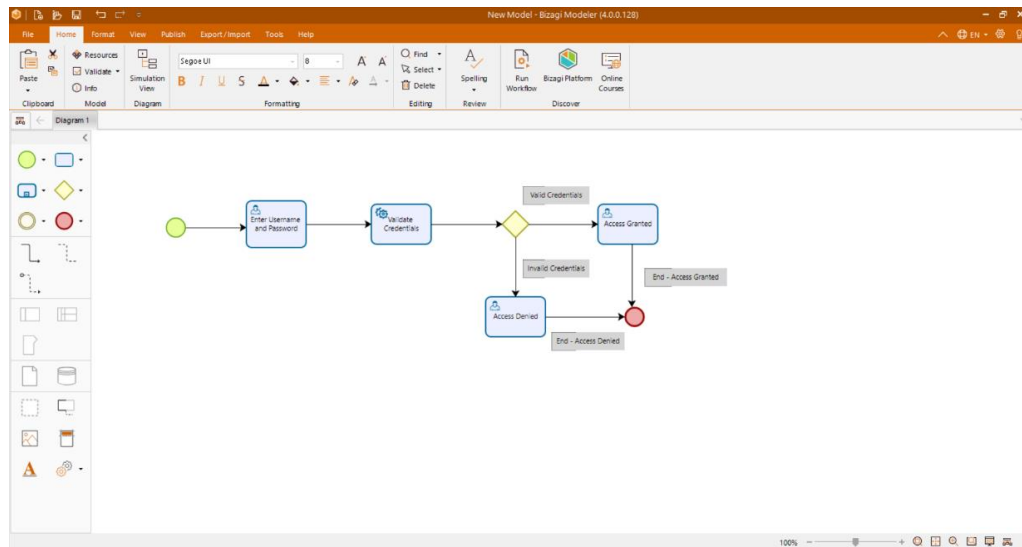


Figure 2. Example of BPMN in Bizagi Modeler

The bpmn.io toolkit [5] offers an intuitive web-based environment for BPMN 2.0 modelling, emphasizing ease of use and customization. While it is appreciated for its simplicity and accessibility as a web-based tool, it lacks some advanced features and integration options. The dashboard of bpmn.io tool presents a minimalistic environment for creating BPMN diagrams, highlighting its flexibility for developers and modelers (Figure 3). The lightweight, browser-based interface facilitates rapid process modelling.

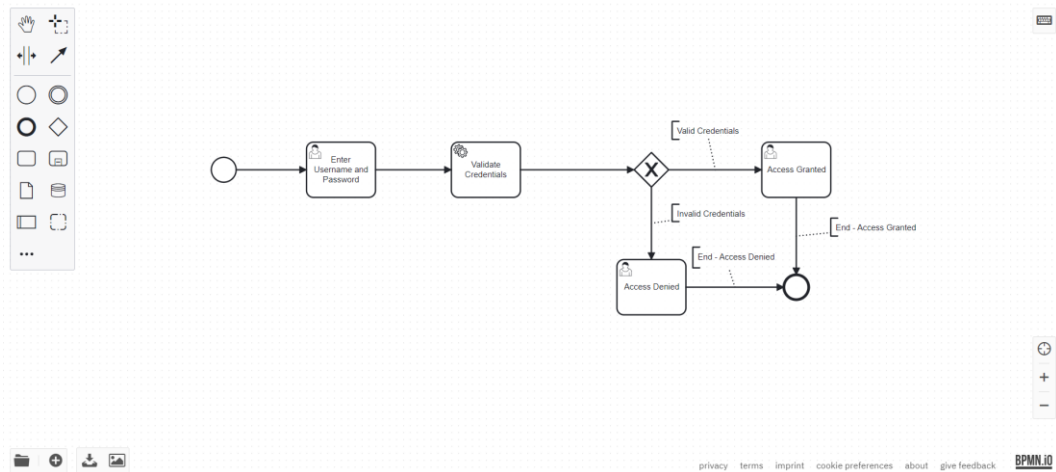


Figure 3. Example of BPMN in bpmn.io

ProcessMaker [6] offers a broad array of features, including advanced BPMN modelling, workflow automation and performance analytics, making it suitable for organizations that require end-to-end process management. The ProcessMaker dashboard

provides a structured workspace focused on designing, automating, and monitoring processes (Figure 4). These functionalities aim to improve organizational efficiency and reduce manual tasks.

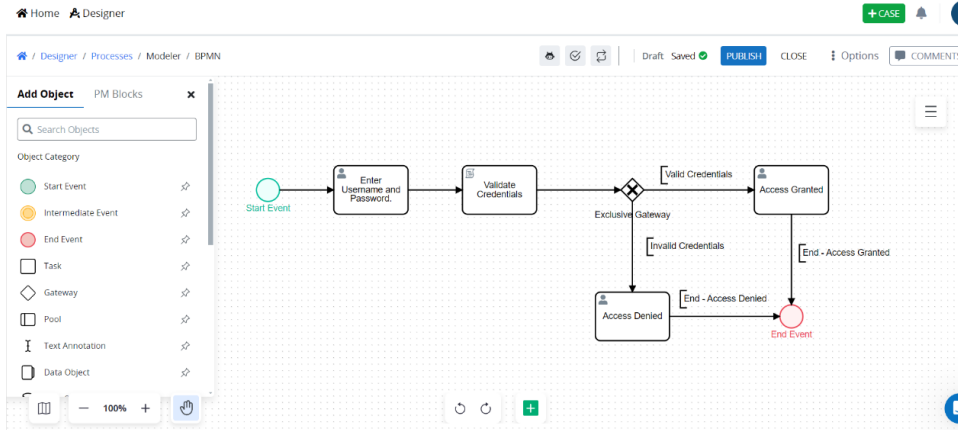


Figure 4. Example of BPMN in ProcessMaker

Lucidchart [7] is a flexible diagramming tool that can create various types of diagrams, including BPMN diagrams. While it is easy to use and excellent for collaboration, it is less specialized in BPMN compared to other tools and focuses more on general diagramming and productivity tool integration. Lucidchart’s dashboard has an intuitive drag-and-drop interface. Figure 5 presents a BPMN login process diagram designed for visual mapping out complex processes. The platform integrates BPMN standards with real-time collaboration, making it ideal for teams to model workflows in an interactive environment.

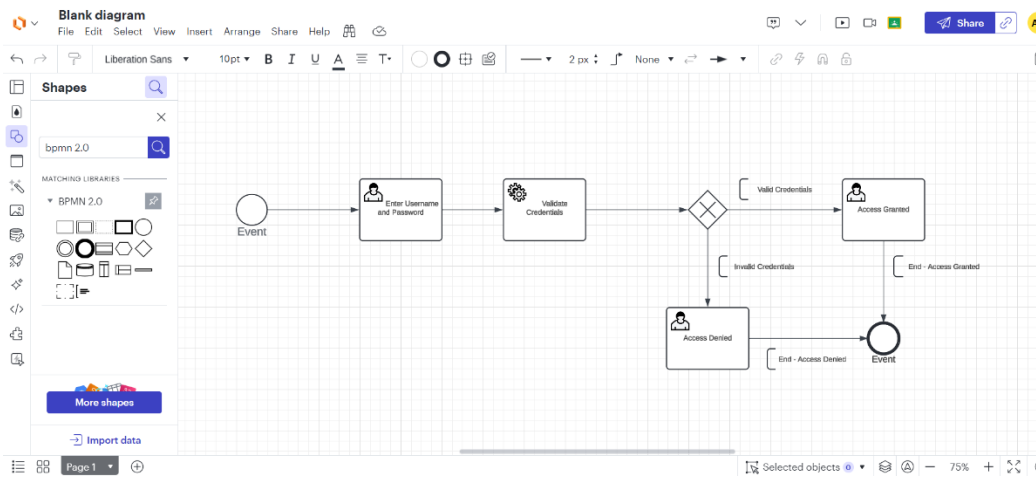


Figure 5. Example of BPMN in Lucidchart

Each tool has its advantages, making the choice dependent on specific organizational needs, from ease of use to advanced functionalities and integration requirements.

#### 4. Comparative analysis

The comparative analysis evaluates each BPMN tool based on:

- **Features and functionalities:** Core BPMN support, advanced features and customization options.
- **Usability:** Interface design, ease of use and learning curve.
- **Integration capabilities:** Compatibility with other systems, export/import options and API support.
- **Cost:** Pricing models, licensing fees and value for money.

Table 1. Comparative analysis of BPMN tools

	Features and functionalities	Usability	Integration	Cost
Camunda	<ul style="list-style-type: none"> <li>• BPMN 2.0 Support</li> <li>• DMN Support</li> <li>• Process Execution</li> <li>• Task Management</li> <li>• Process Monitoring</li> <li>• REST API</li> <li>• Modelling Tools</li> </ul>	<ul style="list-style-type: none"> <li>• User Interface</li> <li>• Documentation</li> <li>• Learning Curve</li> </ul>	<ul style="list-style-type: none"> <li>• Microservices</li> <li>• Java Integration</li> <li>• Third-Party Tools</li> <li>• Custom Extensions</li> </ul>	<ul style="list-style-type: none"> <li>• Open Source</li> <li>• Enterprise Edition</li> </ul>
Bizagi Modeler	<ul style="list-style-type: none"> <li>• BPMN 2.0 Support</li> <li>• Process Simulation</li> <li>• Collaboration Tools</li> <li>• Export Options</li> <li>• Process Documentation</li> <li>• Business Rules</li> </ul>	<ul style="list-style-type: none"> <li>• User Interface</li> <li>• Ease of Use</li> <li>• Learning Curve</li> </ul>	<ul style="list-style-type: none"> <li>• Bizagi Automation</li> <li>• Third-Party Integrations</li> <li>• Export and Import</li> </ul>	<ul style="list-style-type: none"> <li>• Bizagi Modeler Free Edition</li> <li>• Bizagi Enterprise Edition</li> <li>• Bizagi Automation Suite</li> </ul>
bpmn.io	<ul style="list-style-type: none"> <li>• BPMN 2.0 Support</li> <li>• Modeler</li> <li>• Viewer</li> <li>• DMN and CMMN Support</li> </ul>	<ul style="list-style-type: none"> <li>• User Interface</li> <li>• Accessibility</li> <li>• Learning Curve</li> </ul>	<ul style="list-style-type: none"> <li>• API and SDK</li> <li>• Export Options</li> <li>• Third-Party Tools</li> </ul>	<ul style="list-style-type: none"> <li>• Free and Open Source</li> <li>• Commercial Support</li> </ul>

	<ul style="list-style-type: none"> <li>• Extensibility</li> </ul>			
ProcessMaker	<ul style="list-style-type: none"> <li>• BPMN 2.0 Support</li> <li>• Workflow Automation</li> <li>• Process Simulation</li> <li>• Forms and Data Collection</li> <li>• Analytics and Reporting</li> <li>• Case Management</li> <li>• Mobile Access</li> </ul>	<ul style="list-style-type: none"> <li>• User Interface</li> <li>• Learning Curve</li> <li>• Documentation and Support</li> </ul>	<ul style="list-style-type: none"> <li>• APIs</li> <li>• Connectors</li> <li>• Third-Party Integrations</li> </ul>	<ul style="list-style-type: none"> <li>• Pricing Tiers</li> <li>• Free Trial</li> <li>• Enterprise Solutions</li> </ul>
Lucidchart	<ul style="list-style-type: none"> <li>• Diagramming Tools</li> <li>• Collaboration</li> <li>• Templates and Shapes</li> <li>• Process Automation</li> <li>• Data Linking</li> <li>• Presentation Mode</li> </ul>	<ul style="list-style-type: none"> <li>• User Interface</li> <li>• Learning Curve</li> <li>• Accessibility</li> </ul>	<ul style="list-style-type: none"> <li>• APIs</li> <li>• Third-Party Integrations</li> <li>• Import/Export</li> </ul>	<ul style="list-style-type: none"> <li>• Pricing Tiers</li> <li>• Free Trial</li> </ul>

The features offered by each BPMN tool vary significantly. Camunda is ideal for organizations needing detailed task management and seamless API integration, thanks to its robust support for BPMN 2.0 and DMN. Bizagi Modeler emphasizes teamwork, offering simulation and documentation tools that facilitate collaborative process design. bpmn.io provides essential modelling and viewing capabilities for BPMN 2.0, DMN, and CMMN, making it versatile for users working with various model types. ProcessMaker excels in automating workflows, data collection, and analytics, focusing on operational efficiency. Lastly, Lucidchart offers diagramming and collaboration tools, making it well-suited for visually representing processes in a flexible manner.

Usability is crucial for user adoption. Bizagi Modeler and Lucidchart are known for their easy-to-use interfaces, which help new users get started quickly. In contrast, Camunda and ProcessMaker can be more challenging to learn because of their advanced features. However, strong documentation and support can help ease these usability issues.

Camunda and ProcessMaker stand out in integration capabilities by providing strong support for microservices and third-party integrations, which is important for organizations using different software solutions. bpmn.io also offers API and SDK options, allowing users to expand its features, but it may lack some of the built-in

integration properties that the other tools have. Lucidchart supports integrations with various platforms, making it useful for collaborative projects.

Cost is a significant factor in tool selection. bpmn.io is attractive as a free and open-source option, making it accessible for smaller businesses or those with budget constraints. Bizagi Modeler also offers a free edition, though its enterprise solutions can be more costly. Camunda provides both open-source and enterprise editions, allowing organizations to choose based on their specific needs. ProcessMaker and Lucidchart offer various pricing tiers and free trials, making it easier for users to test their functionalities.

Figure 6 illustrates the number of characteristics for the five BPMN tools (Camunda, Bizagi Modeler, bpmn.io, ProcessMaker, and Lucidchart) across the four categories: Features and functionalities, usability, integration and cost. This comparison helps highlight the strengths and weaknesses of each tool in supporting BPMN processes based on their characteristics.

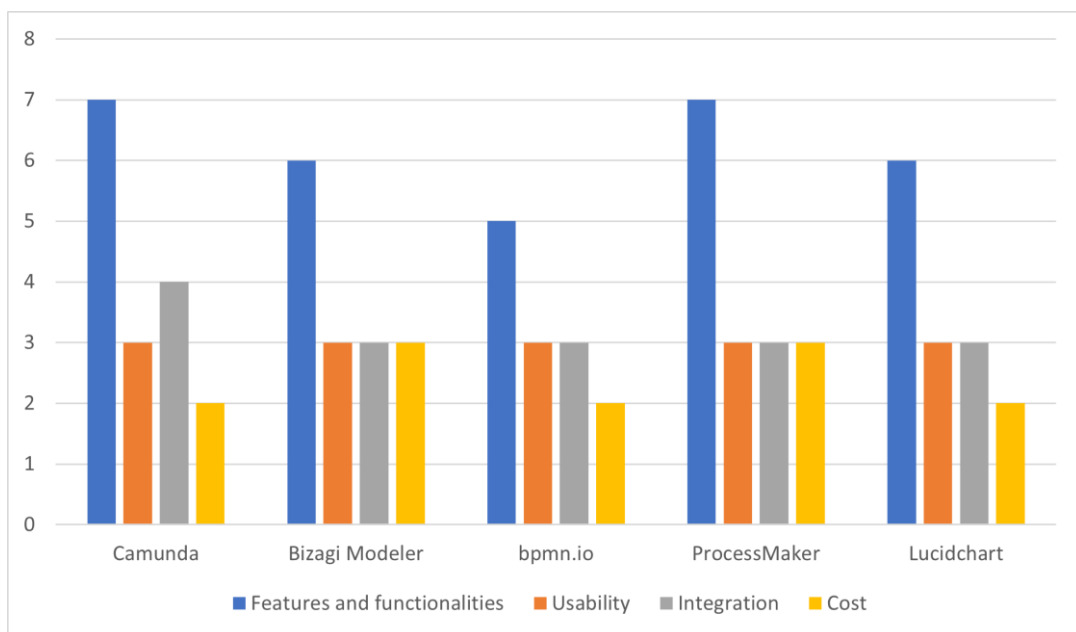


Figure 6. Comparative analysis of BPMN tools

## 5. Conclusion

Selecting the appropriate BPMN tool requires a careful assessment of organizational needs, including process complexity, integration requirements, and budget constraints. Organizations should evaluate each tool's features to ensure alignment with their operational goals and workflow demands.

Tools like Camunda, Bizagi Modeler, bpmn.io, ProcessMaker, and Lucidchart each offer distinct advantages, from robust automation and integration capabilities to ease of use, web accessibility, and collaborative features. Camunda is ideal for organizations requiring robust execution and integration capabilities, particularly in environments

demanding high levels of automation and complex process management. Its workflow engine supports end-to-end process execution, making it suitable for industries with intricate, automation-focused operations. Bizagi Modeler excels in usability and simulation, offering intuitive modelling tools and process testing capabilities that allow organizations to visualize and refine workflows prior to implementation. For those needing a simple, web-based solution, bpmn.io provides essential modelling functions without extensive setup, making it accessible and efficient for basic process mapping needs. ProcessMaker, with its extensive features for process management and automation, supports customizable workflows, form-building, and real-time tracking, enabling organizations to handle multi-step, detailed processes with ease. Lucidchart stands out as a versatile option for teams prioritizing ease of use and collaboration, allowing for seamless diagramming and sharing, which is particularly beneficial for remote and cross-functional teams.

By aligning the unique strengths of these tools with organizational needs, businesses can enhance process efficiency, streamline operations, and support informed decision-making in workflow management. This careful alignment not only maximizes the effectiveness of process modelling but also contributes to more resilient and adaptable organizational structures.

Organizations should consider these features based on their requirements, including the complexity of their processes, budget and integration needs. Accordingly, they will be able to choose the most suitable BPMN tool.

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