

# IBM Business Automation and Digital Labor Hands-on Labs

## IBM watsonx Orchestrate Workflow, Generative AI, and Document Processing Skills

For IBM watsonx Orchestrate Tech Jam EMEA

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# 1 Introduction

## 1.1 IBM watsonx Orchestrate

IBM watsonx Orchestrate (wxO) is a generative AI and automation solution designed to help businesses automate tasks, simplify complex processes, and save time and effort. It provides a catalog of prebuilt apps and skills, a conversational chat experience, and a low-code builder studio to create scalable AI assistants and agents.

To learn more about IBM watsonx Orchestrate, click [here](#). To see the technical documentation, click [here](#).

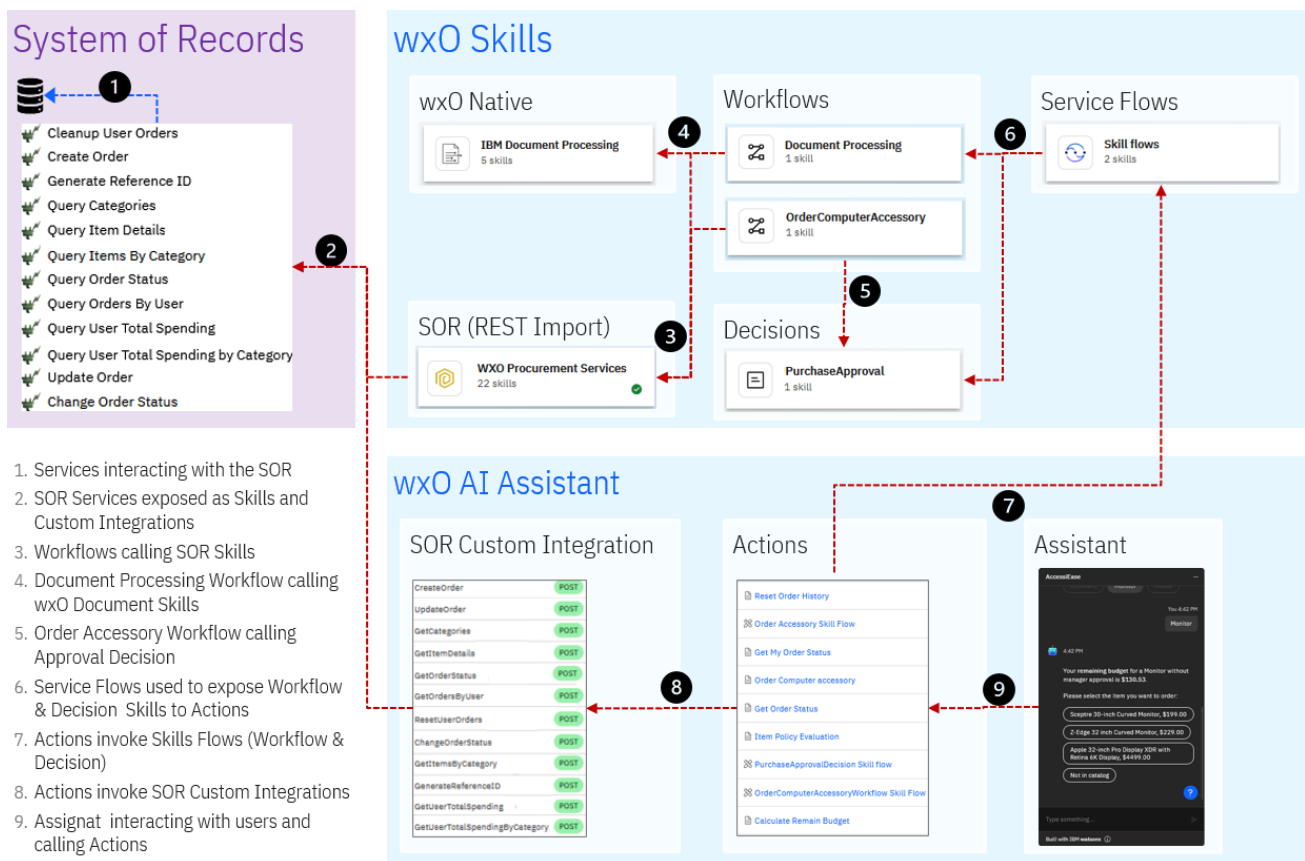
## 1.2 Lab Scenario

### 1.2.1 Computer Accessories Ordering Use Case

Focus Corp. allows employees to order computer accessories (e.g., mouse, keyboard, monitor). The ordering system implemented using wxO's advanced AI-enhanced features provides a superior user experience and operational cost reductions.

- *Employees* use wxO AI Assistant. The AI Assistant guides users through the ordering steps, advises on company policies, and helps them make the best choices.
- *Managers* do not need to get involved with standard orders. They can focus on exception cases, making decisions based on the company's business needs and financial situation.
- *The purchasing department* uses an AI-assisted process to automate the purchasing of catalog accessories, including AI-assisted processing of quote documents.

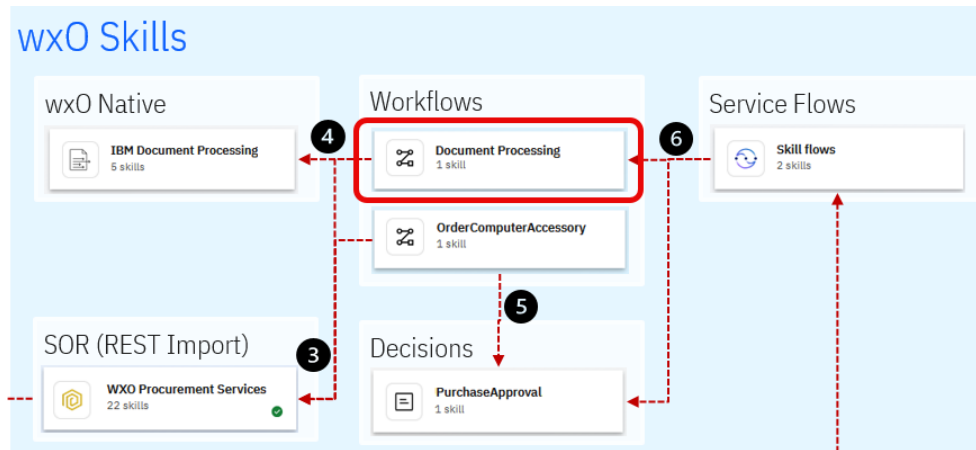
### 1.2.2 Solution Architecture



**Figure 1. Procurement of Computer Accessories Solution Architecture**

### 1.3 Lab Overview

In this lab, you will implement a simplified version of the Document Processing Workflow Skill part of the Solution architecture introduced in the figure above.



In the simplified version of the Document processing Workflow, you will use the advanced document processing features of wxO and Generative AI.



You will follow these steps to create a Workflow that extracts supplier names and prices from quotes received from multiple potential suppliers:

1. Add relevant skills that you will use in this lab to your personal skillset
2. Create a Generative AI skill to extract the supplier name and quote amount from quote documents
3. Create a document processing workflow
4. Test the Workflow

## 2 Lab Setup Instructions

### 2.1 Download Lab Files

- \_1. On the Github page containing this guide go to the **lab data** directory.
- \_2. Download all four files containing the quotes to your computer:

**Quote 1 - IT Supplies Corp.pdf**

**Quote 2 - Business Supplies International.pdf**

**Quote 3 - Computer Equipment Ltd.pdf**

**Quote 4 - Office Supplies Ltd.pdf**

### 2.2 Login to IBM watsonx Orchestrate

- \_1. In your web browser open IBM watsonx Orchestrate using the link provided to you.
- \_2. Enter your **IBM ID**, click **Continue**, enter your **password**, and click **Continue** again to log in.
- \_3. If you have access to multiple tenants, please select the tenant that was shared with you as part of the event.

Log in to IBM

Watson Orchestrate

Don't have an account? [Book a demo](#)

Continue with IBMid

[Forgot ID?](#)

pacholsk@ca.ibm.com

Continue



## 3 Preparation

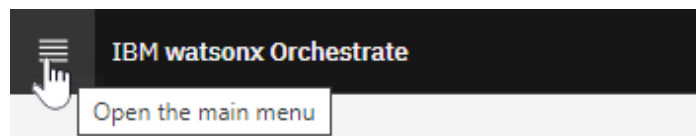
### 3.1 Add Skills to Personal Skills

In the Workflow Skill (short Workflow) you will create as part of this lab, you will invoke pre-existing Skills that provide access to request quotes from Focus Corp's suppliers. Additionally, you will utilize IBM Document Processing Skills to extract the text from these quotes. Since only Skills in your Personal Skills can be invoked from a Workflow, in this step, you will add the skills you need for the Workflow from the system-wide Skill Catalog to your Personal Skills.

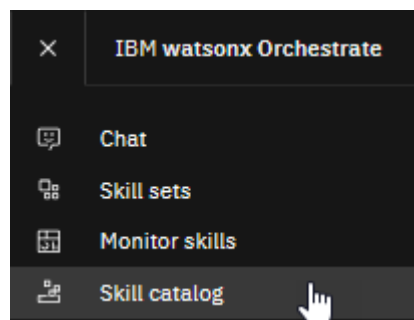
#### 3.1.1 Connect to the " ITAH\_Backend\_Services" App

The *ITAH\_Backend\_Services App* contains the skills you need to import into your Personal Skill Catalog to use later in the Document Processing Workflow.

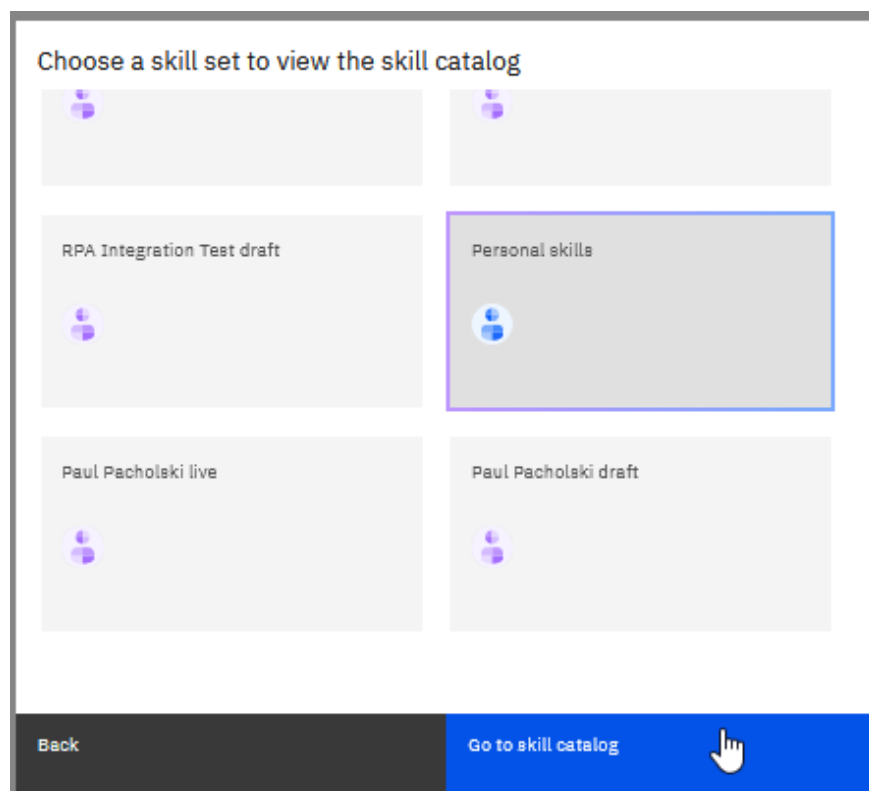
\_1. Click the **Hamburger** menu.



\_2. Click **Skill catalog**.



\_3. If you see the *Choose a skill set to view the skill catalog* panel, select **Personal skills**, and click **Go to skill catalog**.



\_4. Type **ITAH\_Backend\_Services** in the Skill catalog search bar and press the **enter** key.

## Skill catalog

Skills are grouped by app. Select an app to see all the skills that use that app.

Personal skills



ITAH\_Backend\_Services

This action will locate the *ITAH\_Backend\_Services* App.




\_5. Click the **ITAH\_Backend\_Services** tile.

### Apps

ITAH\_Backend\_Services  
34 skills

**Note:** If you have already completed one of the other labs, your ITAH\_Backend\_Services App may be connected (  Connected  ). In that case, you can skip the following three steps.

\_6. Click the **Connect app** button.

 IBM watsonx Orchestrate English   


Skill catalog /

ITAH\_Backend\_Services (34)

Connect app 

Personal skills


\_7. Add the *user ID* and *password* you received, and click on the **Connect app**.

Connect to ITAH\_Backend\_Services 

username

USRXXX

password

..... 

Cancel Connect app

\_8. Verify that the status is **Connected**.

[Skill catalog](#) /

ITAH\_Backend\_Services (34)

✔ Connected

Personal skills

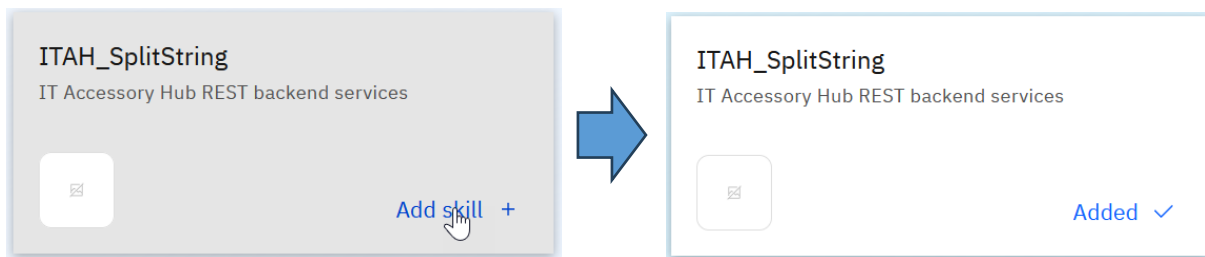
### 3.1.2 Add Skills to Skill Catalog

You will need to add two skills to the Skill Catalog that you will use later in this lab: GetQuotes and SplitStrings.

\_1. Locate the **ITAH\_GetQuotes** skill and click **Add Skill** +. You should see the status set to *Added*.



\_2. Similarly, add the **ITAH\_SplitString** Skill.

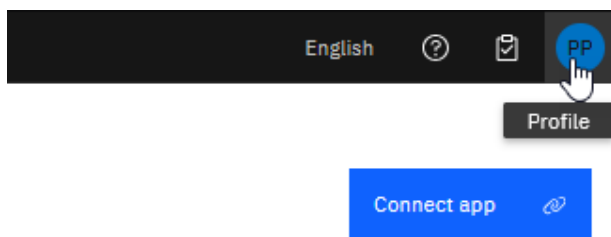


### 3.1.3 Connect to the "IBM Document Processing" App

We must use IBM Document Processing Skills to create the Document Processing Workflow. Specifically, you will need to use the Extract text skill.

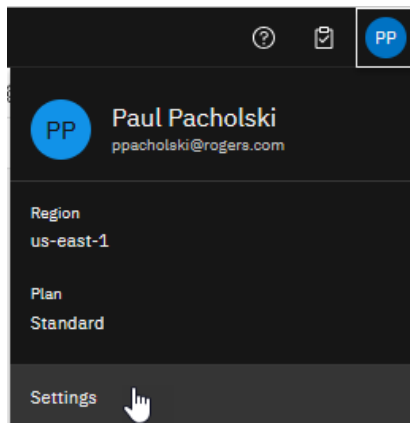
In our scenario, procurement will receive quotes from suppliers in PDF form. We need to extract the text from the PDF and provide it as input to a Gen AI skill you will also create.

\_1. Click the **Profile** icon.

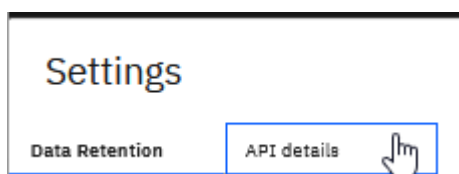




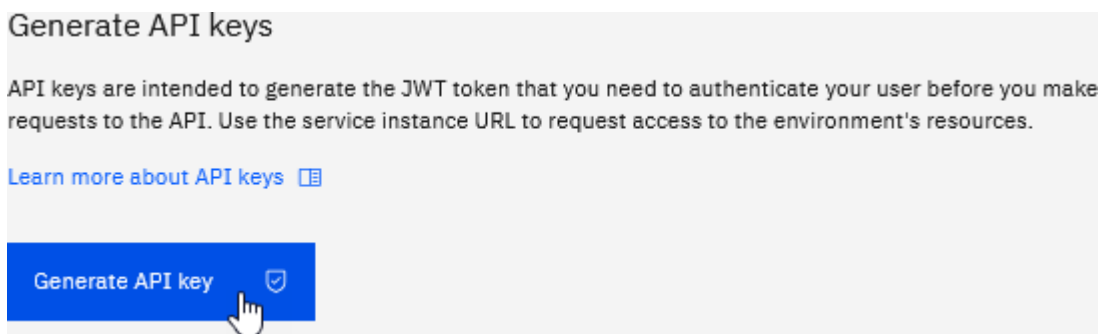
\_2. Select **Settings**.



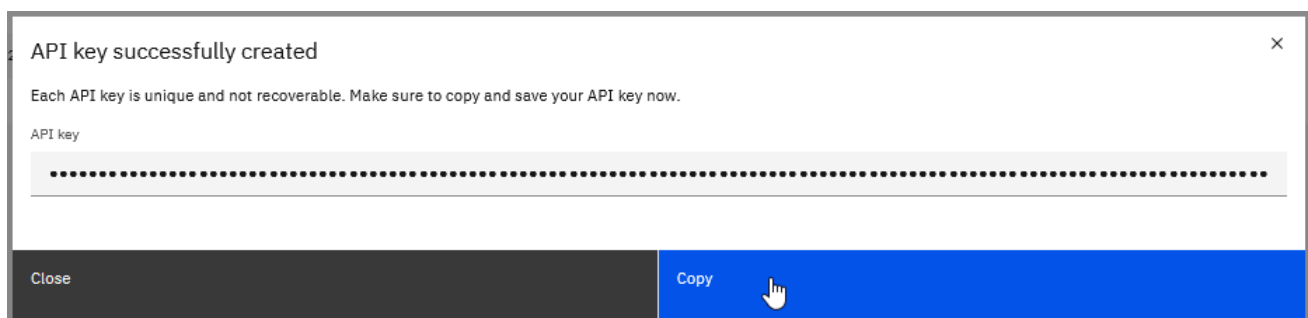
\_3. Click the **API details** tab.



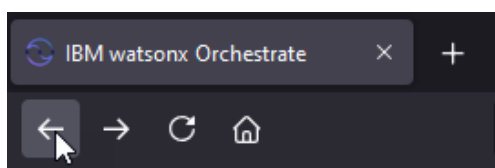
\_4. Click **Generate API key**.



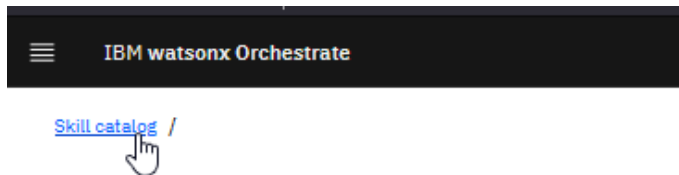
\_5. Click **Copy**.



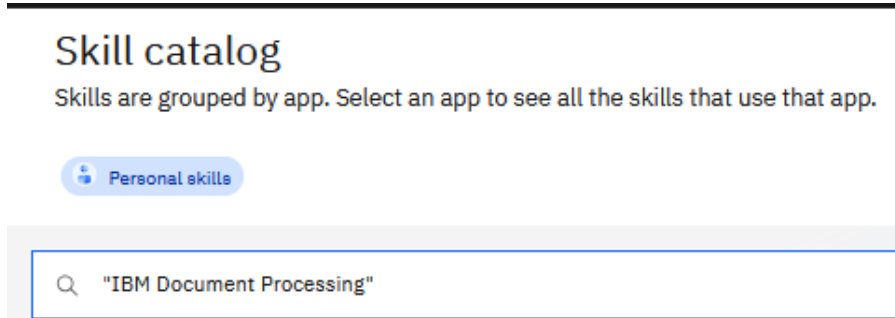
\_6. Click the Web Browser **back arrow** to get back to the Skill catalog.



\_7. Click the **Skill catalog** link.

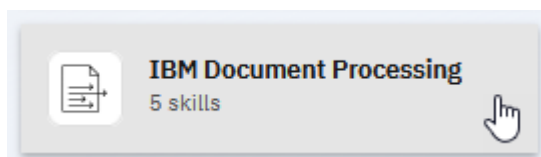


\_8. Type "IBM Document Processing" in the Skill catalog search bar and press the **enter** key.

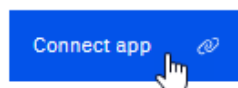
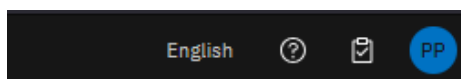


This action will locate the IBM Document Process App.

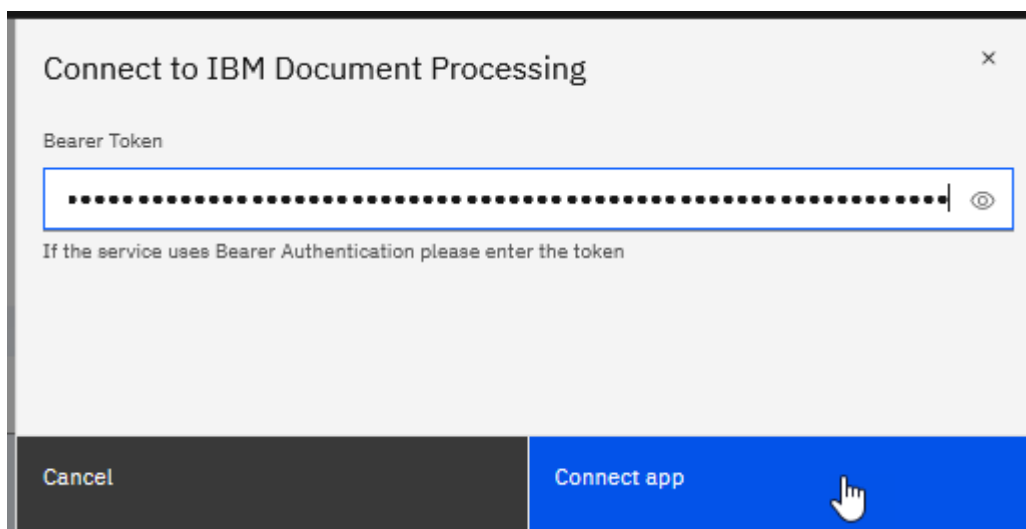
\_9. Click on the **IBM Document Processing** tile.



\_10. Click **Connect App** on the top right.



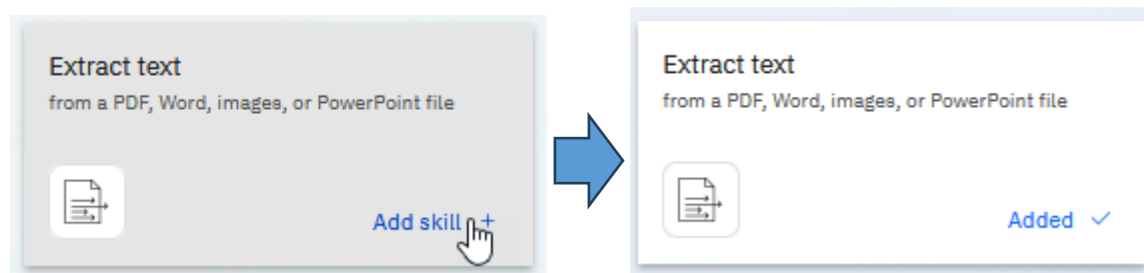
\_11. **Paste** the API key (you copied it to the clipboard in the previous step) into the *Bearer Token* field, and click **Connect app**.



### 3.1.4 Add Extract Text Skill to Skill Catalog

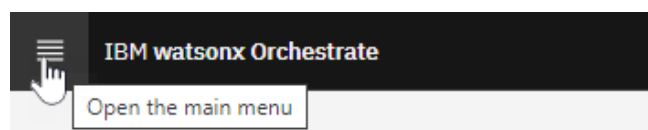
You will use the Extract Text Skill to extract text from the quote documents provided by computer parts suppliers.

- \_1. Locate the **Extract text** skill and click **Add Skill +**. You should see the status set to *Added*.

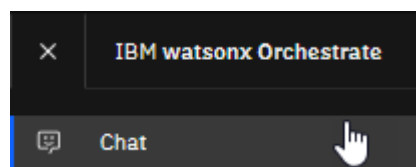


### 3.2 Test the Extract Text Skill

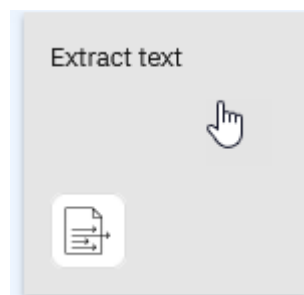
- \_1. Click the **Hamburger** menu.



- \_2. Click **Chat**.



- \_3. Click the **Extract text** skill tile.

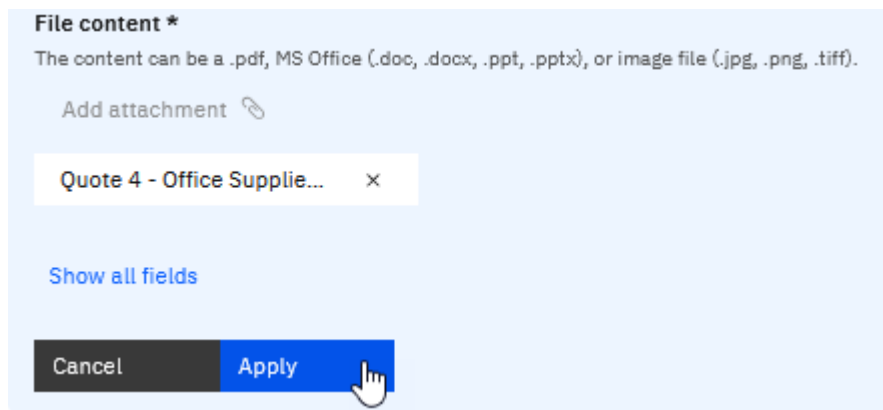


- \_4. Click **Add attachment**.

The screenshot shows a form titled 'You just need to complete this form first.' for adding an attachment to the 'Extract text' skill. The form includes a file upload icon and the text 'File content \*'. Below this, it states: 'The content can be a .pdf, MS Office (.doc, .docx, .ppt, .pptx), or image file (.jpg, .png, .tiff).' There is a button labeled 'Add attachment' with a link icon, and a link labeled 'Show all fields'. At the bottom, there are 'Cancel' and 'Apply' buttons.


\_5. Upload **Quote 4 - Office Supplies Ltd.pdf** (you previously downloaded as described in 2.1 [Download Lab Files](#)).

\_6. Click **Apply**.



**File content \***

The content can be a .pdf, MS Office (.doc, .docx, .ppt, .pptx), or image file (.jpg, .png, .tiff).

Add attachment 

Quote 4 - Office Supplie... x

[Show all fields](#)

Cancel Apply

\_7. Check that the *Extracted text* appears as below.



Here are the results of the Extract text skill.

 Extract text

Extracted text

N @ Office Supplies Quotation No: Quotation Date: Quotation Valid Till: 100 15-Aug-24 15-Sep-24 Office Supplies Ltd. 1235 NW 107th Ave Doral 33172 Florida Larry Stevenson Focus Corp. 5941 Prospect Ave Kansas City, 64130 Montana 1 2 3 4 5 Cherry CAD Advanced Pro keyboard 1 -\$ -\$ -\$ -\$ -\$ -\$ -\$ -\$  
\$ Special Notes and Instructions We are sorry, but we cannot offer the requested item. Item Summary Total Amount SGST  
Total CGST Total Total including taxes In case of any queries, please contact Maria Sanchez at +1 (305) 593-1245 or drop  
us an email at Maria.Sanchez@officesuppliesltd.com

### 3.3 Create wxO Project

A project is a collection of skills that fulfill a business purpose. You create projects in Skill Studio and publish them to the Skills and Apps page, where you train the skills and make them available in the Skill catalog. Users can then use the Skill by entering a phrase in the watsonx Orchestrate chat window.

A project can contain one or more skills. A skill fulfills a business purpose and contains business logic. The following are the types of skills available:

#### Decision

A skill type that captures and automates repeatable intelligent business decisions. For example, a business decision to authorize a loan based on established rules and policies. A decision can be implemented with decision models, ruleflow models, and prediction models.

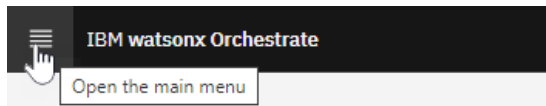
#### Workflow

This skill type models a business process—for example, a process to find and hire candidates for a job. A workflow is composed of a sequence of activities and tasks. These activities can be other workflows, decisions, or skills you can combine to create powerful solutions.

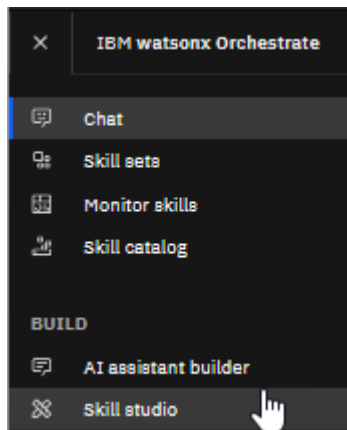
#### Generative AI

This skill type can be used to analyze or generate contextual information. You can use the prompt editor in the component to specify what needs to be analyzed or produced. You can then use the content within a skill or a broader project.

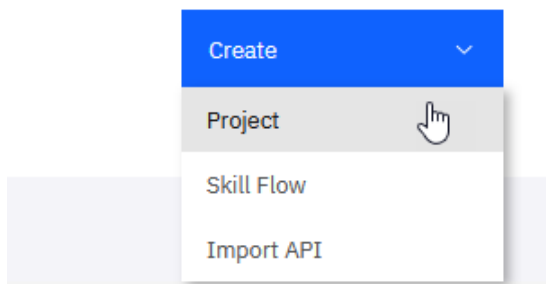
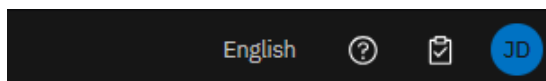
\_1. Click the **Hamburger** menu in the top-left corner.



\_2. Click **Skill studio**.



\_3. On the top-right, click **Create > Project**.

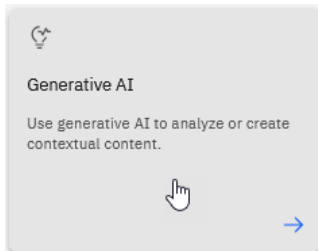


\_4. For *Name*, enter **UsrXXXDocumentProcessing** (remember to replace XXX with the three-digit number in the user id you have received), provide an optional description, and click **Create**.

## 4 Exercise: Create a Generative AI Skill

You will now create a Generative AI skill to extract the supplier's name and the item cost from the quote information in the PDF files you receive from your suppliers. Since the format of the quotes will differ between suppliers, we will use the Generative AI Model to find these two pieces of information. Using a multi-shot prompt technique, you will "train" the Large Language Model to extract the two fields from documents of varying formats.

1. Click the **Generative AI** tile.



2. For *Name*, enter **UsrXXXExtractSupplierAndCost** (remember to replace XXX with the three-digit number in the user id you have received), provide an optional description, and click **Create**.

A dialog box titled "Create a generative AI" with a close button (X) in the top right corner. It contains two input fields. The first is labeled "Name" and contains the text "UsrXXXExtractSupplierAndCost". Below this field is a note: "Note: This is a symbolic name that must be unique and cannot be changed later." The second field is labeled "Description (optional)" and contains the placeholder text "Describe your skill". At the bottom of the dialog, there are two buttons: "Cancel" on the left and "Create" on the right. A hand cursor is pointing at the "Create" button.

### \_3. Examine the Generative AI Editor.

**Prompt 1**  
Create a prompt to analyze or produce contextual content.

Model: ibm/granite-13b-chat-v2

**Generate**

**Context**  
You are generating a short paragraph with some inspiring text.

**Prompt input**  
Write something about `{{topic}}`.

**Generated output**  
The model generates an output here.

**Variables 2**  
Add variables and insert them into your prompt to dynamically take inputs from users and workflows.

Variable	Default value
topic	nature

[New variable](#)

**Parameters 3**  
Constrain the length of the generated output.

Min generated tokens: 1

Max generated tokens: 50

**Training examples 4**  
Improve results of the prompt by providing examples of prompts and expected outputs.

No training examples.

[New example](#)

#### 1) **Prompt:**

**Model selection.** You can select a model from the list of supported models and their capabilities. Click [here](#) for a list of supported models and their capabilities.

**Context.** It provides the background or contextual information in your prompt. You can use it to nudge the model output in the right direction. Specifically, words that appear in your prompt text are more likely to be included in the generated output. Enter the text (including Get AI Skill input variables) you want the model to answer in the Prompt input pane.

**Click the Generate button.** The model generates the output in the Generated output pane for you to preview and further tune your prompt.

- 2) **Variables:** This section defines variables and default values that can be used within the prompt input. When invoking the Generative AI skill, you can pass values for these variables, which will be included when generating the output.
- 3) **Parameters:** Parameters to control the length of the generated output.
- 4) **Training examples:** Optionally add examples to the prompt to improve the precision, quality, and stability of the output generated with your prompt.

## 4.1 Author the Generative AI Skill

### 4.1.1 Create Input Variable

#### \_1. Rename the Variable *topic* to **text**.

Variable	Default value
text	nature

### 4.1.2 Define Generative AI Model Prompt

On the Prompt Model, you will define the input variable to the GenAI LLM (quote text), and select the LLM that is best suited for text extraction task

\_1. **Select and delete** the contents of the *Prompt input*.

Prompt input

Write something about `{{topic}}` .

\_2. In *Prompt input*, Click **Ctrl-Space** and select **text**.

Prompt input

Write your prompt here. Insert variables into the prompt to use values.

text

\_3. Ensure you see the Generative AI Skill variable **text** as input to the Gen AI Model.

Prompt input

`{{text}}`

\_4. If not already selected, click the *Model dropdown* and select the **ibm/granite-13b-instruct-v2** model.

Prompt

Create a prompt to analyze or produce contextual content.

Model: ibm/granite-13b-chat-v2

Generate

Model: ibm/granite-13b-chat-v2

ibm/granite-13b-chat-v2 (8191 max tokens)  
The Granite model series is a family of IBM-trained, dense decoder-only models, which are particularly well-suited for generative tasks.

ibm/granite-13b-instruct-v2 (8191 max tokens)  
The Granite model series is a family of IBM-trained, dense decoder-only models, which are particularly well-suited for generative tasks.

\_5. **Select and delete** the text in the Clear the *Context* section.

We will not need the context, as we will use training examples instead.

Context

You are generating a short paragraph with some inspiring text.

\_6. Verify that the Prompt section should now look exactly like this.

Prompt

Create a prompt to analyze or produce contextual content.

Model: ibm/granite-13b-instruct-v2

Generate

Context

Provide instructions and context to your prompt.  
Insert variables into the prompt to use values.

Prompt input

`{{text}}`

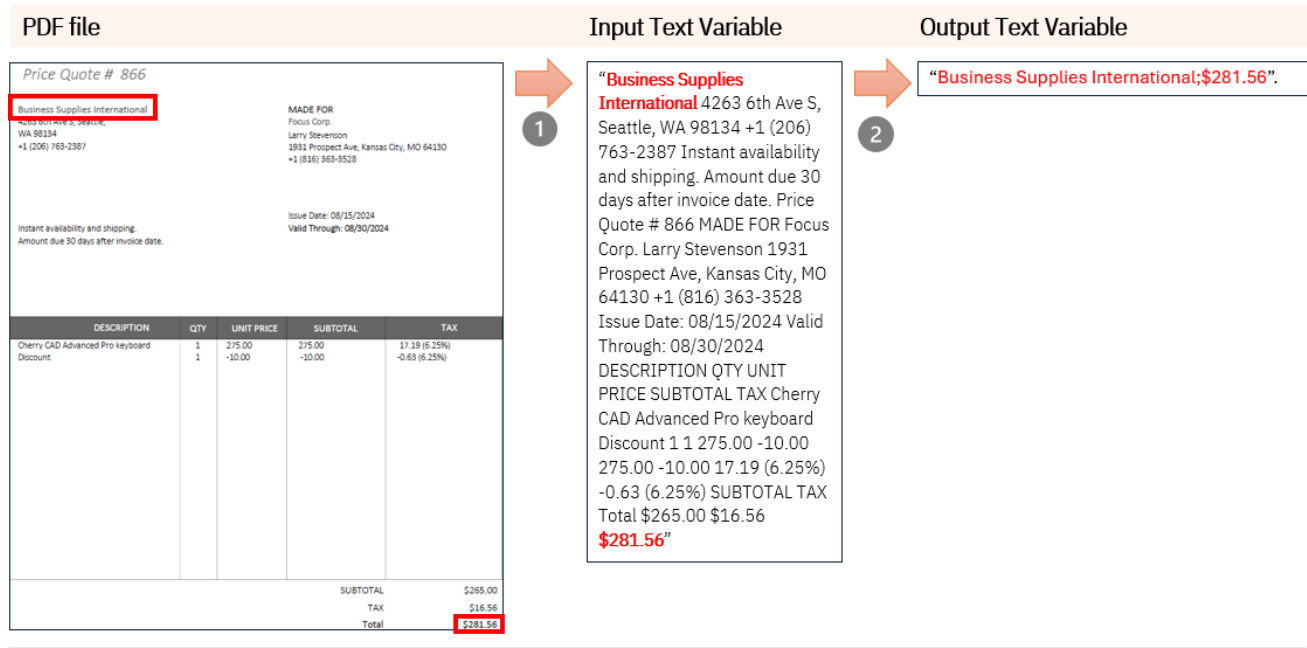


### 4.1.3 Define Training Examples

In this lab part, you will define a training example to help the selected AI model find the supplier's name and item cost information in various documents. In the lab, we will only provide three training examples. In a real scenario, you would provide one instance per document you will likely encounter.

There are two elements in a training example:

1. Gen AI Skill input text (Input Text Variable in the figure below)
2. Expected Output (Output Text Variable in the figure below)



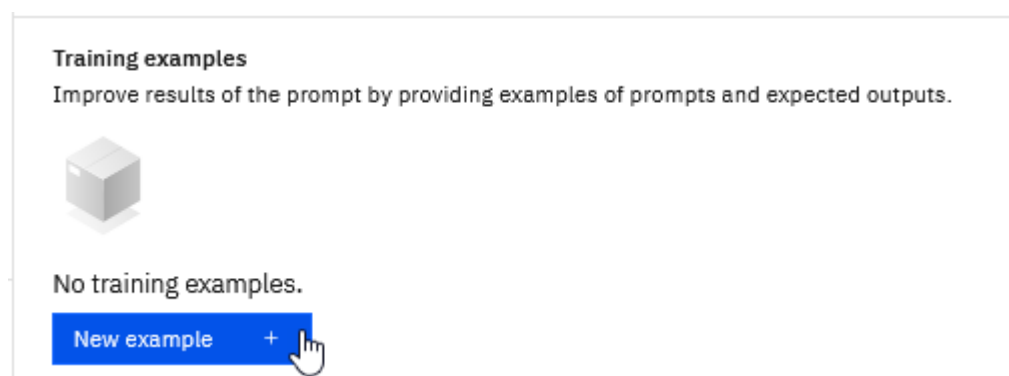
1 wxO Document Processing Skill extract data from a PDF file.

2 Generative AI Skill extracts data into output variables.

The more examples you can provide, the more accurate your Gen AI skill will become at extracting required data from varying document types.

#### 4.1.3.1 Add Example 1

1. Click the **New Example +** button.



2. For *Input* enter:

**Business Supplies International 4263 6th Ave S, Seattle, WA 98134 +1 (206) 763-2387 Instant availability and shipping. Amount due 30 days after invoice date. Price Quote # 866 MADE FOR Focus Corp. Larry Stevenson 1931 Prospect Ave, Kansas City, MO 64130 +1 (816) 363-3528 Issue Date: 08/15/2024 Valid Through: 08/30/2024 DESCRIPTION QTY UNIT PRICE SUBTOTAL TAX Cherry CAD Advanced Pro keyboard Discount 1 1 275.00 -10.00 275.00 -10.00 17.19 (6.25%) -0.63 (6.25%) SUBTOTAL TAX Total \$265.00 \$16.56 \$281.56**

\_3. For *Expected Output*, enter:

**Business Supplies International;\$281.56**

\_4. Check that your Example 1 looks as shown below:

Example 1	Input	Expected output
	Business Supplies International 4263 6th Ave S, Seattle, WA 98134 +1 (206) 763-2387 Instant availability and shipping. Amount due 30 days after invoice date. Price Quote # 866 MADE FOR Focus Corp. Larry Stevenson 1931 Prospect Ave, Kansas City, MO 64130 +1 (816) 363-3528 Issue Date: 08/15/2024 Valid Through: 08/30/2024 DESCRIPTION QTY UNIT PRICE SUBTOTAL TAX Cherry CAD Advanced Pro keyboard Discount 1 1 275.00 -10.00 275.00 -10.00 17.19 (6.25%) -0.63 (6.25%) SUBTOTAL TAX Total \$265.00 \$16.56 \$281.56	Business Supplies International;\$281.56
New example +		

#### 4.1.3.2 Add Example 2

\_1. Click the **New Example +** button.

Example 1
New example +

\_2. For *Input* enter:

< LOGO ? QUOTEComputer Equipment Ltd. 3569 Puesta Del Sol Santa Barbara, CA 93105  
Phone: +1 (805) 682-4700 Prepared by: Sam Smith CUSTOMER Larry Stevenson Focus Corp. 5941 Prospect Ave Kansas City, MO, 64130 +1 (816) 363-3528 DATE QUOTE #  
CUSTOMER ID VALID UNTIL 2024-08-15 871324 97152 2024-09-14 DESCRIPTION Cherry CAD Advanced Pro keyboard Promotion discount TAXED X AMOUNT 225.00 (5.00) [42]  
Subtotal Taxable Tax rate 220.00 225.00 6.250% TERMS AND CONDITIONS 1. Customer will be billed after indicating acceptance of this quote 2. Payment will be due prior to delivery of service and goods Tax due 14.06 3. Please fax or mail the signed price quote to the address above Other - Customer Acceptance (sign below): TOTAL 234.06\$ x  
Print Name: If you have any questions about this price quote, please contact Sam Smith, +1 (805) 682-4711, Sam.Smith@computer-equipment.com Thank You For Your Business!

\_3. For *Expected Output*, enter:

**Computer Equipment Ltd;\$234.06**

\_4. Check that your second Example looks as shown below:

Example 1	Input	Expected output
Example 2	6.250% TERMS AND CONDITIONS 1. Customer will be billed after indicating acceptance of this quote 2. Payment will be due prior to delivery of service and goods Tax due 14.06 3. Please fax or mail the signed price quote to the address above Other - Customer Acceptance (sign below): TOTAL 234.06\$ x _____ Print Name: If you have any questions about this price quote, please contact Sam Smith, +1 (805) 682-4711, Sam.Smith@computer-equipment.com Thank You For Your Business!	Computer Equipment Ltd;\$234.06
New example +		

#### 4.1.3.3 Add Example 3

Let's add an example where the supplier does not provide a price because the product may not be available.

\_1. Click the **New Example +** button.

Example 1
Example 2
New example +

\_2. For *Input* enter:

**Office Supplies Ltd. 1235 NW 107th Ave Doral 33172 Florida Larry Stevenson Focus Corp. 5941 Prospect Ave Kansas City, 64130 Montana 1 2 3 4 5 Cherry CAD Advanced Pro keyboard 1 -\$ -\$ -\$ -\$ -\$ -\$ -\$ -\$ -\$ Special Notes and Instructions We are sorry, but we cannot offer the requested item. Item Summary Total Amount SGST Total CGST Total Total including taxes In case of any queries, please contact Maria Sanchez at +1 (305) 593-1245 or drop us an email at Maria.Sanchez@officesuppliesltd.com**

\_3. For *Expected Output*, enter:

**Office Supplies Ltd.;\$0.00**

\_4. Check that your third Example looks as shown below:

Example 1	Input	Expected output
Example 2	Office Supplies Ltd. 1235 NW 107th Ave Doral 33172 Florida Larry Stevenson Focus Corp. 5941 Prospect Ave Kansas City, 64130 Montana 1 2 3 4 5 Cherry CAD Advanced Pro keyboard 1 -\$ -\$ -\$ -\$ -\$ -\$ -\$ -\$ -\$ Special Notes and Instructions We are sorry, but we cannot offer the requested item. Item Summary Total Amount SGST Total CGST Total Total including taxes In	Office Supplies Ltd.;\$0.00
Example 3		
New example		

## 4.2 Test the Generative AI Skill

We will now use a new quote example different from the three training examples we provided.

\_1. Change the *Default value* of the text variable from "nature" to:

**< LOGO ? QUOTEComputer Equipment Ltd. 3569 Puesta Del Sol Santa Barbara, CA 93105 Phone: +1 (805) 682-4700 Prepared by: Sam Smith CUSTOMER Larry Stevenson Focus Corp. 5941 Prospect Ave Kansas City, MO, 64130 +1 (816) 363-3528 DATE QUOTE # CUSTOMER ID VALID UNTIL 2024-08-15 871324 97152 2024-09-14 DESCRIPTION Cherry CAD Advanced Pro keyboard Promotion discount TAXED X AMOUNT 225.00 (5.00) [42] Subtotal Taxable Tax rate 220.00 225.00 6.250% TERMS AND CONDITIONS 1. Customer will be billed after indicating acceptance of this quote 2. Payment will be due prior to delivery of service and goods Tax due 14.06 3. Please fax or mail the signed price quote to the address above Other - Customer Acceptance (sign below): TOTAL 234.06\$ x**  
**Print Name: If you have any questions about this price quote, please contact Sam Smith, +1 (805) 682-4711, Sam.Smith@computer-equipment.com Thank You For Your Business!**

Variable	Default value
text	nature

→

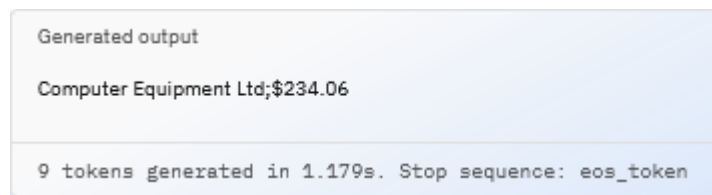
Variable	Default value
text	Thank You For Your Business!

\_2. Click the **Generate** button.

Model: ibm/granite-13b-instruct-v2

**Generate**

\_3. You should now see **Computer Equipment Ltd;\$234.06** in *Generated output*.



\_4. Click **Create Skill +** in the bottom left corner.

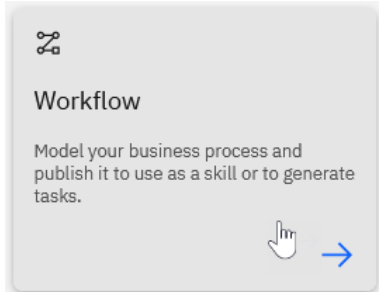


## 5 Exercise: Create a Document Processing Workflow

### 5.1 Create the Workflow

In this lab part, you will create one of the sub-flows of the Workflow Skill used in the complete Order Computer Accessories scenario.

\_1. Click the **Workflow** tile.



\_2. For *Name*, enter **UsrXXXDocumentProcessingWorkflow**, (remember to replace XXX with the three-digit number in the user id you have received), provide an optional description, and click **Create**.

### 5.2 Author the Workflow

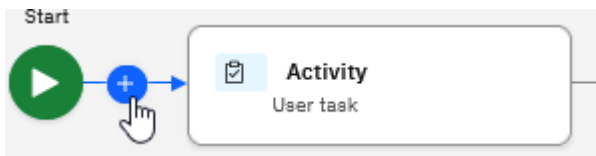
Let us first outline the steps that the Workflow should have:

1. The first step is to gather the quotes as PDF files. We will use a prebuilt skill that provides us with a list of PDF files.
2. The second step is to iterate through the list, providing each document to the Document Processing Extract Text skill and gathering its content.
3. The third step is to provide the extracted text to the Gen AI skill we created earlier to get the Supplier and Cost, which are delimited by a known delimiter, such as ";".
4. The next step is to collect each Supplier and Cost information and build the list.
5. Finally, after all values have been extracted from the documents, we exit the iteration and provide the Supplier and Cost lists as output.

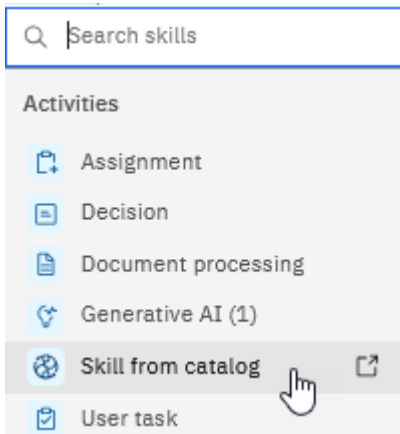
#### 5.2.1 Add "ITAH\_GetQuotes" Skill

The first Skill that we need in the Workflow is GetQuotes. It returns the suppliers' quotes received as a list of PDF files.

\_1. Click the **+** icon next to the process start icon (hover over the connection line to see it).



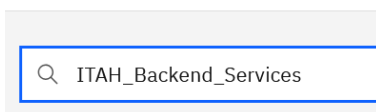
\_2. Select **Skill from catalog**.



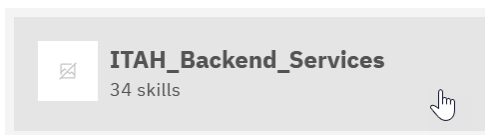
\_3. In the search bar, type **ITAH\_Backend\_Services**, and press **enter**.

Choose a skill from the list to invoke

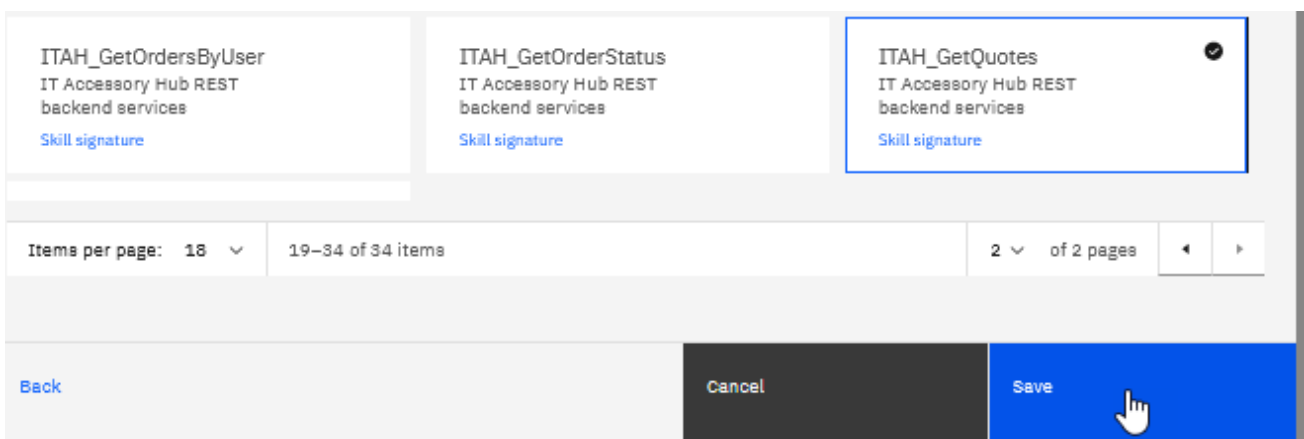
## Add a skill



\_4. Click the **ITAH\_Backend\_Services** tile.



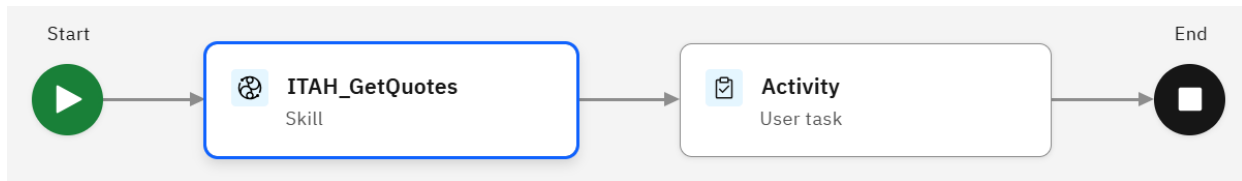
\_5. Select the **ITAH\_GetQuotes** skill and click **Save**.



**Note:** If you cannot find it, click the page arrow in the lower right corner to go to page 2.



\_6. You should now see the ITAH\_GetQuotes activity added to the flow and selected (blue frame).



\_7. Click the **Define data mapping** button in the *Activity properties* for GetQuotes.

### Activity properties

Name

ITAH\_GetQuotes

Implementation



ITAH\_GetQuotes

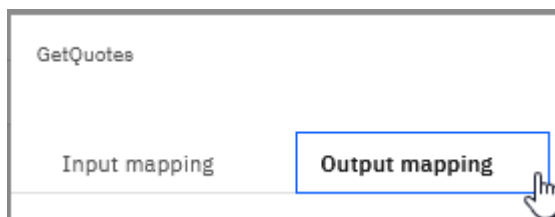


[Refresh connection](#)

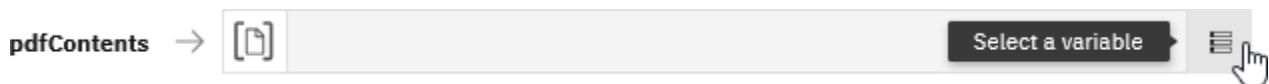
Define data mapping



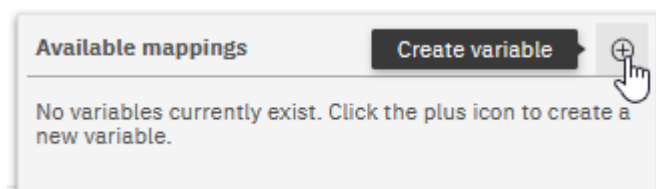
\_8. Click the **output mapping** tab.



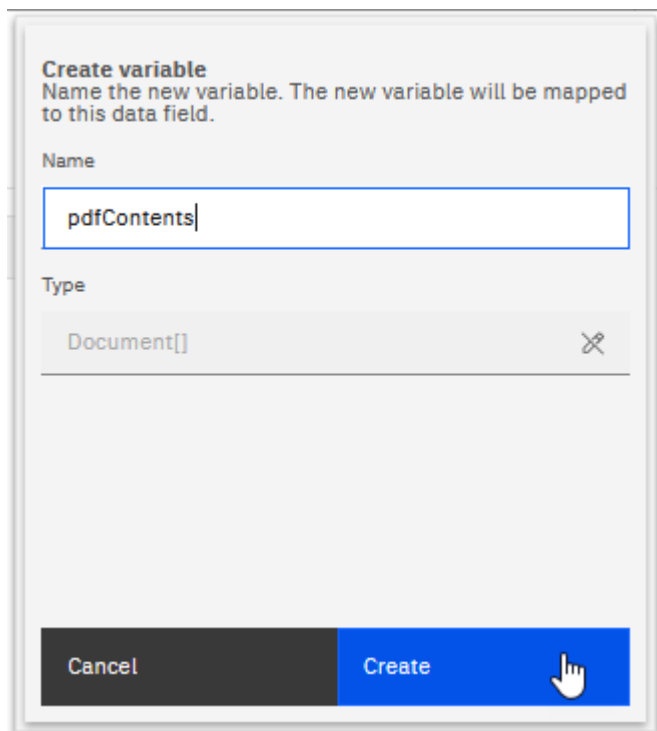
\_9. Click the **Select a variable** button.



\_10. Click Create variable **+** icon.



\_11. Click the **Create** button.



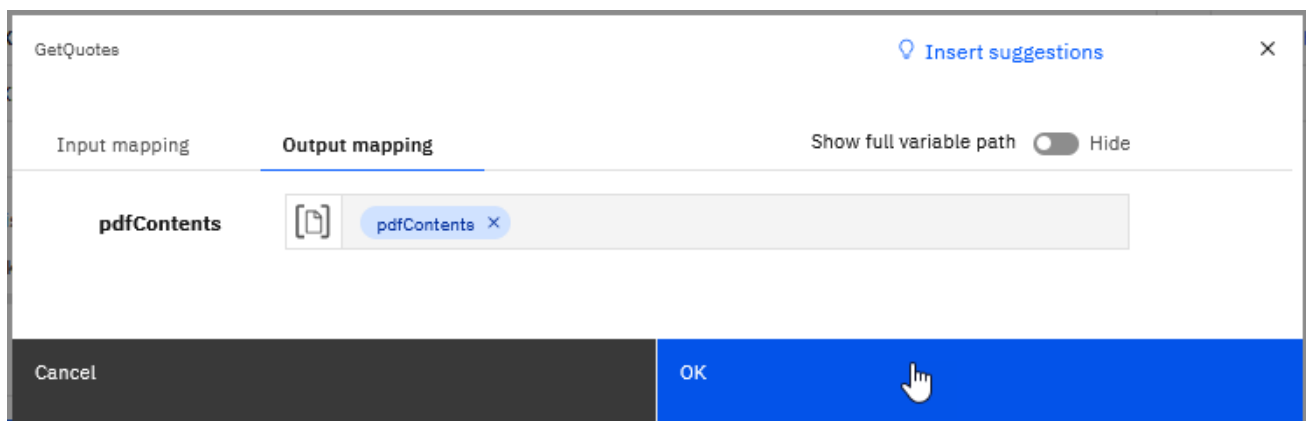
**Create variable**  
Name the new variable. The new variable will be mapped to this data field.

Name  
pdfContents

Type  
Document[]

Cancel Create

\_12. Click **OK** to close the mapping.



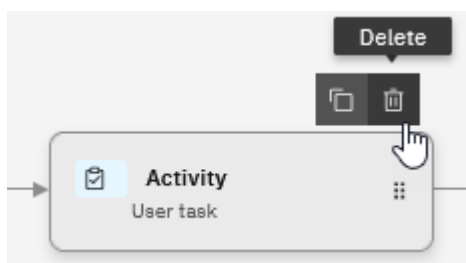
GetQuotes Insert suggestions ×

Input mapping **Output mapping** Show full variable path ☐ Hide

pdfContents [ ] pdfContents ×

Cancel OK

\_13. Select **Activity** (User task) and click **Delete**.



The User Task was created automatically for us, but we will not use it. This is a straight-through workflow.

### 5.2.2 Create Workflow Variables

We will now create several variables required to process the document list retrieved by the GetQuotes activity.



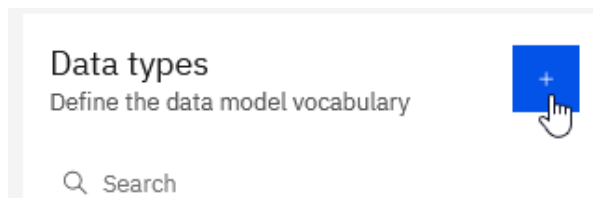
### 5.2.2.1 Create Data Type

First, we need to create a new data type to store the Price and Supplier information retrieved from the quotes.

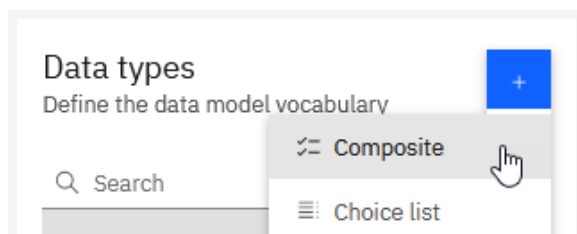
\_1. Click the **Data** tab.



\_2. Click the **+** button to create a new Data type.



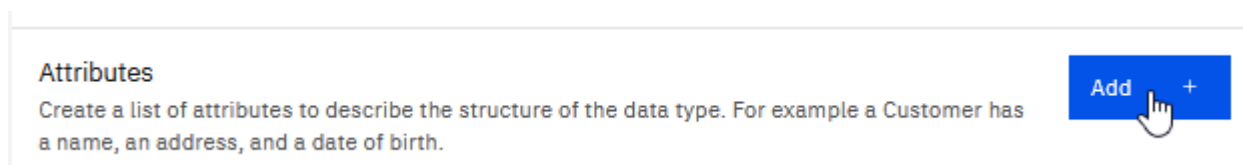
\_3. Select **Composite**.



\_4. Change the *Composite* from *newType* to **Quote**.



\_5. Click the **Add +** button **twice** to add two Attributes.



\_6. Configure each Attribute according to the table below:

Name	Type	List
price	String	No
supplier	String	No

The Attributes should look as shown below:

Name	Type	List
price	String	<input type="checkbox"/> ⋮
<i>the price, the prices, a price, prices</i>		
supplier	String	<input type="checkbox"/> ⋮
<i>the supplier, the suppliers, a supplier, suppliers</i>		

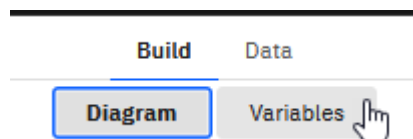
\_7. Click the **Build** tab



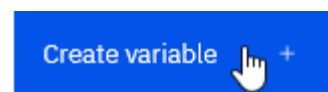
### 5.2.2.2 Create Variables

In the Workflow, we will use the Loop activity to iterate over the list of quote documents and retrieve the Supplier and Price information from them. Now, we will create the workflow variables.

\_1. Click the **Variables** tab.



\_2. Click **Create variable +** nine times to create the nine new variables.



\_3. Configure the new variables according to the table below:

Name	Data Type	List	Input	Output	Use
quotesIterator	Integer	No	No	No	The loop iterator variable that will increment to indicate the quote that is being processed
quotesLength	Integer	No	No	No	The number of quotes
quotes	Quote	Yes	No	Yes	The list of quotes extracted from the pdf documents
quotePDF	Document	No	No	No	A single quote pdf document
quoteText	String	No	No	No	The quote text extracted from the pdf document
quoteExtractedText	String	No	No	No	Contains the ; separated quote information extorted from GenAI activity
quoteSplitted	String	Yes	No	No	A list containing a single quote. Index 1 is the vendor name, and index 2 is the price.
supplier	String	No	No	No	Supplier extracted from pdf document
price	String	No	No	No	Price extracted from pdf document

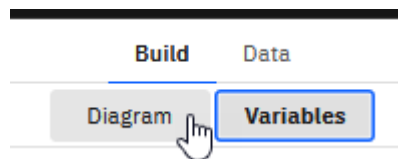
The variable should look as shown below.

Name	Data type	List	Input	Output
pdfContents	Document	<input checked="" type="checkbox"/> Multiple values	<input type="checkbox"/> No	<input type="checkbox"/> No
quotesIterator	Integer	<input type="checkbox"/> Single value	<input type="checkbox"/> No	<input type="checkbox"/> No
quotesLength	Integer	<input type="checkbox"/> Single value	<input type="checkbox"/> No	<input type="checkbox"/> No
quotes	Quote	<input checked="" type="checkbox"/> Multiple values	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
quotePDF	Document	<input type="checkbox"/> Single value	<input type="checkbox"/> No	<input type="checkbox"/> No
quoteText	String	<input type="checkbox"/> Single value	<input type="checkbox"/> No	<input type="checkbox"/> No
quoteExtractedText	String	<input type="checkbox"/> Single value	<input type="checkbox"/> No	<input type="checkbox"/> No
quoteSplitted	String	<input checked="" type="checkbox"/> Multiple values	<input type="checkbox"/> No	<input type="checkbox"/> No
supplier	String	<input type="checkbox"/> Single value	<input type="checkbox"/> No	<input type="checkbox"/> No
price	String	<input type="checkbox"/> Single value	<input type="checkbox"/> No	<input type="checkbox"/> No

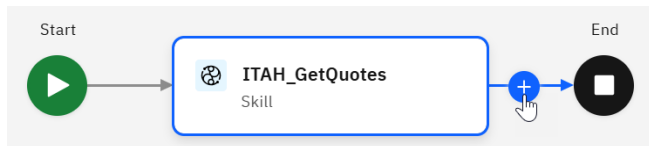
### 5.2.3 Add "Assignment" Activity

We will now add an Assignment activity to initiate the Iterator variables.

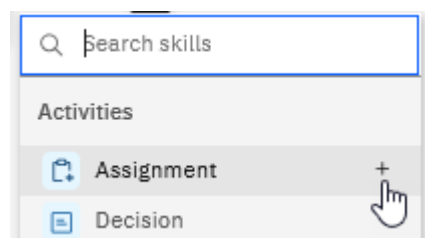
\_1. Click the **Diagram** tab.



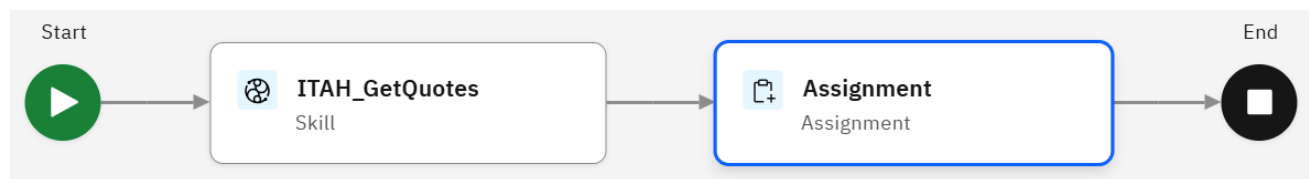
\_2. Click the **+** icon on the line leading to the End activity.



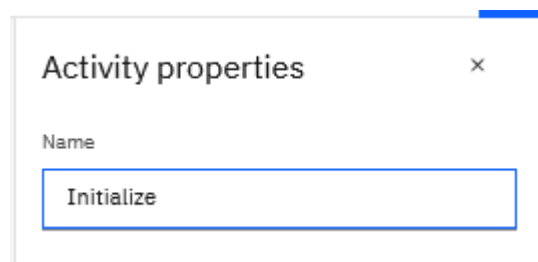
\_3. Select **Assignment**.



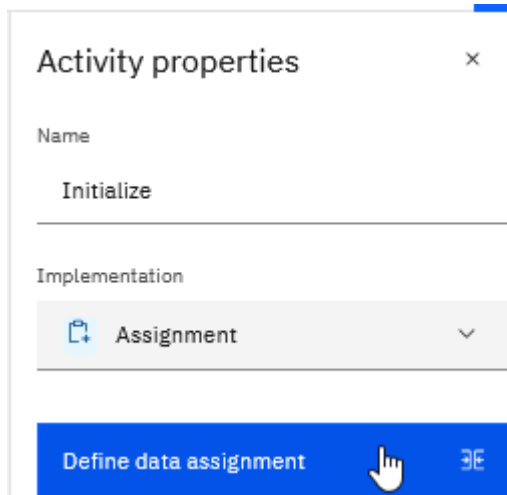
\_4. You should now see the Assignment activity added to the flow and selected (blue frame).



\_5. Set the Activity Name to **Initialize**.



\_6. Click **Define data assignment**.



Activity properties

Name

Initialize

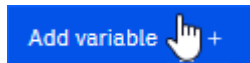
---

Implementation

Assignment

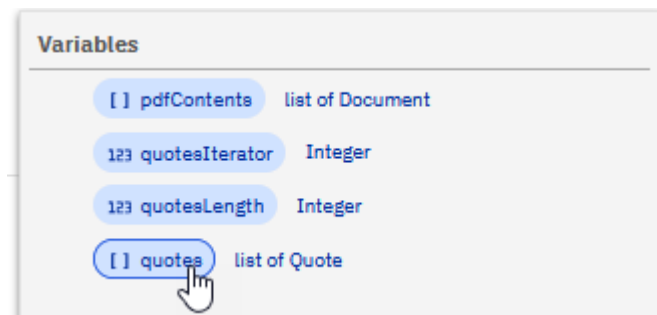
Define data assignment

\_7. Click **Add variable +** to create an assignment.



Add variable +

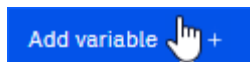
\_8. Select **[ ] quotes**.



Variables

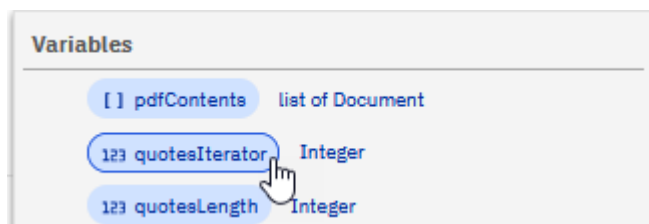
- [ ] pdfContents list of Document
- 123 quotesIterator Integer
- 123 quotesLength Integer
- [ ] quotes list of Quote

\_9. Click **Add variable +** to create an assignment.



Add variable +

\_10. Select **123 quotesIterator**.



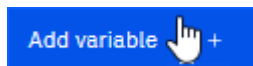
Variables

- [ ] pdfContents list of Document
- 123 quotesIterator Integer
- 123 quotesLength Integer

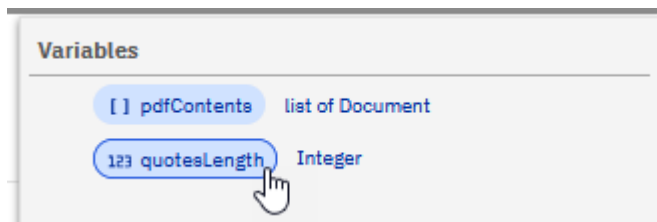
\_11. Set its value to **1**.

quotesIterator	Assign	123	1
----------------	--------	-----	---

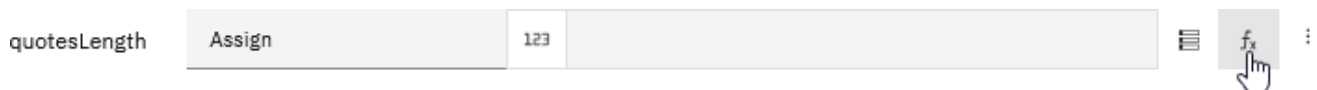
\_12. Click **Add variable +** to create an assignment.



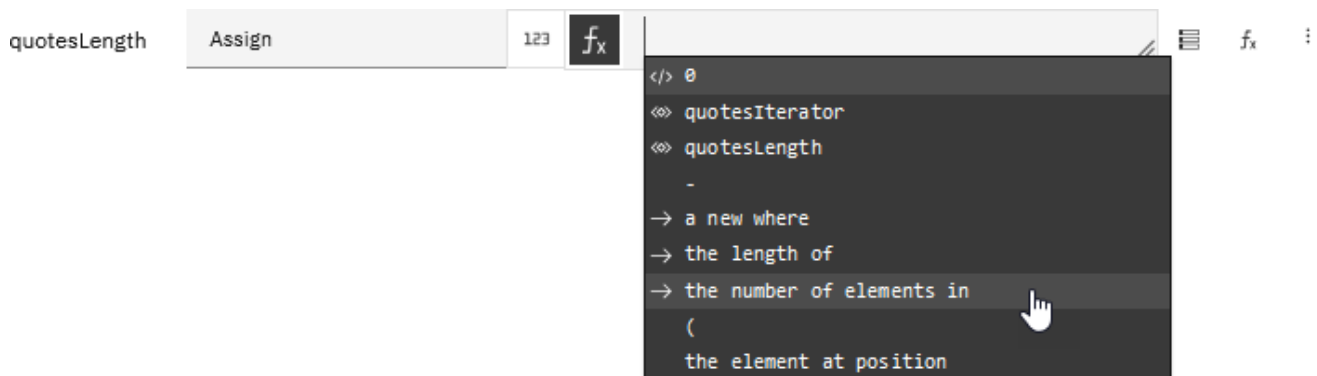
\_13. Select **123 quotesLength**.



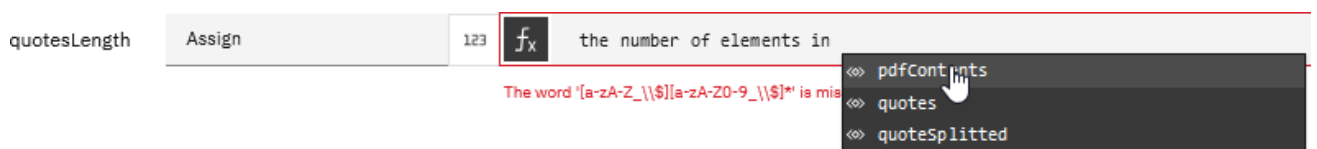
\_14. Click the **fx** icon.



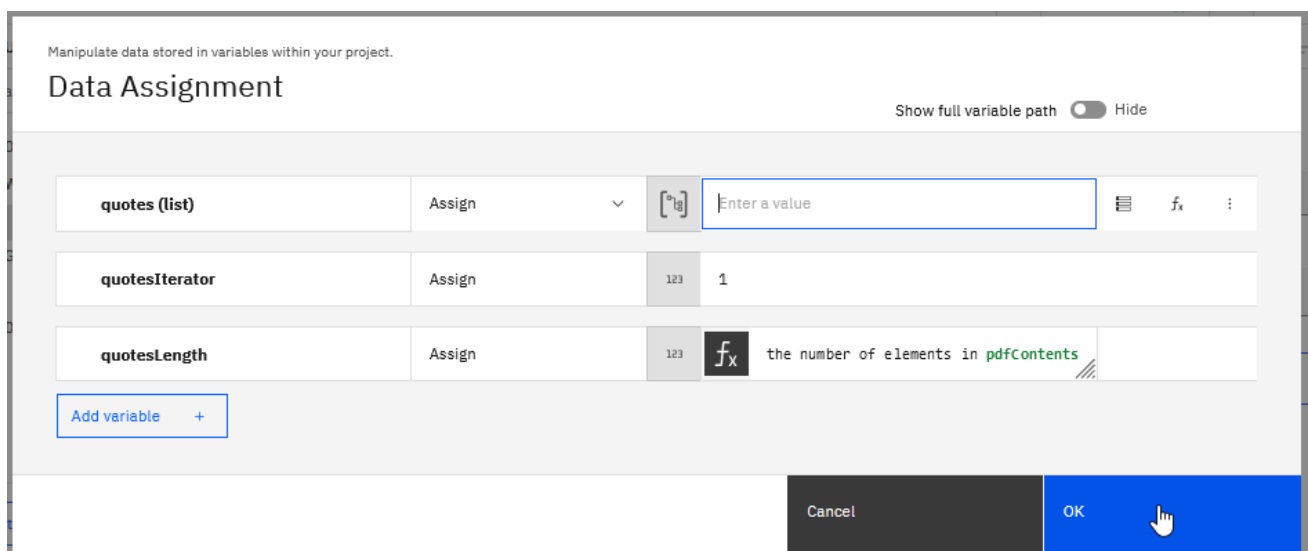
\_15. Click inside the assignment field, hit the **Ctrl+Space** keys, and select **the number of elements in** from the dropdown.



\_16. Position the cursor after *the number of elements in*, press the **Ctrl+Spacebar** keys, and then select **pdfContents**.



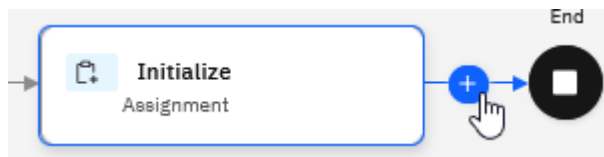
\_17. Verify that the assignments are as shown below and click **OK**.



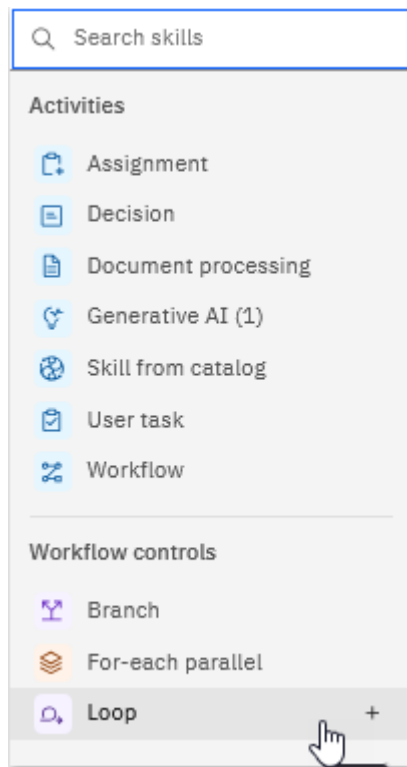
### 5.2.4 Add "Loop" Activity

Next, we add the While loop activity to iterate through each document and extract the Quotes.

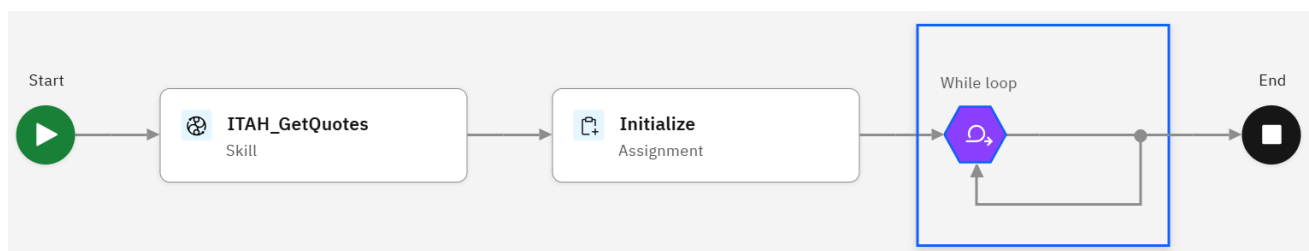
\_1. Click the **+** icon on the line leading to *End Activity*.



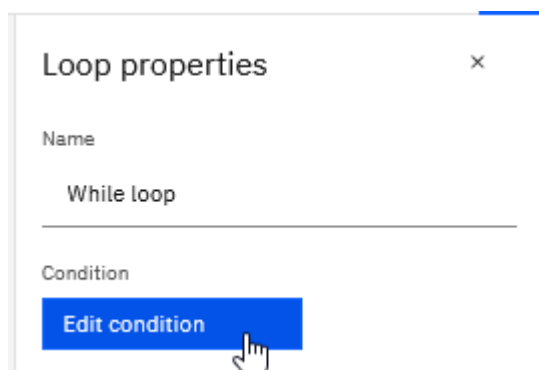
\_2. Select **Loop**.



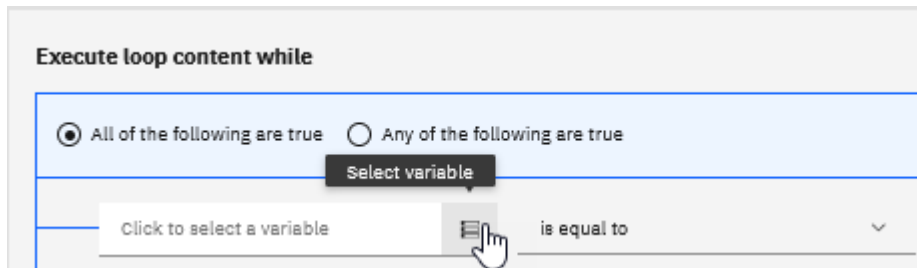
\_3. You should now see the While loop activity added to the flow and selected (blue frame).



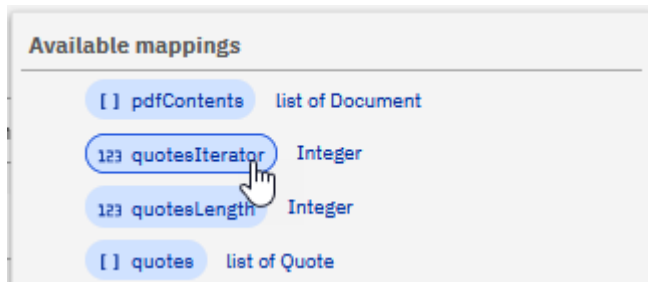
\_4. In *Loop properties*, click the **Edit condition** button.



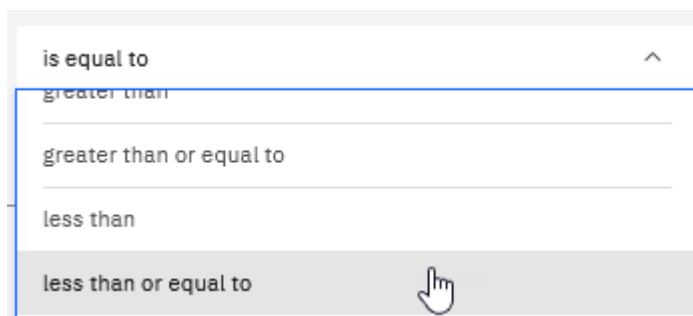
\_5. Click the **Select variable** button.



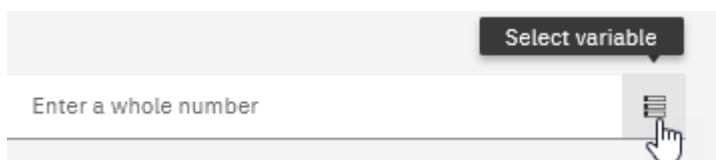
\_6. Select **123 quotesIterator**.



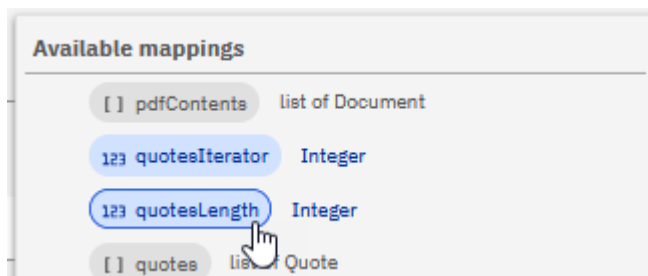
\_7. For the condition, select **less than or equal to**.



\_8. Click the **Select variable** button.



\_9. Select **quotesLength**.



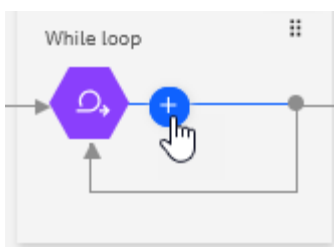


\_10. Verify that the loop condition looks like the one below and click **Save**.

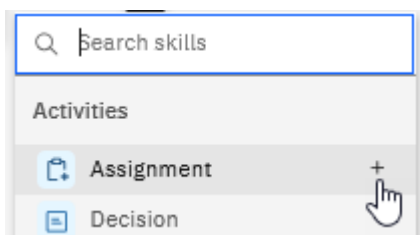
### 5.2.5 Add "Assignment" Activity

Based on the iterator value, we will add an Assignment activity to get a quote document from the list of quotes in the pdfContents variable.

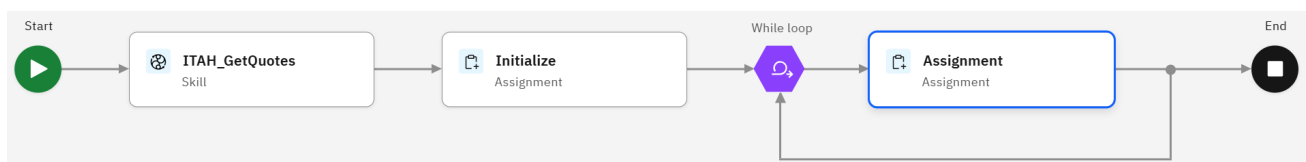
\_1. Click the **+** icon on the line emerging from the *While loop* activity.



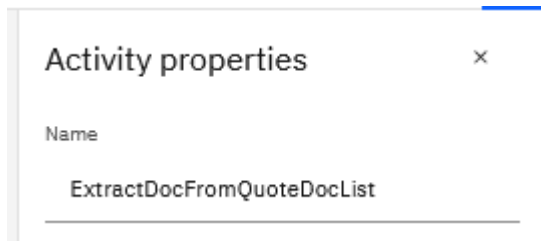
\_2. Select **Assignment**.



\_3. You should now see the Assignment activity added to the flow and selected (blue frame).



\_4. Set the Activity Name to **ExtractDocFromQuoteDocList**.



Activity properties

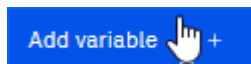
Name

ExtractDocFromQuoteDocList

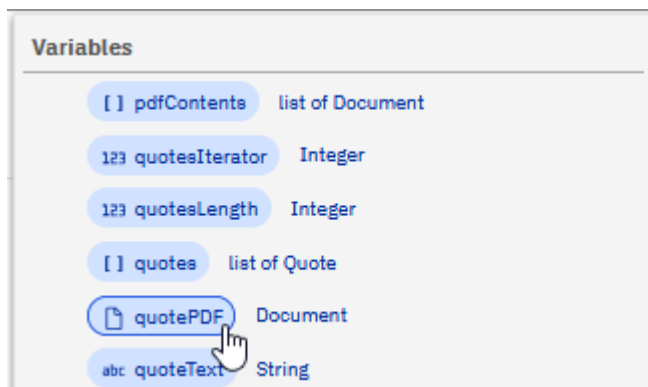
\_5. Click **Define data assignment**.



\_6. Click **Add variable +** to create an assignment.



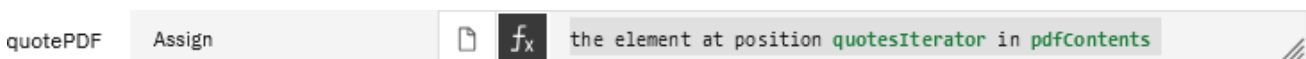
\_7. Select **quotePDF**.



\_8. Click the **fx** icon.

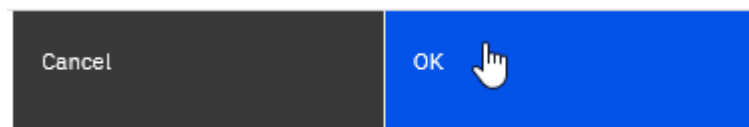


In the *assignment* field, enter **the element at position quotesIterator in pdfContents**



**Note.** As in the first assignment Activity you created, you could also use the Ctrl-Space to compose the above statement.

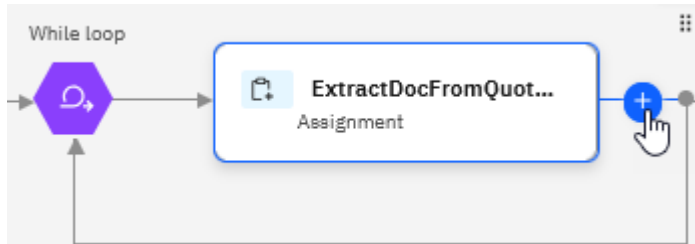
\_9. Click **OK**.



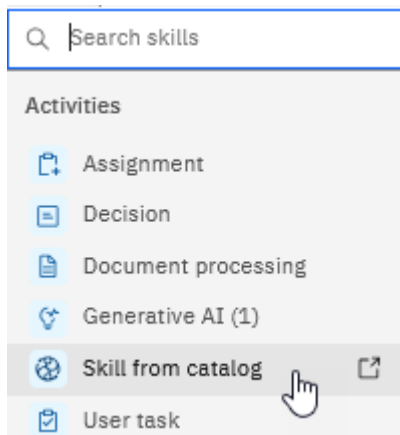
## 5.2.6 Add "Extract text" Skill

You will add a skill-based activity to extract text from the PDF document content. You will use the **Extract text** Skill previously added to the Personal Skills.

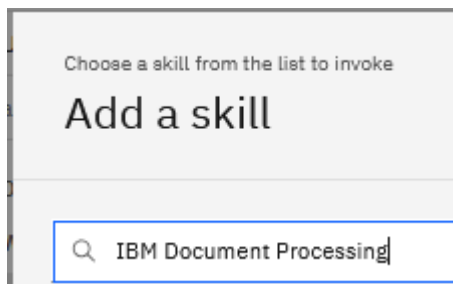
\_1. Click the **+** icon on the line emerging for the *ExtractDocFromQuoteDocList* Activity.



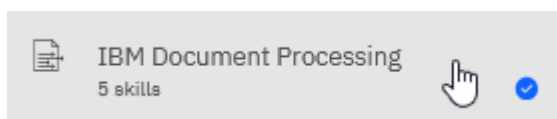
\_2. Select **Skill from catalog**.



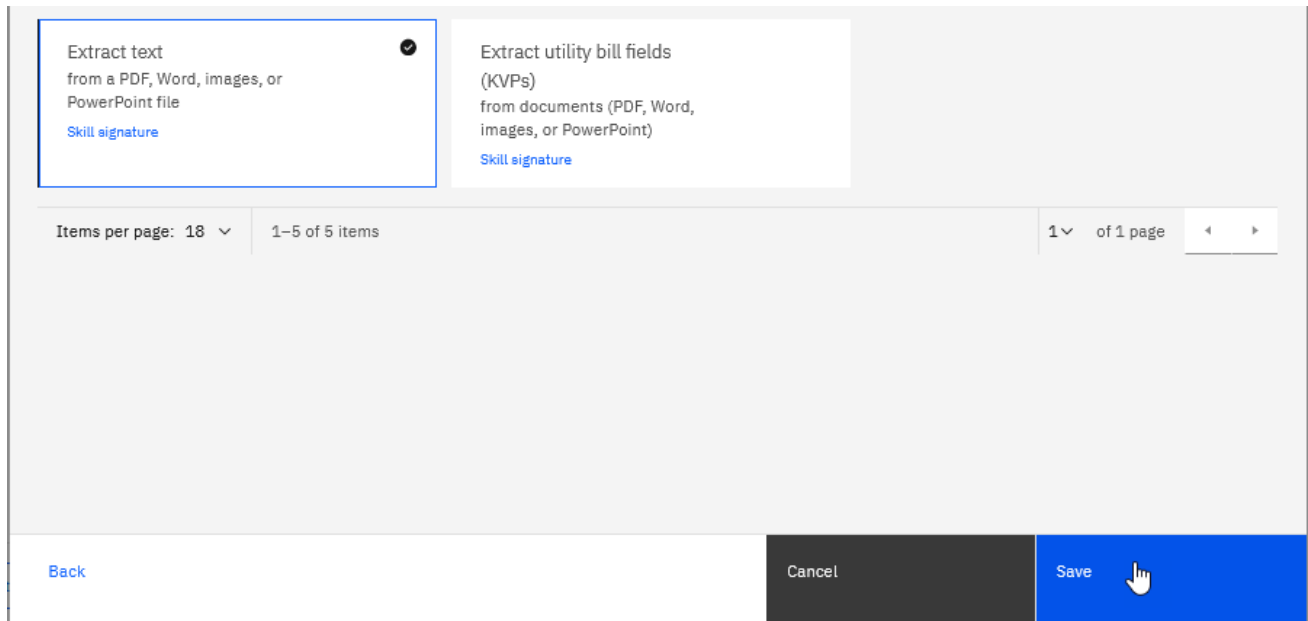
\_3. In the search bar, type **IBM Document Processing** and press **enter**.



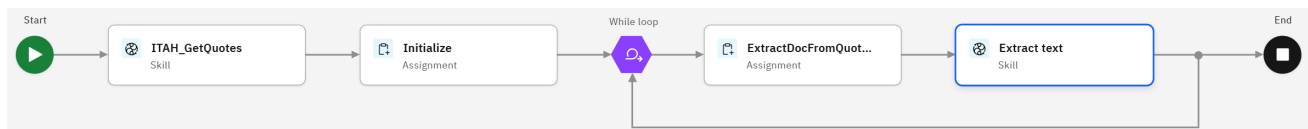
\_4. Click the **IBM Document Processing** tile.



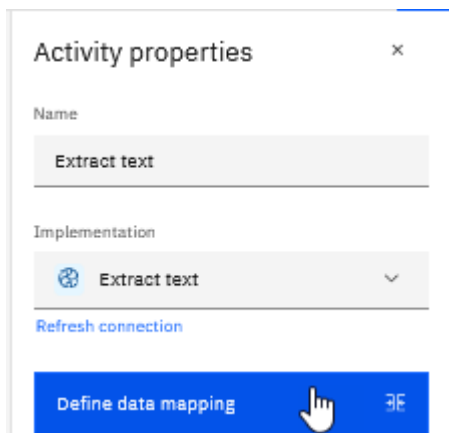
\_5. Select the **Extract text** skill and click **Save**.



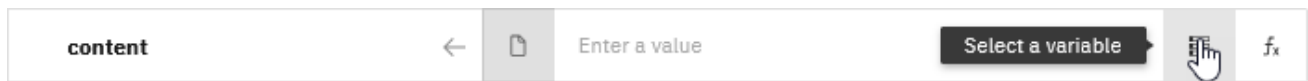
\_6. You should now see the Extract text activity added to the flow and selected (blue frame)



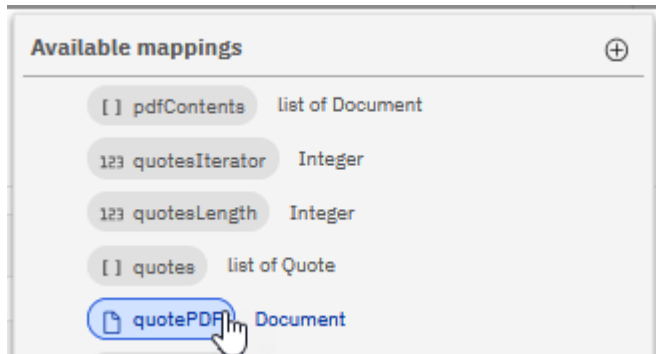
\_7. Click the **Define data mapping** button in the *Activity properties* for Extratc text skill.



\_8. For *content*, click the **Select a variable** button.



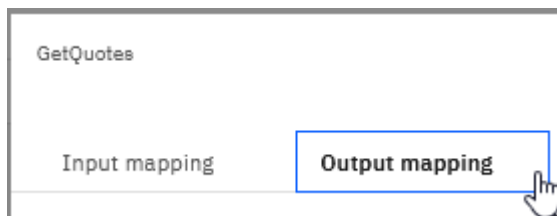
\_9. Select **quotePDF**.



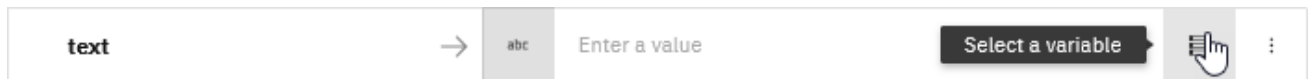
\_10. For *language*, select **en**.



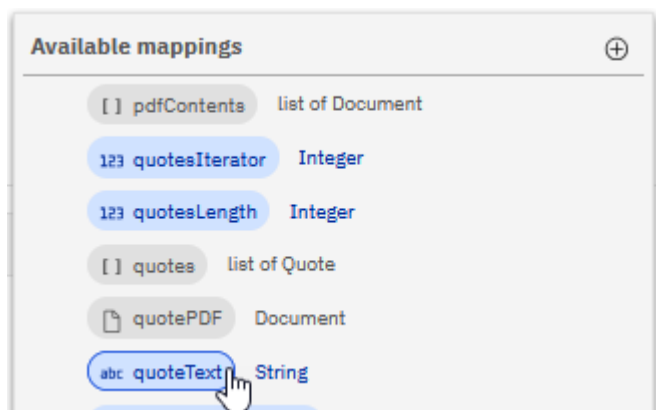
\_11. Click the **output mapping** tab.



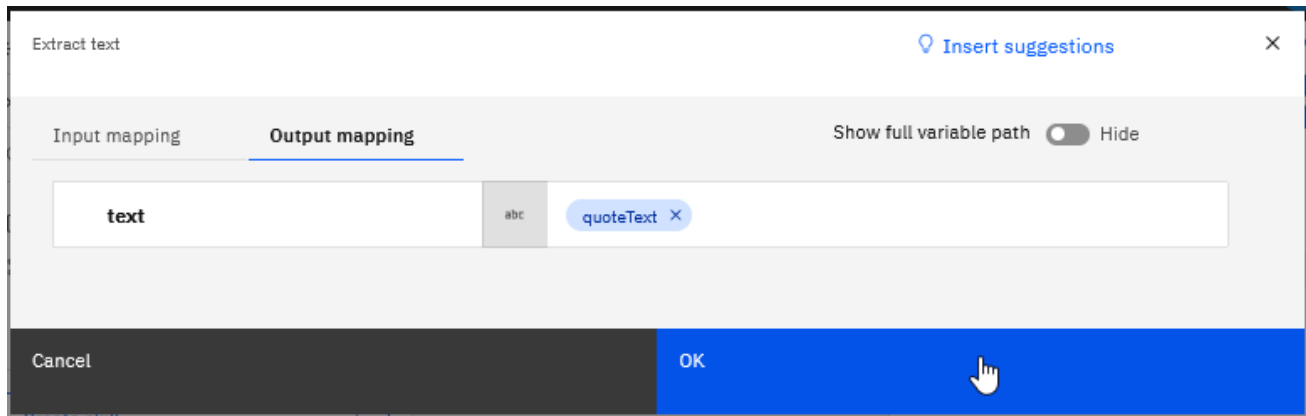
\_12. For *text*, click the **Select a variable** button.



\_13. Select **abc quoteText**.



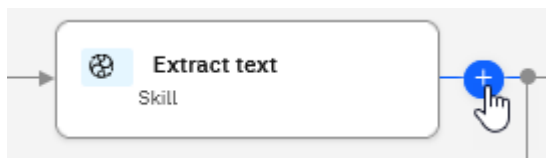
\_14. Click **OK** to close the mapping.



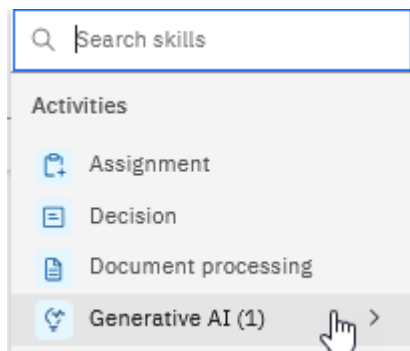
### 5.2.7 Add "ExtractSupplierAndCost" Skill

Next, we will add the Gen AI skill you developed previously. This Skill was trained to extract the supplier name and item cost from quotes of varying formats.

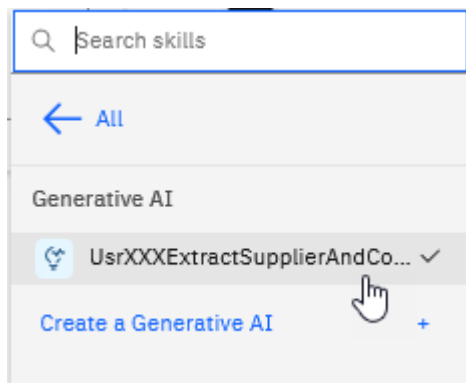
\_1. Click the **+** icon on the line emerging for the *Extract text* Activity.



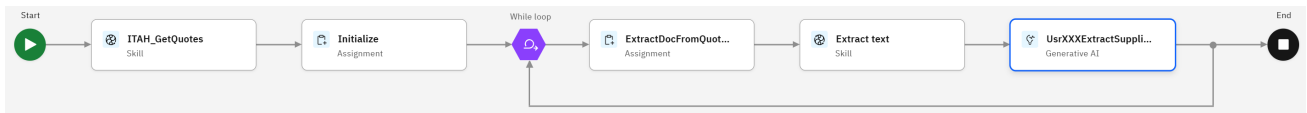
\_2. Select **Generative AI (1)**.



\_3. Select **UsrXXXExtractSupplierAndCost** (remember to replace XXX with the three-digit number in the user id you have received).



\_4. You should now see the *UsrXXXExtractSupplierAndCost* Activity added to the flow and selected (blue frame).



\_5. Click the **Define data mapping** button in the *Activity properties*.

### Activity properties

Name

UsrXXXExtractSupplierAndCost

Implementation

UsrXXXExtractSupplierAndCost

[Go to UsrXXXExtractSupplierAndCost](#) →

Define data mapping

\_6. In the *Input mapping* tab, click the **Select a variable** button.

text	←	abc	Enter a value	Select a variable	fx	:
------	---	-----	---------------	-------------------	----	---

\_7. Select **abc quoteText** variable.

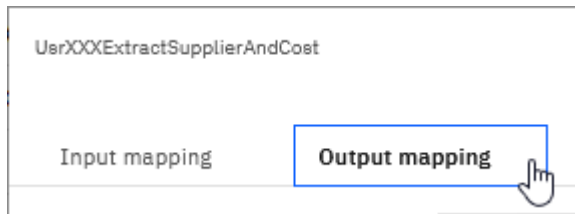
Available mappings

- [ ] pdfContents list of Document
- 123 quotesIterator Integer
- 123 quotesLength Integer
- [ ] quotes list of Quote
- quotePDF Document
- abc quoteText String
- abc quoteExtratcedText String

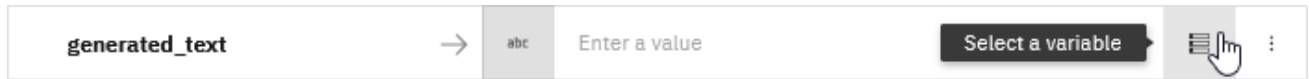
The mapping should be as shown below.

text	abc	quoteText
------	-----	-----------

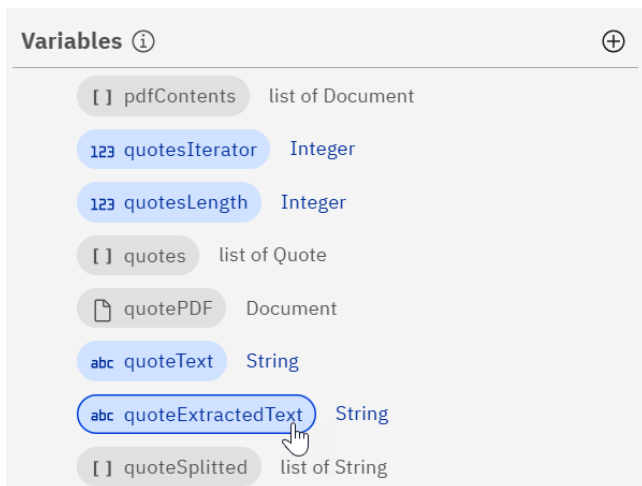
\_8. Click the **output mapping** tab.



\_9. In the *Input mapping* tab, click the **Select a variable** button.

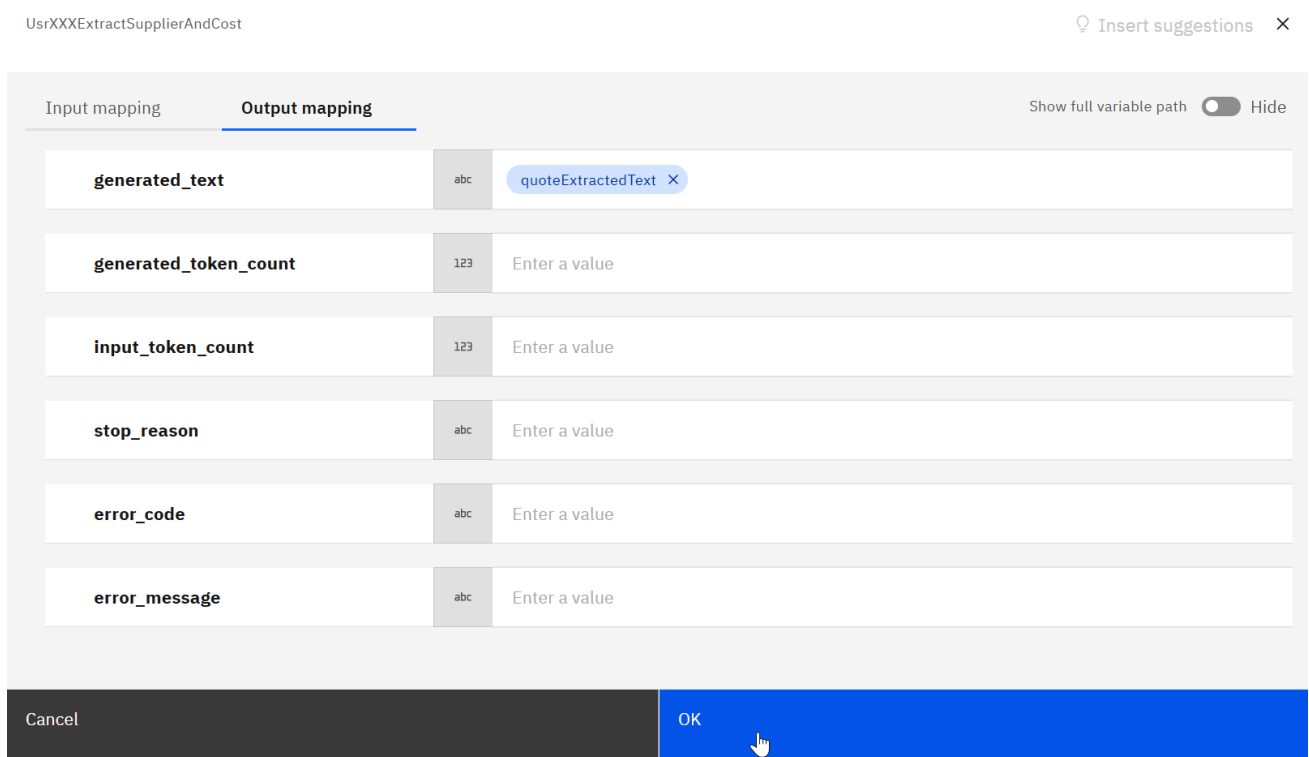


\_10. Select the **quoteExtractedText** variable.



\_11. Click **OK**.

We do not need to map the rest of the output variables as we are not interested in their values.

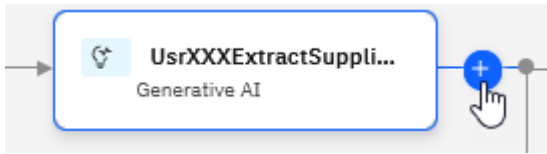




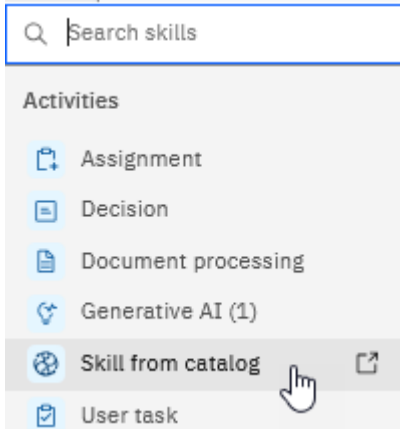
### 5.2.8 Add “ITAH\_SplitString” Skill

We will now use the utility *SplitString Skill* to split the *quoteExtractedText* variable (where supplier and process are delimited by ";") into two separate variables: *supplier* and *price*.

\_1. Click the **+** icon on the link that follows the *Generative AI Activity*.



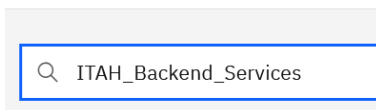
\_2. Select **Skill from catalog**.



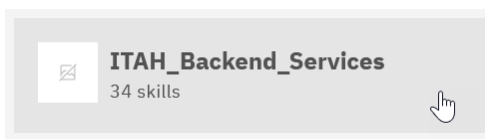
\_3. In the search bar, type **ITAH\_Backend\_Services**, and press enter.

Choose a skill from the list to invoke

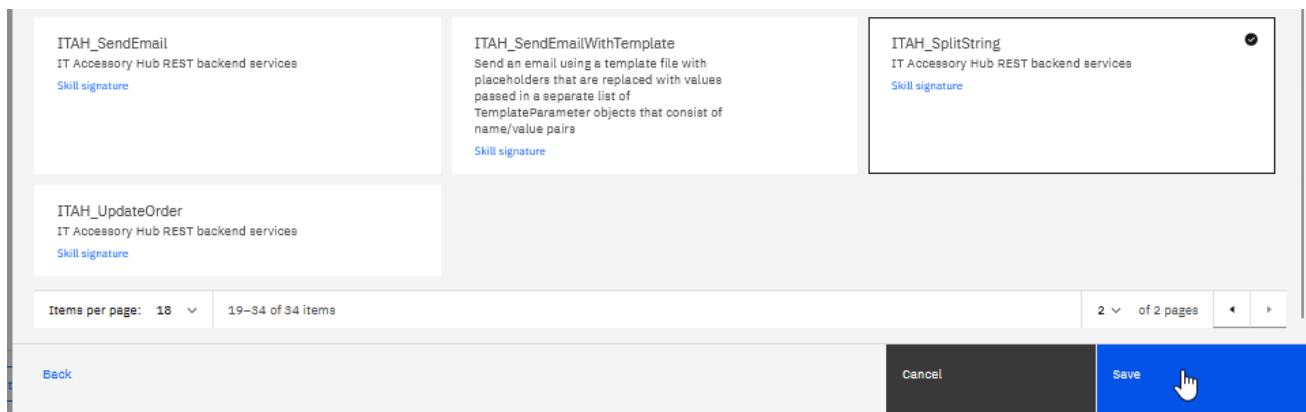
## Add a skill



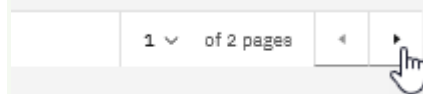
\_4. Click the **ITAH\_Backend\_Services** tile.



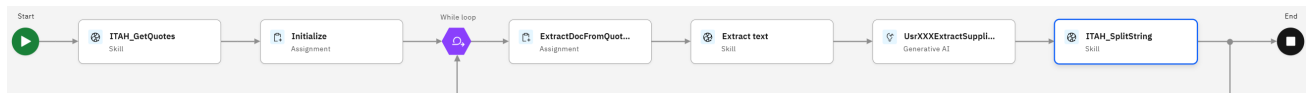
\_5. Select the **ITAH\_SplitString** Skill and click **Save**.



**Note:** if you cannot find it, go to page 2 by clicking the page arrow in the lower right corner.



\_6. You should now see the ITAH\_SplitString Activity added to the flow and selected (blue frame).



\_7. Click the **Define data mapping** button in the *Activity properties* for *SplitString*.

Activity properties

Name

ITAH\_SplitString

Implementation

ITAH\_SplitString

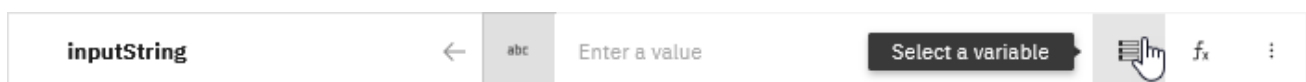
[Refresh connection](#)

Define data mapping

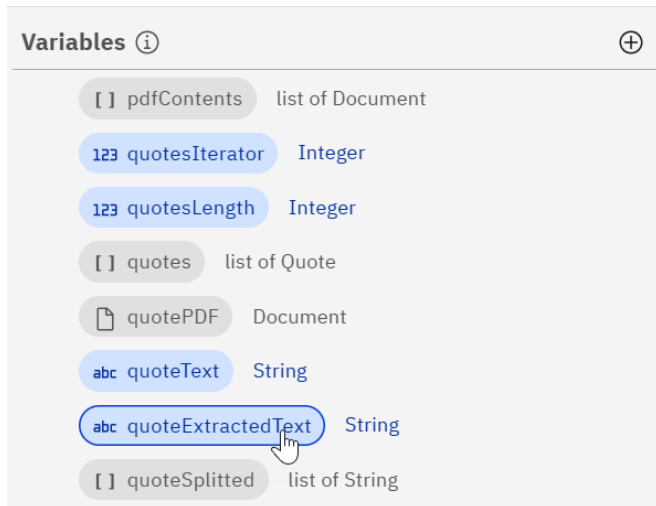
\_8. In the *Input mapping* tab, set the *delimiter* to ; (semi-colon).



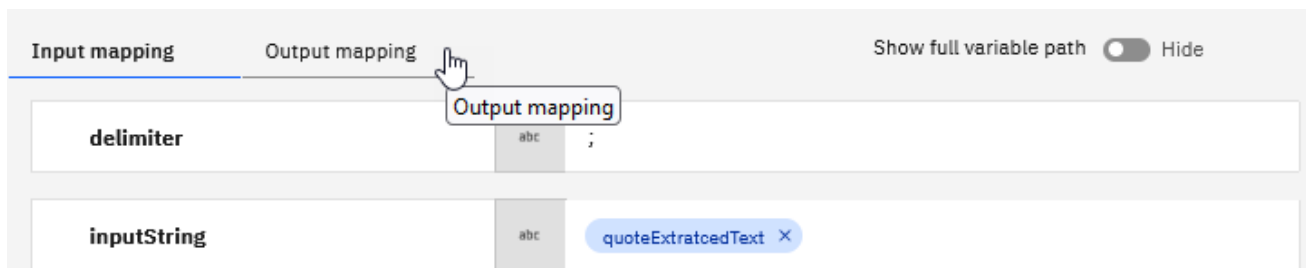
\_9. Click the **Select a variable** button.



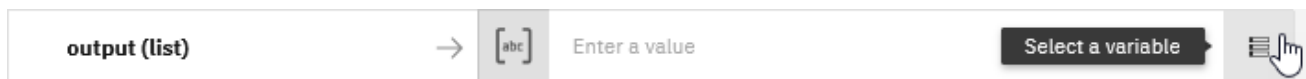
\_10. Select **abc quoteExtractedText**.



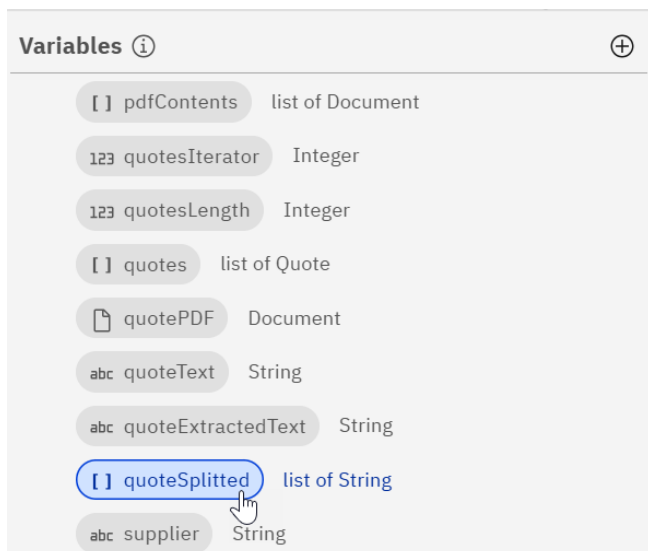
\_11. Click the **output mapping** tab.



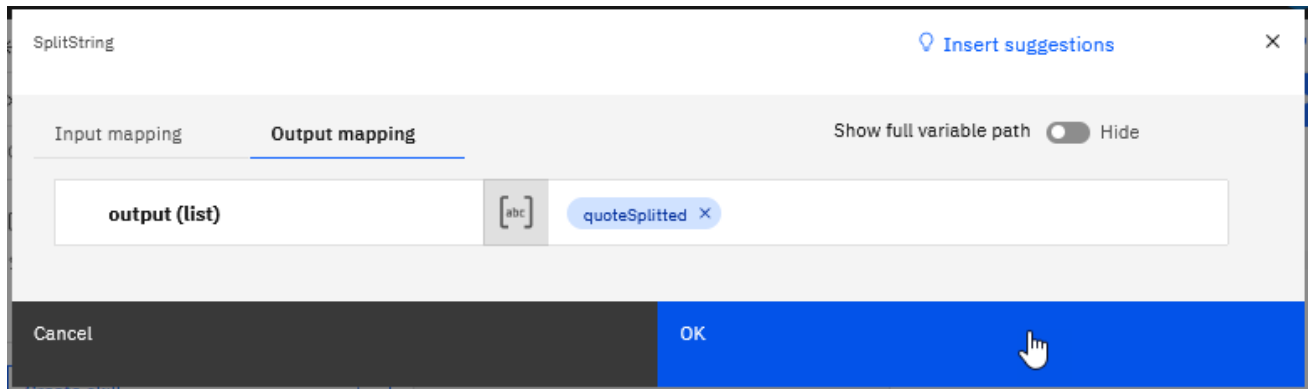
\_12. Click the **Select a variable** button.



\_13. Select **[ ] quoteSplitted**.



\_14. Click **OK** to close the mapping.

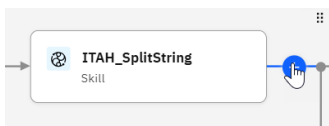


### 5.2.9 Add "Assignment" Activity

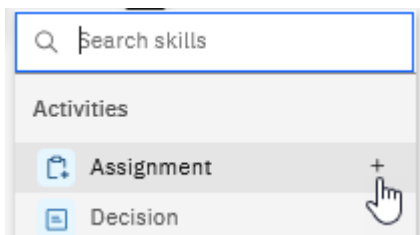
We will now add an Assignment activity to:

- Collect the supplier and item cost information from the Output of the *Split String* Skill into separate variables: *price* and *supplier*.
- Increment the Iterator variable.

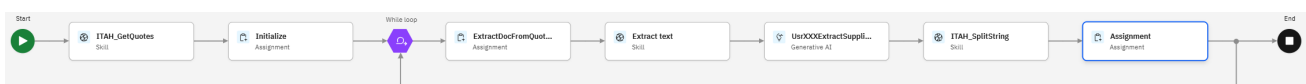
\_1. Click the **+** icon on the line emerging from *SplitString* activity.



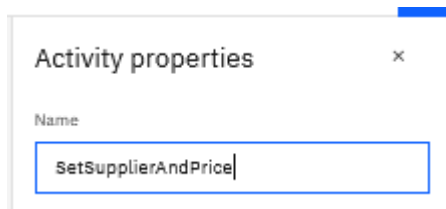
\_2. Select **Assignment**.



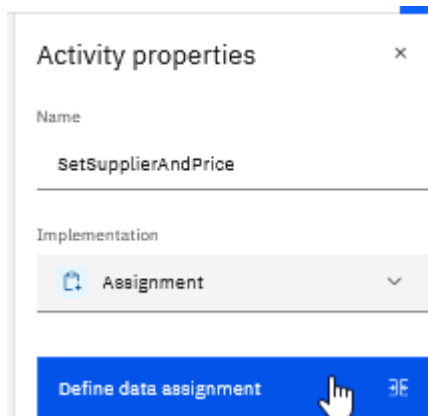
\_3. You should now see the Assignment activity added to the flow and selected (blue frame).



\_4. Set the Activity Name to **SetSupplierAndPrice**.



\_5. Click **Define data assignment**.



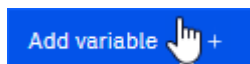
Activity properties

Name  
SetSupplierAndPrice

Implementation  
Assignment

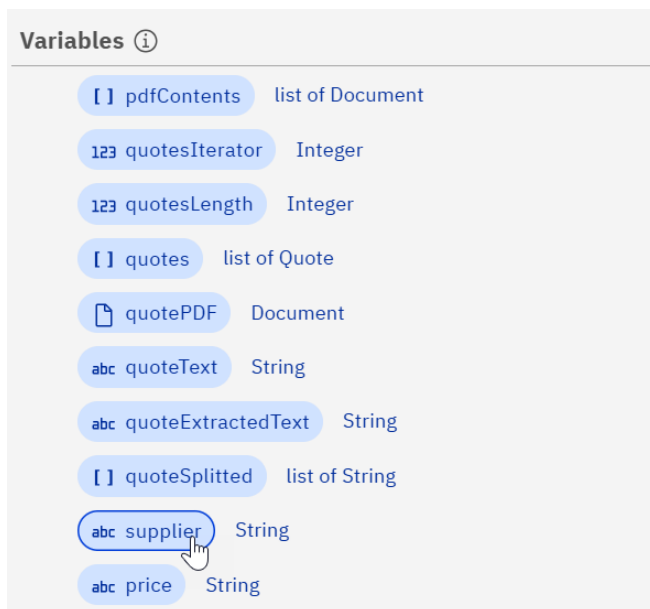
Define data assignment

\_6. Click **Add variable +** to create an assignment.



Add variable +

\_7. Select **abc supplier**.



Variables

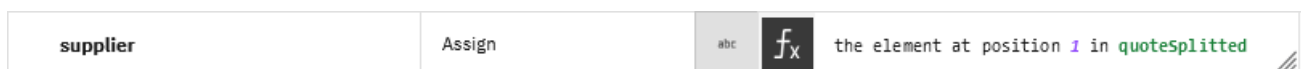
- [ ] pdfContents list of Document
- 123 quotesIterator Integer
- 123 quotesLength Integer
- [ ] quotes list of Quote
- [ ] quotePDF Document
- abc quoteText String
- abc quoteExtractedText String
- [ ] quoteSplitted list of String
- abc supplier String
- abc price String

\_8. Click the **fx** icon.



supplier	Assign	abc	Enter	fx	:
----------	--------	-----	-------	----	---

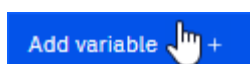
\_9. In the *assignment* field, enter **the element at position 1 in quoteSplitted**



supplier	Assign	abc	fx	the element at position 1 in quoteSplitted	/
----------	--------	-----	----	--	---

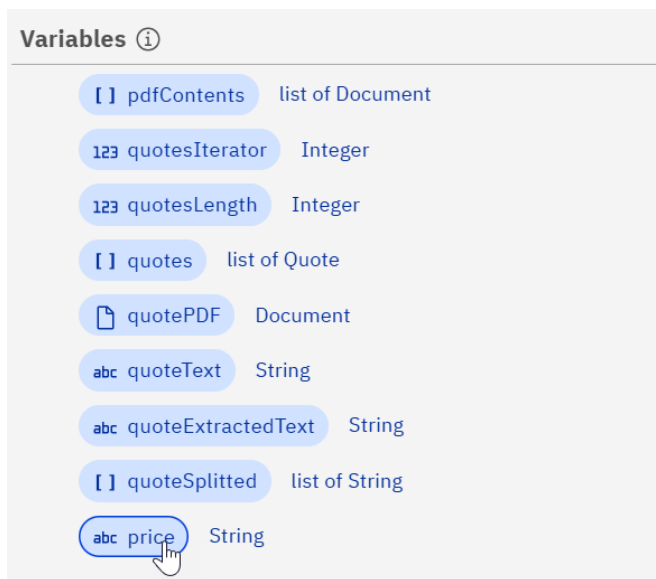
**Note.** You could also use the Ctrl-space to compose the above statement.

\_10. Click **Add variable +** to create an assignment.



Add variable +

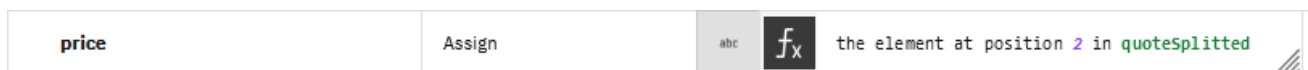
\_11. Select **abc price**.



\_12. Click the **fx** icon.

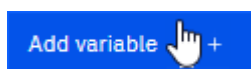


\_13. In the *assignment* field, enter **the element at position 2 in quoteSplitted**

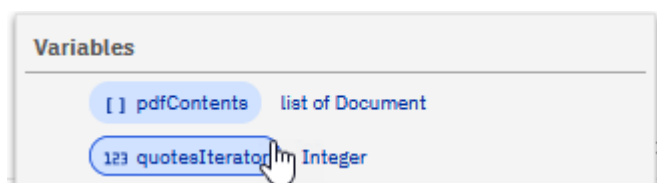


**Note.** You could also use the Ctrl-space to compose the above statement.

\_14. Click **Add variable +** to create an assignment.



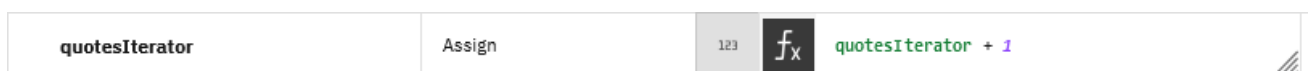
\_15. Select **123 quotesIterator**.



\_16. Click the **fx** icon.



\_17. In the *assignment* field, enter **quotesIterator + 1**



**Note.** You could also use the Ctrl-space to compose the above statement.

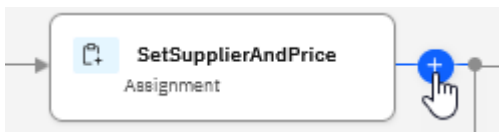
\_18. Click **OK**.



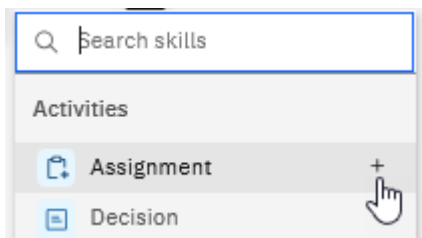
### 5.2.10 Add "Assignment" Activity

The final step in the document iterator is to append the price and supplier information extracted in the current iteration to the *quotes* variable (recall, this is the Workflow's output variable).

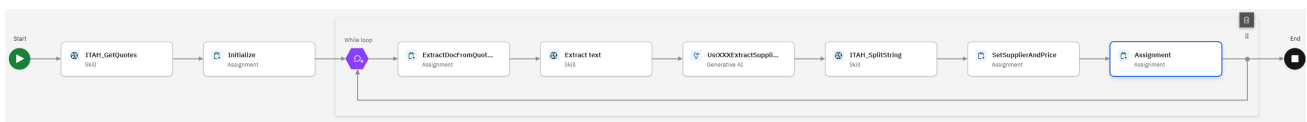
\_1. Click the **+** icon on the line emerging from *SetSupplierAndPrice* Activity.



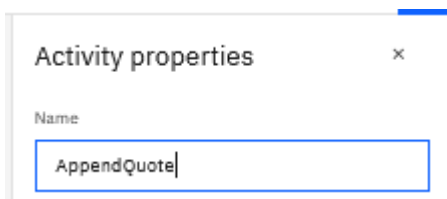
\_2. Select **Assignment**.



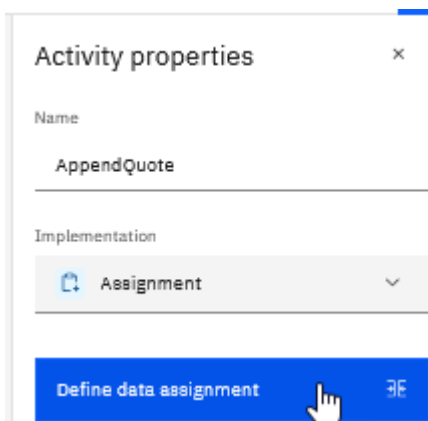
\_3. You should now see the Assignment activity added to the flow and selected (blue frame).



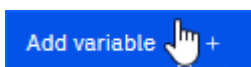
\_4. Set the Activity Name to **AppendQuote**.



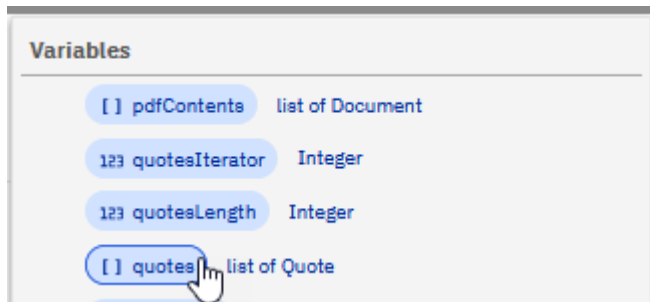
\_5. Click **Define data assignment**.



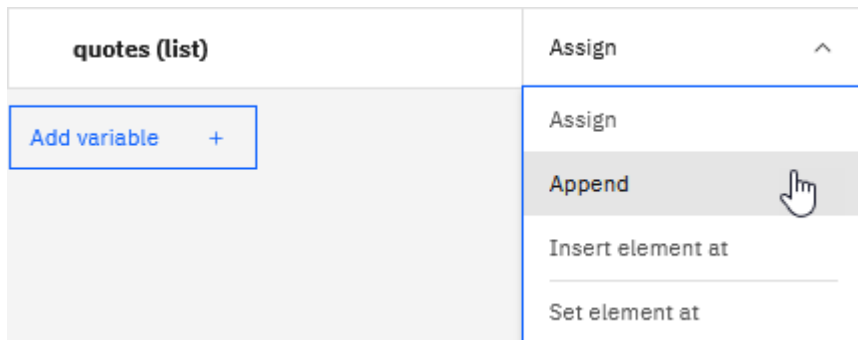
\_6. Click **Add variable +** to create an assignment.



\_7. Select **quotes**.



\_8. Select **Append** for the assignment option.



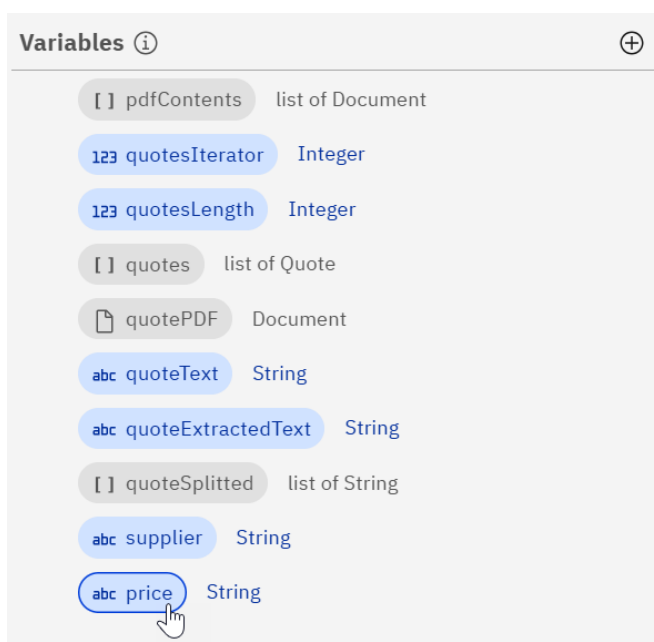
\_9. Expand the **New Quote** twistie.



\_10. For *price*, click the **Select a variable** button.



\_11. Select **abc price**





\_12. For *supplier*, click the **Select a variable** button.

\_13. Select **abc supplier**

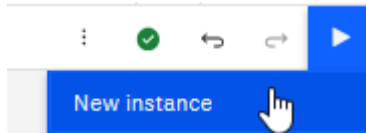
\_14. Verify that the *Data Assignment* looks like the one below and click **OK**.

Variable	Action	Value
quotes (list)	Append	New Quote(s)
New Quote	Assign	Child attributes mapped
price	Assign	price
supplier	Assign	supplier

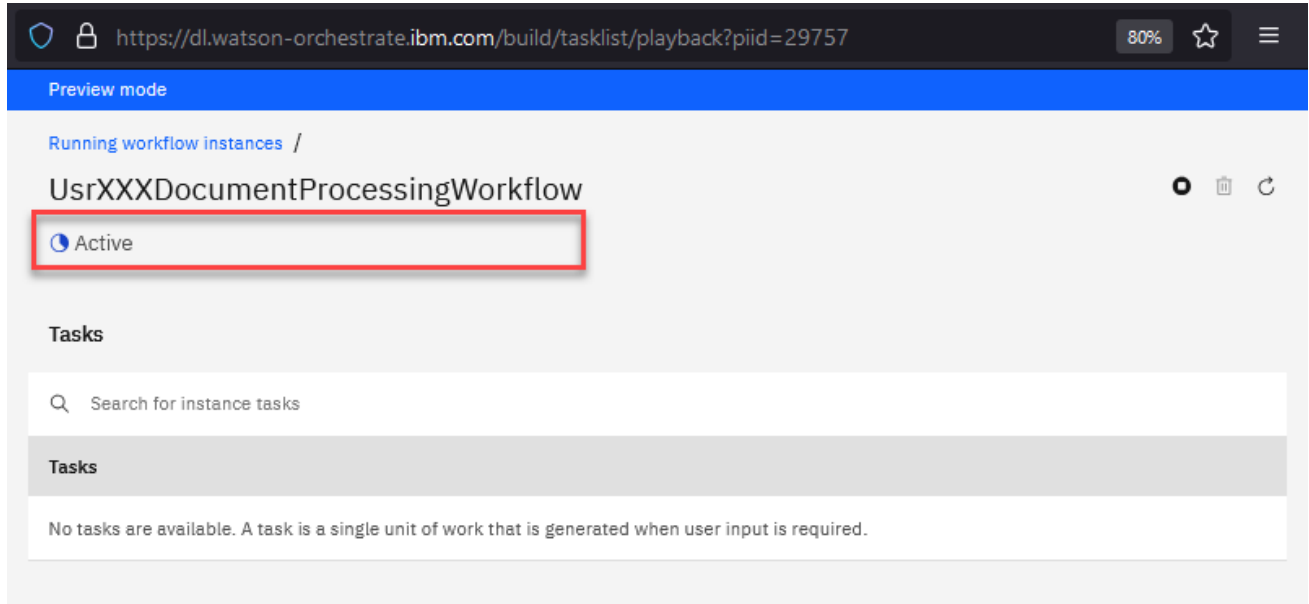
## 5.3 Test the Workflow

\_1. Click the **Preview** (play) button in the top right corner.

\_2. Select **New instance**.



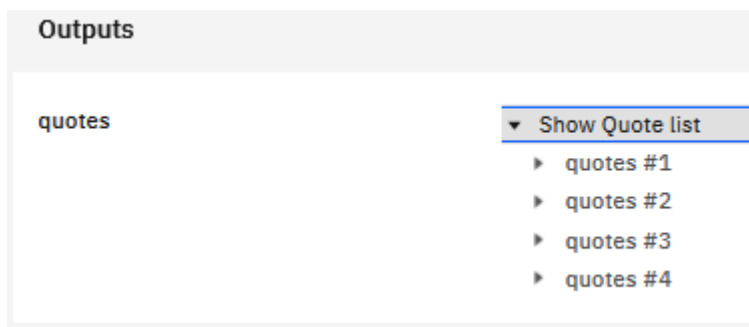
You will now see the Workflow in an **Active** state.



\_3. Wait until the state changes to **Completed**. This can take several minutes.



\_4. **Expand** the *quotes twisty*.



\_5. **Expand** the twisties of all the quotes.

Outputs	
quotes	<div><div>▼ Show Quote list</div><div><div>▼ quotes #1</div><div>price \$280.00</div><div>supplier IT Supplies Corp</div></div><div><div>▼ quotes #2</div><div>price \$281.56</div><div>supplier Business Supplies International</div></div><div><div>▼ quotes #3</div><div>price \$234.06</div><div>supplier X Computer Equipment Ltd.</div></div><div><div>▼ quotes #4</div><div>price \$0.00</div><div>supplier Office Supplies Ltd.</div></div></div>

You should see the quotes received from four suppliers. Note that the last supplier set the price to 0.0, which indicates that the supplier does not want to bid.

\_6. Click **X** to close the Web Browser window.

**Congratulations, you have completed this lab!**

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