Introduction to Operation Management

PART TWO Design the operation

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1 Business Process Design

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Introduction to Business Process

What is a business process?

A business process is a series of structured activities or tasks that are performed by individuals or systems within an organization to achieve a specific goal or produce a particular outcome. These processes are designed to create value by transforming inputs (such as materials, information, or customer requests) into outputs (such as products, services, or solutions). Business process is a fundamental component of organizational operations, enabling companies to achieve their goals efficiently and effectively.

StarUML (https://staruml.io/) has been the software use to draw the diagrams.

Types of business process

Business processes can be broadly categorized into three main types: core processes, support processes, and long-tail processes. **Core processes** are the essential activities that directly create value for the organization and its customers. These include operational processes like order fulfillment, manufacturing, and customer service. Core processes are crucial for the day-to-day functioning of the business and are directly tied to the organization's primary objectives and revenue generation.

Support processes provide the necessary infrastructure and assistance to ensure that core processes run smoothly. These include human resources management, IT support, accounting and finance, and compliance processes. Support processes do not directly add value to the product or service but are essential for maintaining the overall efficiency, quality, and regulatory compliance of the organization. They form the backbone that enables core processes to function effectively.

Long-tail processes encompass a variety of activities that, while not central to the organization's primary operations, contribute to its long-term growth, innovation, and sustainability. These include development processes like product development and market research, customer relationship management (CRM) processes, project management, strategic management, and environmental and sustainability processes. Long-tail processes help the organization adapt to changing market conditions, foster innovation, and ensure sustainable practices, thereby supporting the organization's long-term success and resilience.

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2 Business Process Management

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Business Process Management

Business process design involves creating or improving processes to enhance efficiency, effectiveness, and adaptability within an organization.

Business Process Management (BPM) is a systematic approach to designing, executing, monitoring, and optimizing business processes. It involves the use of various methods, tools, and technologies to manage and improve an organization's processes continuously. BPM aims to align processes with the organization's strategic goals, enhance efficiency, and ensure adaptability to changing business environments.

Using Business Process Management (BPM) offers numerous advantages for organizations. Firstly, BPM provides a holistic view of all business processes, helping organizations understand how different processes interact and impact each other. This comprehensive perspective is crucial for identifying areas of improvement and ensuring that all processes are aligned with the organization's strategic goals. Secondly, BPM promotes a culture of continuous improvement by regularly analyzing and optimizing processes to enhance performance and efficiency. This ongoing refinement helps organizations stay competitive and responsive to changes. Thirdly, BPM enhances agility by enabling organizations to quickly adapt to changes in the market, technology, or regulatory environment. The flexible framework provided by BPM allows for swift adjustments and innovations. Additionally, BPM aids in better resource management by identifying bottlenecks and inefficiencies, ensuring that resources are used optimally. This leads to cost savings and more effective operations. Lastly, BPM improves compliance and risk management by ensuring that processes adhere to regulatory requirements and industry standards, thereby reducing the risk of non-compliance and associated penalties. Overall, BPM is a powerful tool for driving efficiency, agility, and compliance within an organization.

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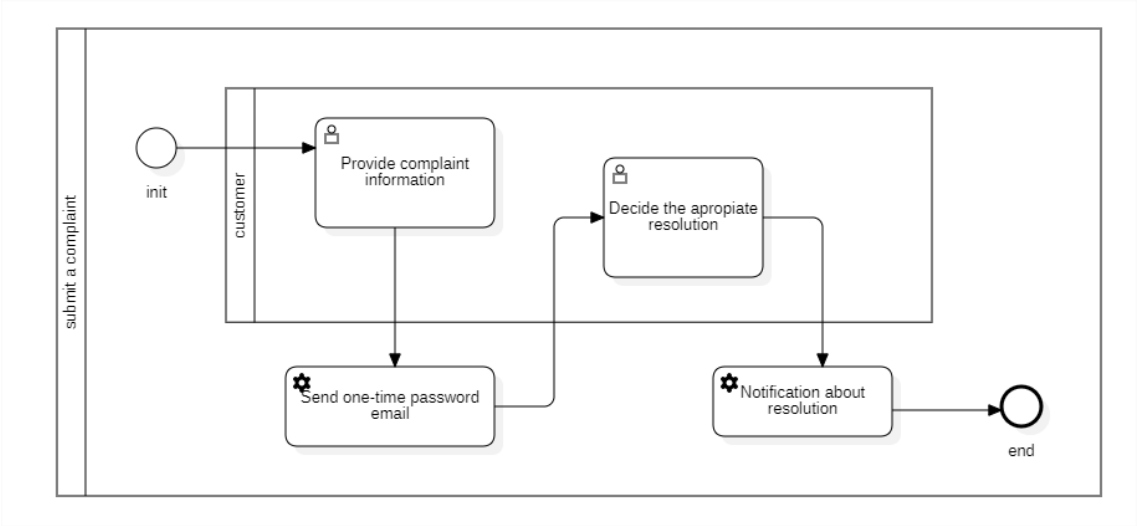
Human interaction management

The activities that form business processes can be broadly classified into **automatic** and **manual**. Automatic activities are those that can be completed by the software system without any manual intervention.

For example, consider a customer support process in an e-commerce company. When a customer submits a complaint about a defective product, a customer service representative must review the complaint details, communicate with the customer to gather additional information if needed, and decide on the appropriate resolution, such as issuing a refund or arranging for a replacement. This is a manual activity that requires human judgment and interaction. In contrast, once the resolution is decided, an automatic activity might involve updating the customer's order status in the system and sending an email notification to the customer about the resolution. The email notification is an automatic activity that the software system can handle without any manual intervention.



Therefore, human tasks are in fact human interactions in the business processes or, in a broader sense, human interactions with the software system in place. Usually, human activities are physical tasks that are performed outside the software system and the results or conclusions are then fed as input into the software system. Technically, from the perspective of the system, we can say that the associated human activities would provide an input to the business process and there would be scenarios where the business process would be able to continue only after manual decisions.

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Business activity monitoring

Business Activity Monitoring (BAM) offers real-time tracking capabilities for business operations, allowing companies to derive key performance indicators by analyzing detailed activity data. BAM is a versatile software system designed to oversee business processes, and integrating it with a BPM-based software system is both straightforward and highly effective. Typically, BAM software can display business data through dashboards, enabling users to generate custom reports and visualizations for performance metrics and trend analysis.

For instance, in the customer support process of the e-commerce company, BAM can be used to monitor various aspects of the process in real-time. The BAM system can track metrics such as the number of customer complaints received, the average response time, the resolution time, and the customer satisfaction scores. This data can be visualized on a dashboard, providing a comprehensive view of the customer support process's performance.

Business process simulation

Business process simulation involves creating a virtual model of a business process to analyze and test its performance under various conditions without affecting the actual operations. This technique allows organizations to experiment with different scenarios, identify potential bottlenecks, and evaluate the impact of changes before implementing them in the real world. By simulating business processes, companies can make data-driven decisions to optimize efficiency, reduce costs, and improve overall performance.

Consider the customer support process in an e-commerce company. The company wants to improve its response time and resolution rate for customer complaints. By using business process simulation, the e-commerce company can test different strategies in a risk-free environment, identify the most effective solutions, and implement changes with confidence.

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The business process model and notation

Business Process Model and Notation (**BPMN**) is the widely accepted standard for business process modeling and provides a graphical notation for specifying business processes in a **Business Process Diagram** (**BPD**). It is based on a flowcharting technique very similar to the activity diagrams of **Unified Modeling Language** (**UML**). BPMN is maintained by **Object Management Group** (**OMG**), and the current version is 2.0 (released in March 2011).

The primary goal of BPMN is to provide a standard notation readily understandable by business stakeholders. These include business analysts who create and refine the processes, technical developers responsible for implementing these processes, and operation managers who monitor and manage the processes. Consequently, BPMN serves as a common language, bridging the communication gap that frequently occurs between business process design and implementation. BPMN also serves as a communication medium between organizations who partner for achieving common business goals, to share functional processes and procedures.

BPMN specification documents can be found at http://www.bpmn.org/.

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Core elements

The chief constituents of a BPMN diagram, BPMN elements, can be broadly classified into five categories:

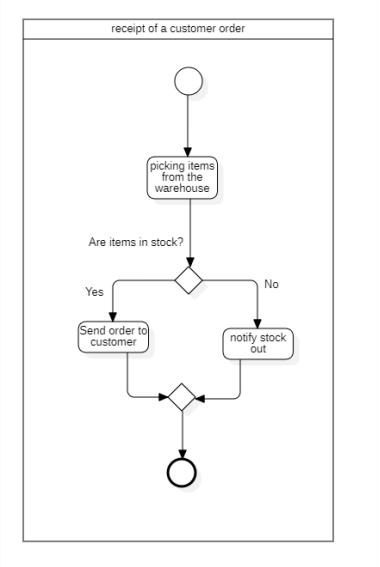
- Flow Objects: These objects define the behavior of a business process
- Data: This represents the data associated in the business process
- Connecting Objects: These objects are used to connect the flow objects to each other
- Swimlanes: This is used to categorize the flow objects
- Artifacts: These provide additional information about the process

1. Flow Objects:

Flow objects are the primary elements that define the behavior and sequence of activities within a business process. They represent the actions, events, and decision points that occur as the process unfolds. Flow objects can be further categorized into three types:

- Events: These indicate something that happens during the process, such as the start, intermediate, or end of a process.
- Activities: These represent tasks or work that needs to be performed. Activities can be simple tasks or more complex sub-processes.
- Gateways: These are decision points that control the divergence and convergence of the process flow, determining the path that the process will take based on certain conditions.

In an e-commerce order fulfillment process, a "Start Event" could represent the receipt of a customer order, an "Activity" could be the task of picking items from the warehouse, and a "Gateway" could be a decision point to check if the items are in stock.



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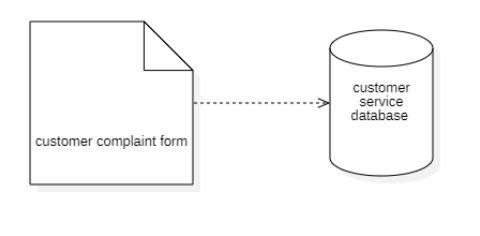
2. Data:

Data elements represent the information that is created, manipulated, or used within the business process. These elements help in understanding how data flows through the process and how it is associated with various activities.

- Data Objects: These show the data required or produced by activities.
- Data Stores: These represent places where data is stored, such as databases or document repositories.
- Data Inputs and Outputs: These indicate the data that enters or exits the process.

In the e-commerce customer support process, a "Data Object" could be a customer complaint form, and a "Data Store" could be the customer service database where all complaints are logged.

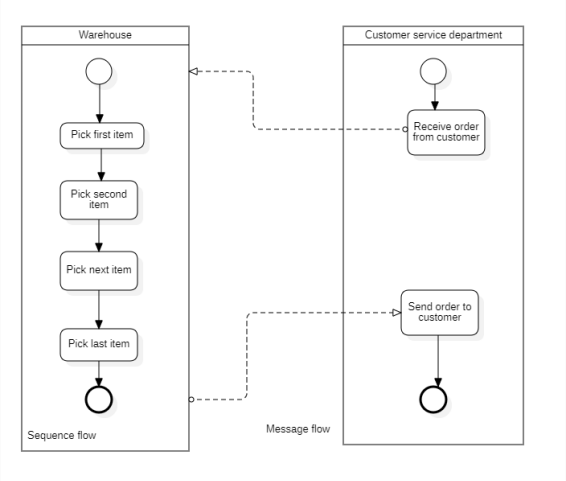


3. Connecting Objects:

Connecting objects are used to link flow objects to each other, establishing the sequence and relationships between different parts of the process. They ensure that the process flows logically from one step to the next.

- Sequence Flows: These show the order in which activities are performed.
- Message Flows: These represent the flow of messages between different participants or processes.
- Associations: These link artifacts and data objects to flow objects, providing additional context.

In the e-commerce order fulfillment process, a "Sequence Flow" could connect the task of picking items to the task of packing them, while a "Message Flow" could represent communication between the warehouse and the customer service department to confirm order details.



4. Swimlanes:

Swimlanes are used to categorize and organize flow objects within a BPMN diagram, making it easier to understand who is responsible for each part of the process. They help in visualizing the roles, departments, or systems involved in the process.

- Pools: These represent major participants in the process, such as different organizations or departments.
- Lanes: These are subdivisions within pools that represent specific roles, teams, or functions.

In the e-commerce customer support process, a pool could represent the entire customer service department, while lanes within the pool could represent individual roles such as "Customer Service Representative," "Technical Support," and "Manager."

5. Artifacts:

Artifacts provide additional information about the process that is not directly related to the sequence flow but is important for understanding the context and details of the process. They help in annotating the diagram with supplementary information.

- Annotations: These are used to add comments or explanatory notes to the diagram.
- Groups: These visually group related elements without affecting the flow.
- Text Annotations: These provide textual information to clarify certain aspects of the process.

In the e-commerce order fulfillment process, an annotation could be used to explain a specific business rule, such as "Orders over $100 qualify for free shipping." A group could be used to visually cluster all activities related to order verification.

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Business process management as applied in industry

Business Process Management (BPM) is particularly valuable in industries where the following conditions are met:

1. Distributed Business Processes:

BPM is essential in industries where business processes are distributed and span across multiple applications or software systems. This is common in large organizations where different departments or units use various software tools to perform their tasks. BPM helps in integrating these disparate systems, ensuring seamless communication and coordination.

- Banking and Finance: Financial institutions often use multiple systems for customer management, transaction processing, compliance, and reporting. BPM helps in integrating these systems to provide a unified view of operations.
- Healthcare: Hospitals and healthcare providers use various systems for patient records, billing, lab results, and treatment plans. BPM ensures that these systems work together efficiently.

2. Complex Rules and Regulations:

Industries with complex rules and regulations that need to be maintained and updated over time benefit greatly from BPM. BPM systems can automate rule enforcement, ensuring compliance and reducing the risk of errors.

- Insurance: Insurance companies have to manage complex policies, claims processing, and regulatory compliance. BPM helps in automating these processes and ensuring adherence to rules.
- Telecommunications: Telecom companies deal with intricate billing systems, service provisioning, and regulatory requirements. BPM helps in managing these complexities effectively.

3. Continuous Improvement:

Industries that require continuous improvement of business processes by monitoring existing activities can leverage BPM to achieve operational excellence. BPM systems provide real-time monitoring and analytics, enabling organizations to identify bottlenecks and areas for improvement.

- Manufacturing: Manufacturers need to continuously optimize production processes, reduce waste, and improve quality. BPM helps in monitoring and improving these processes.
- Retail: Retailers need to streamline supply chain operations, manage inventory, and enhance customer service. BPM provides insights into these processes and helps in making data-driven improvements.

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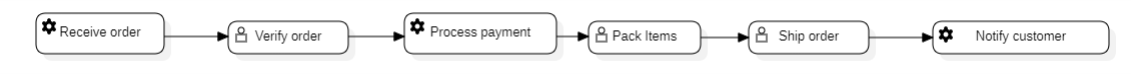
Design patterns in business process modelling

Design patterns are solutions to commonly occurring problems in their corresponding domain.

Sequence

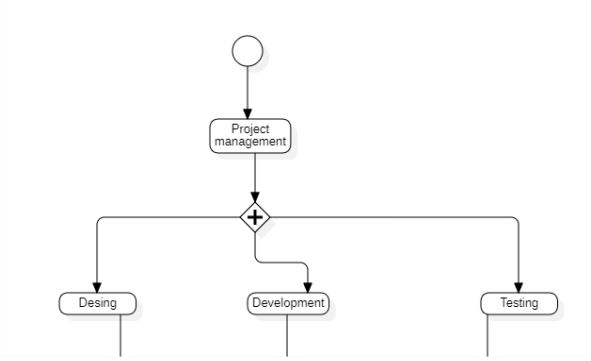
The sequence pattern is the most basic pattern where activities are performed in a linear order, one after the other.



In this BPMN diagram, we will specify whether each task is a user task (performed by a human) or a service task (automated by a system).

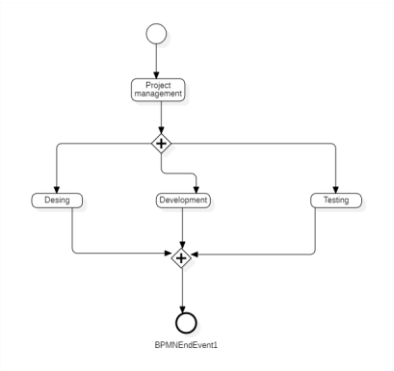
Parallel split

The parallel split pattern allows multiple activities to be executed simultaneously. It is used when tasks can be performed independently of each other.



Synchronization

The synchronization pattern is used to synchronize parallel activities. It ensures that all parallel tasks are completed before moving to the next step.



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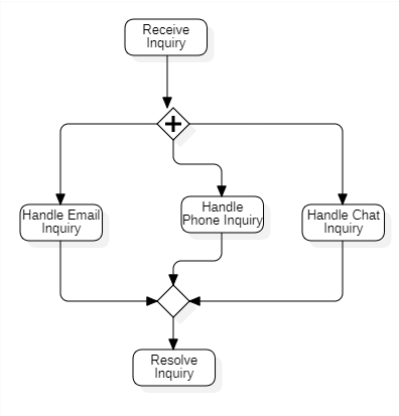
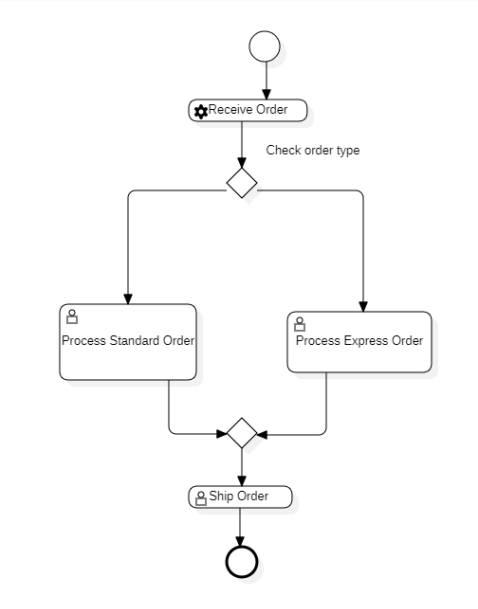
Simple merge

The simple merge pattern is used to bring together multiple alternative paths into a single path. It is the counterpart to the exclusive choice pattern.



Exclusive choice

The exclusive choice pattern represents a decision point where only one of several possible paths can be taken based on certain conditions.



Implicit termination

The implicit termination pattern enables a user to terminate the process from any branch. The process engine verifies the completed workitems and decides the termination of the process. This largely avoids clutter because otherwise we have to design the process in such a way that these paths join at a single point of termination. The complexity of such a design would increase with the increasing number of paths in the process.

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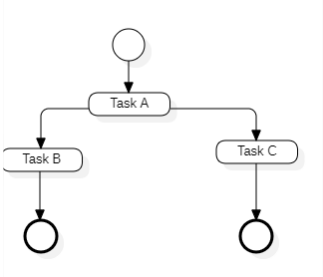
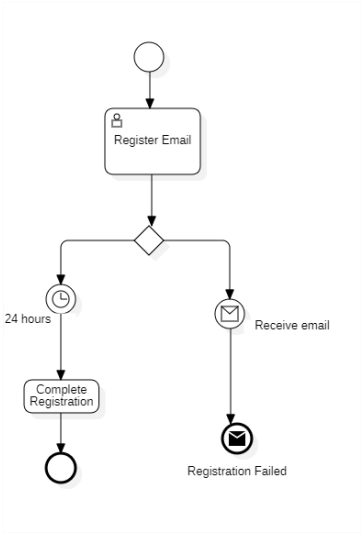
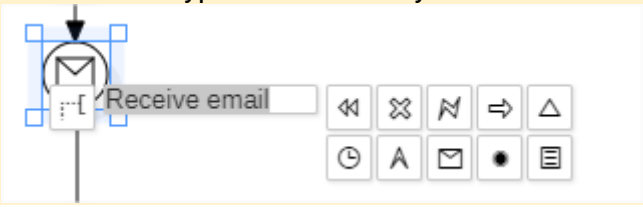


Deferred choice

Deferred choice gives a business process the ability to choose a path on the basis of an interaction with the operating environment. The execution control waits in the decision gateway; the path where the first task is initiated is chosen as the path of execution.



In StarUML you can set the type of the event by doble click in a StartEvent.



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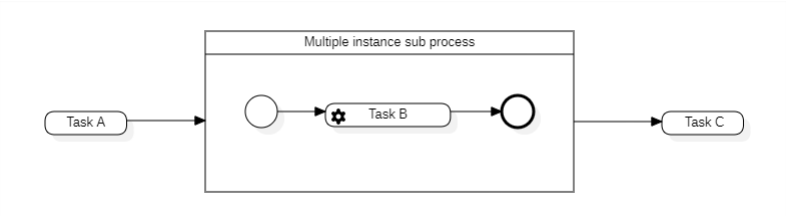
Multiple instances without synchronization

By using the **Multiple Instance** (**MI**) facility, we can create multiple instances of a task. These instances are independent of each other. There is no requirement to synchronize the execution flow after the multiple instance execution, unlike a merge.

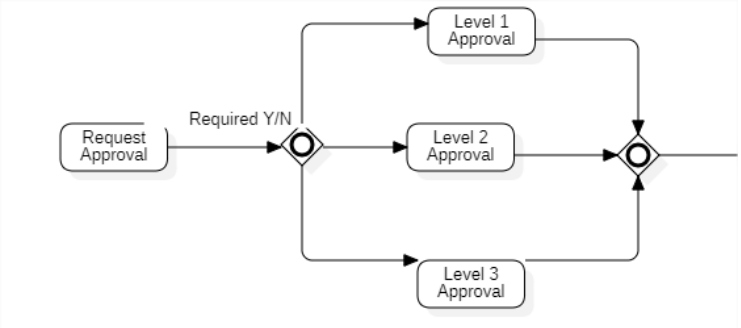


After the execution of **Task A**, the **Task B** execution is done by using a collection expression used to define **B Multiple Instance Sub process**. Multiple instances of **Task B** are executed depending on the number of items provided in the collection expression. **Task C** is executed without waiting for the execution completion of **Task B** (or instances of **Task B**). This pattern is particularly useful when multiple tasks need to be run in a *fire-and forget*-manner.

For example, in a process, we have to send e-mails to a set of users (say subscribers for an incident). Here, the collection expression would be the list of subscribers. The multiple instance task (send e-mail task) would send e-mails to each subscriber.

Synchronized merge

Synchronized merge provides a controlled way for merging a branched execution flow. The execution flow is merged when all incoming "active" branches are completed.



The preceding process illustrates a synchronized merge scenario. Based on the condition for the levels of approval, one or more levels of approval may be required. The second inclusive gateway ensures that the control to the next activity is done after all active approvals are done.

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Arbitrary cycle

Arbitrary cycle patterns address the need for repetition of tasks in a process model in an unstructured manner, without the need of explicit constructs such as loop operators. This pattern helps in representing process models that require a cycle in a visually readable format.

The preceding figure shows that tasks can be cyclically connected using connectors and gateways.

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Bibliography

Weske, M. (2024) *Business Process Management 4th edition.* Springer

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