An approach to improve User Acceptance Testing with Generative AI and RSL – Results, review and validation

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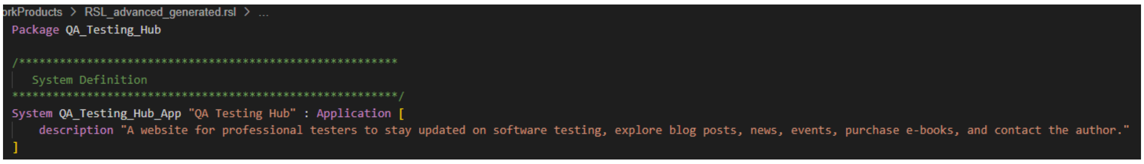
B - Advanced scenario

For the advanced scenario, generated results that require tool validation (RSL requirements and Robotframework automation script) are presented, with respective correction if necessary. The corrections were based on the AI assistant's response after including the error as input in the prompt.

1. RSL requirements generation

Below are the sections of the RSL file before and after review. Errors are marked in red and corrections in green.

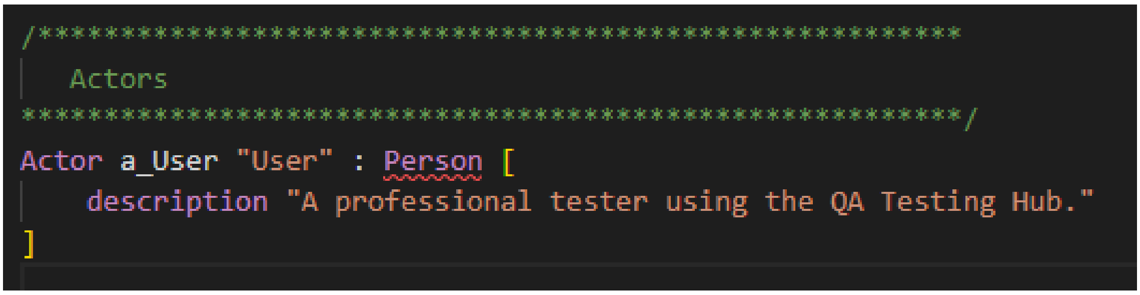
- System Definitions - Before and after review



```
rkProducts > RSL_advanced_generated.rsl > ...
Package QA_Testing_Hub

/********************************************************
    System Definition
********************************************************/
System QA_Testing_Hub_App "QA Testing Hub" : Application [
    description "A website for professional testers to stay updated on software testing, explore blog posts, news, events, purchase e-books, and contact the author."
]
```

Figure 1. System Definitions section validated.

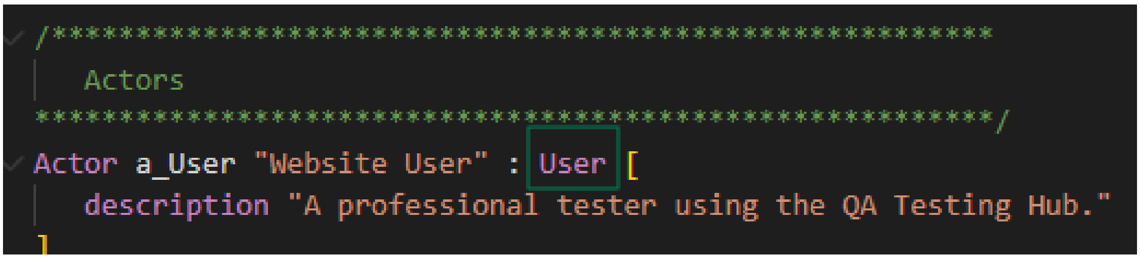
- Actors – Before review



```
/**********************************************************
    Actors
**********************************************************/
Actor a_User "User" : Person [
    description "A professional tester using the QA Testing Hub."
]
```

Figure 2. Actors section before correction.

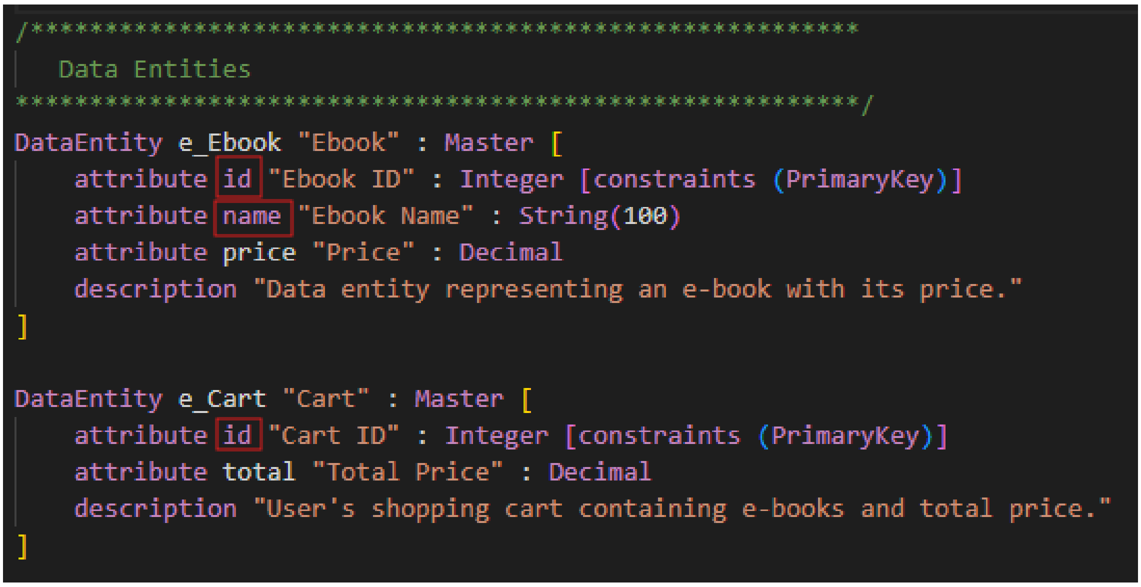
- Actors – After review



```
/*********************************************************
   Actors
*********************************************************/
Actor a_User "Website User" : User [
   description "A professional tester using the QA Testing Hub."
]
```

Figure 3. Actors section after correction.

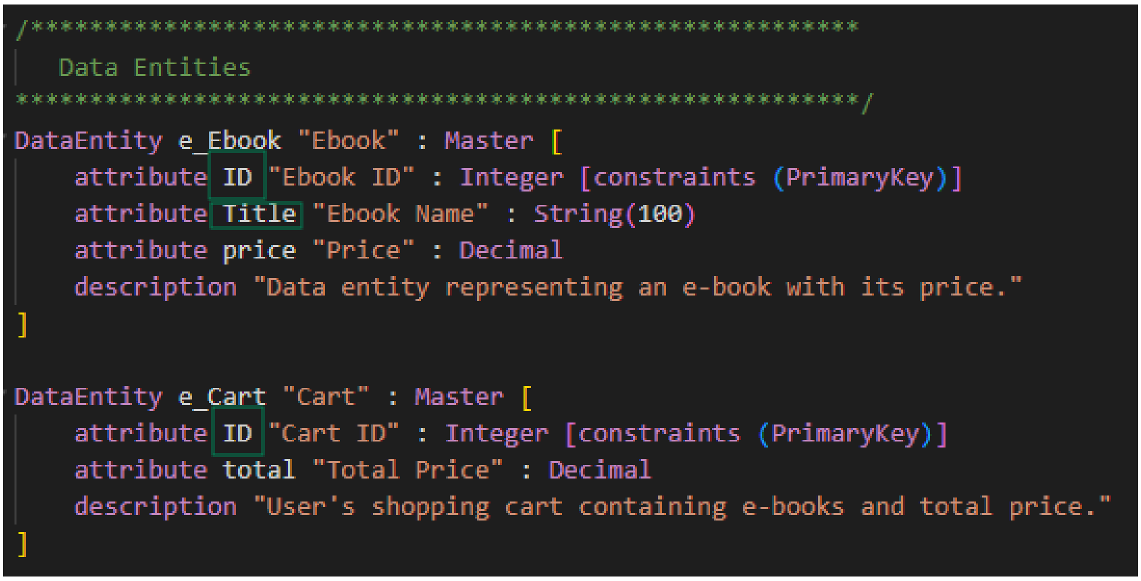
- Data Entities – Before review



```
/*********************************************************
   Data Entities
*********************************************************/
DataEntity e_Ebook "Ebook" : Master [
    attribute id "Ebook ID" : Integer [constraints (PrimaryKey)]
    attribute name "Ebook Name" : String(100)
    attribute price "Price" : Decimal
    description "Data entity representing an e-book with its price."
]

DataEntity e_Cart "Cart" : Master [
    attribute id "Cart ID" : Integer [constraints (PrimaryKey)]
    attribute total "Total Price" : Decimal
    description "User's shopping cart containing e-books and total price."
]
```

Figure 4. Data Entities section before correction.

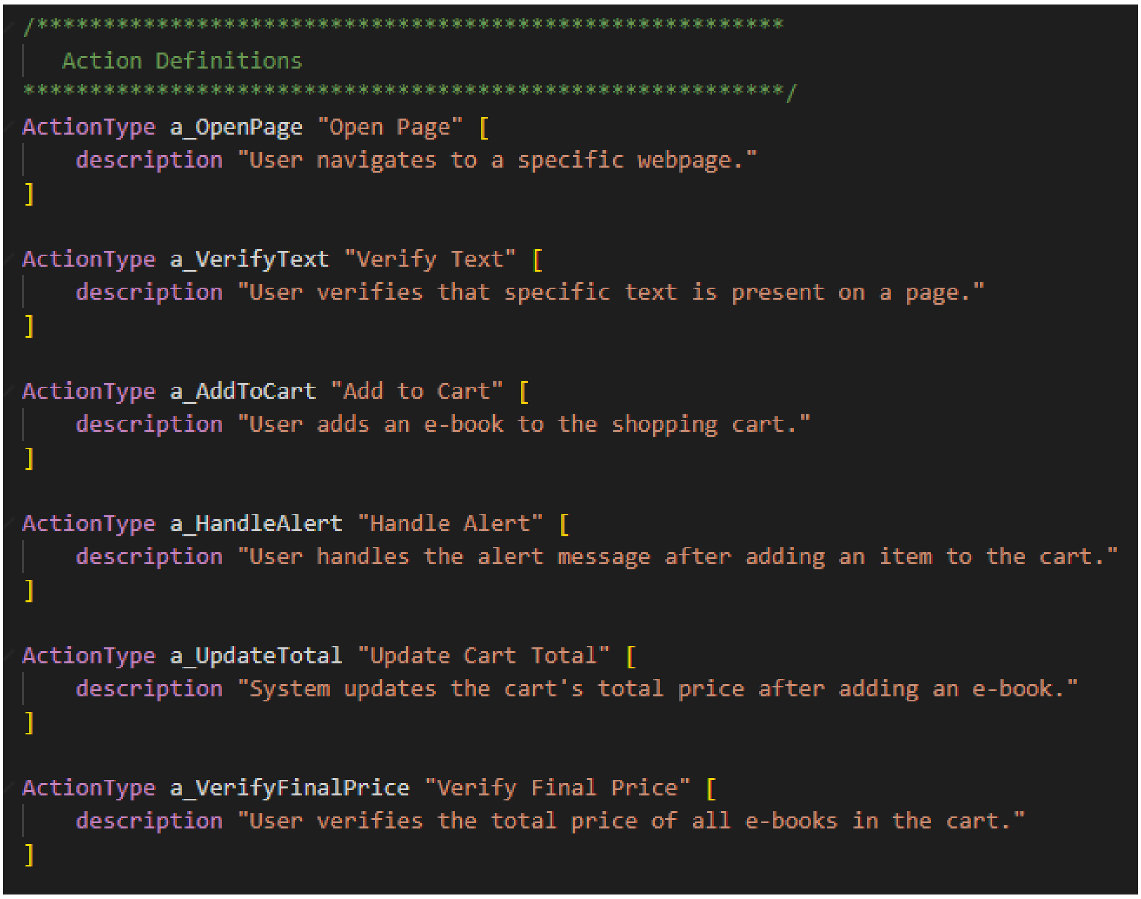
- Data Entities – After review



```
/*********************************************************
   Data Entities
*********************************************************/
DataEntity e_Ebook "Ebook" : Master [
    attribute ID "Ebook ID" : Integer [constraints (PrimaryKey)]
    attribute Title "Ebook Name" : String(100)
    attribute price "Price" : Decimal
    description "Data entity representing an e-book with its price."
]

DataEntity e_Cart "Cart" : Master [
    attribute ID "Cart ID" : Integer [constraints (PrimaryKey)]
    attribute total "Total Price" : Decimal
    description "User's shopping cart containing e-books and total price."
]
```

Figure 5. Data Entities section after correction.

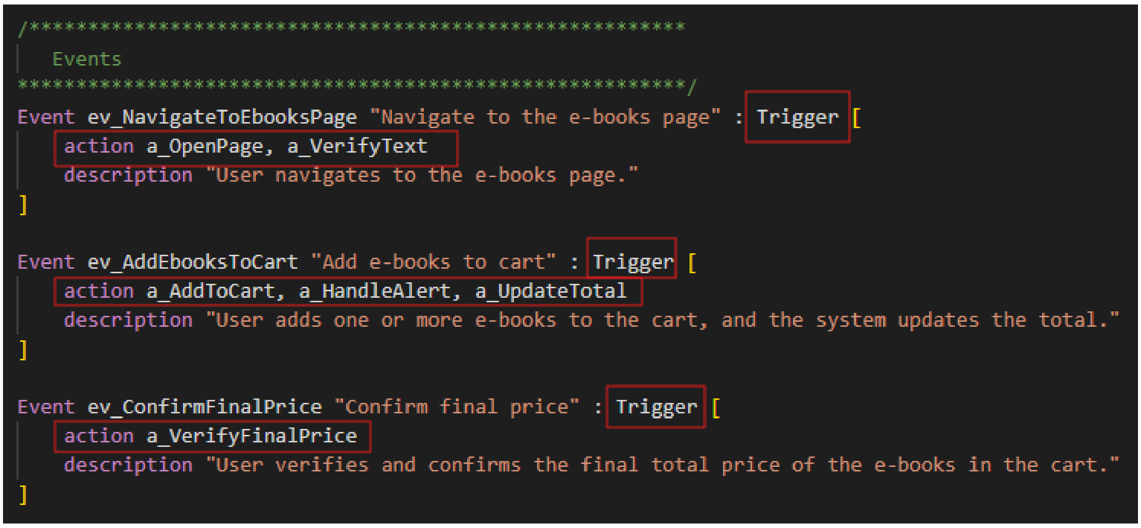
- Action Definitions – Before and after review



```
/*********************************************************
    Action Definitions
*********************************************************/
ActionType a_OpenPage "Open Page" [
    description "User navigates to a specific webpage."
]

ActionType a_VerifyText "Verify Text" [
    description "User verifies that specific text is present on a page."
]

ActionType a_AddToCart "Add to Cart" [
    description "User adds an e-book to the shopping cart."
]

ActionType a_HandleAlert "Handle Alert" [
    description "User handles the alert message after adding an item to the cart."
]

ActionType a_UpdateTotal "Update Cart Total" [
    description "System updates the cart's total price after adding an e-book."
]

ActionType a_VerifyFinalPrice "Verify Final Price" [
    description "User verifies the total price of all e-books in the cart."
]
```

Figure 6. Actions Definitions section before and after review.

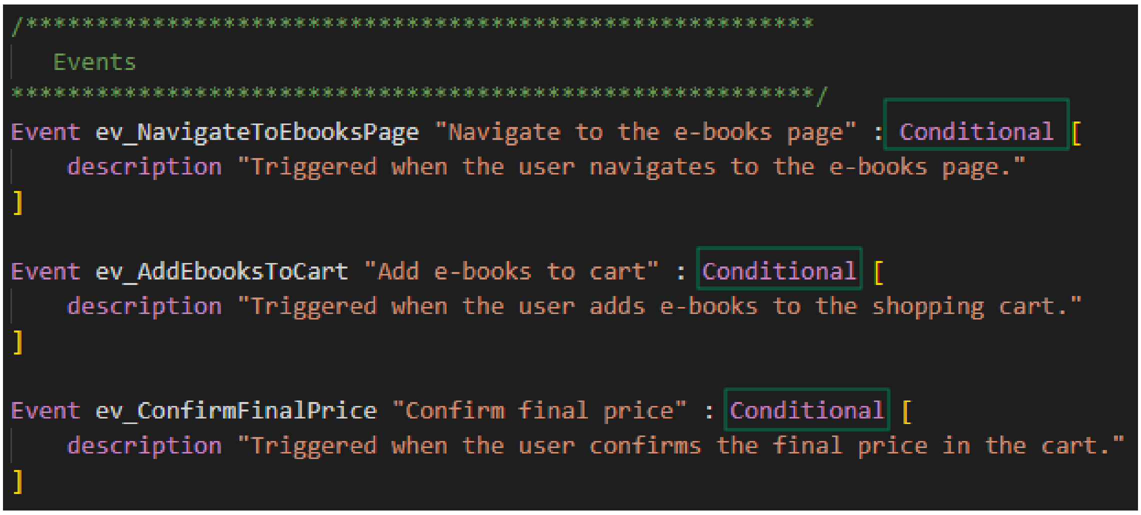
- Events – Before review



```
/*********************************************************
    Events
*********************************************************/
Event ev_NavigateToEbooksPage "Navigate to the e-books page" : Trigger [
    action a_OpenPage, a_VerifyText
    description "User navigates to the e-books page."
]

Event ev_AddEbooksToCart "Add e-books to cart" : Trigger [
    action a_AddToCart, a_HandleAlert, a_UpdateTotal
    description "User adds one or more e-books to the cart, and the system updates the total."
]

Event ev_ConfirmFinalPrice "Confirm final price" : Trigger [
    action a_VerifyFinalPrice
    description "User verifies and confirms the final total price of the e-books in the cart."
]
```

Figure 7. Events section before review.

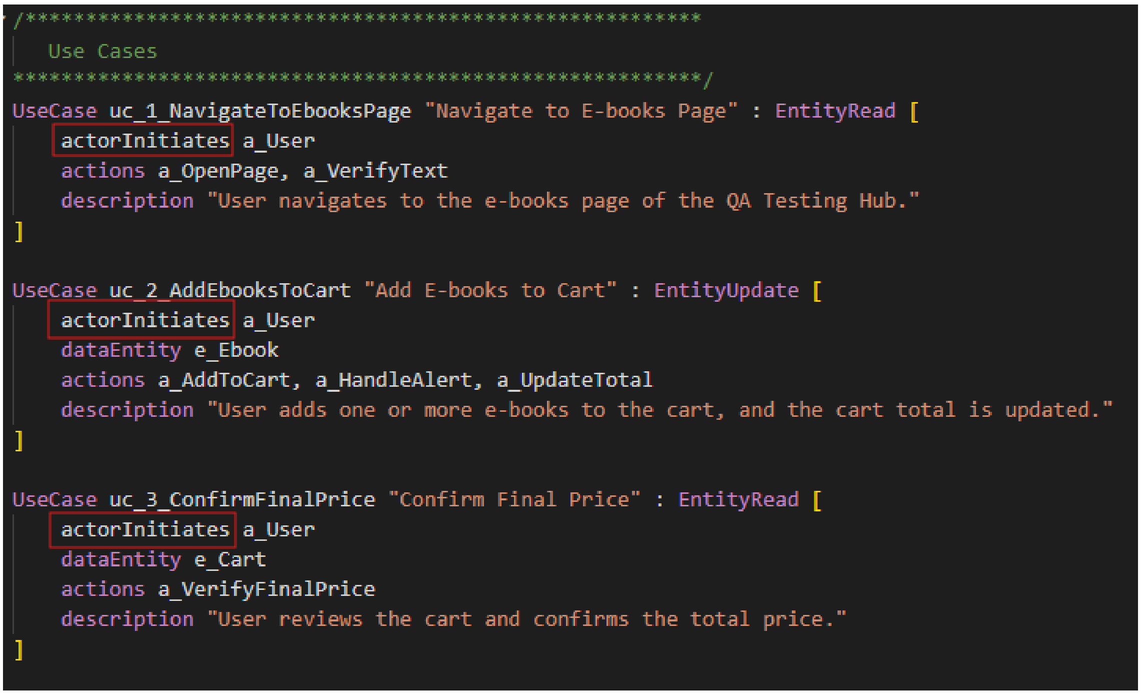
- Events – After review



```
/*********************************************************
    Events
*********************************************************/
Event ev_NavigateToEbooksPage "Navigate to the e-books page" : Conditional [
    description "Triggered when the user navigates to the e-books page."
]

Event ev_AddEbooksToCart "Add e-books to cart" : Conditional [
    description "Triggered when the user adds e-books to the shopping cart."
]

Event ev_ConfirmFinalPrice "Confirm final price" : Conditional [
    description "Triggered when the user confirms the final price in the cart."
]
```

Figure 8. Events section after correction.

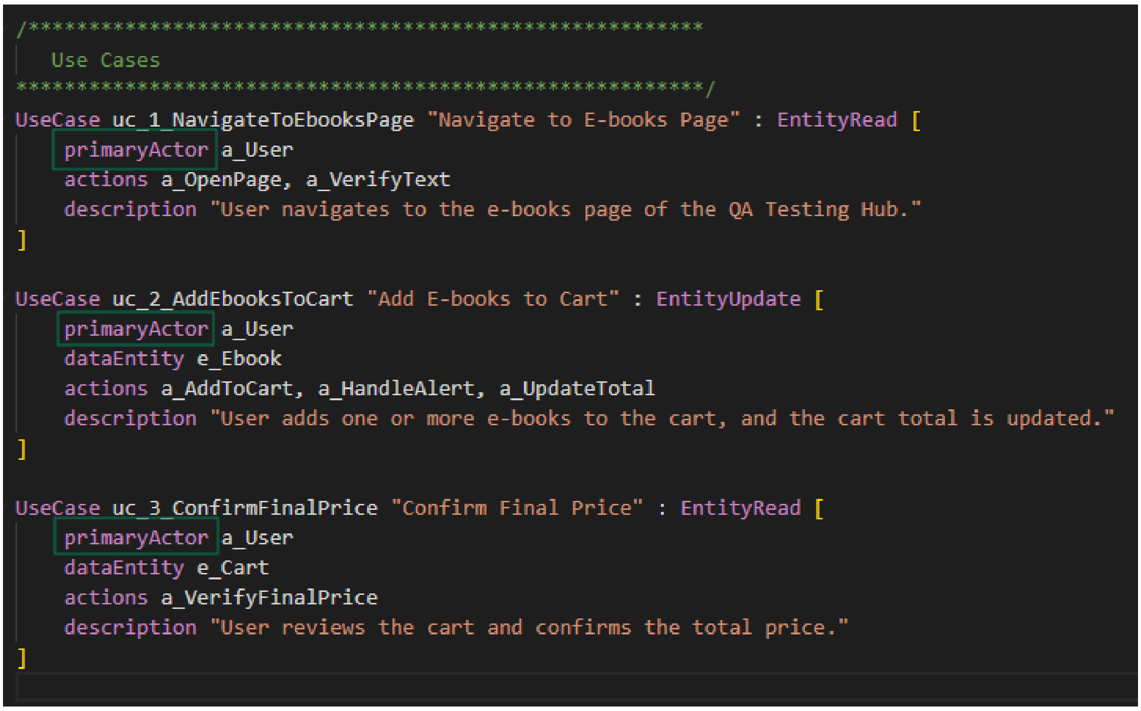
- Use Cases – Before review



```
/*********************************************************
    Use Cases
*********************************************************/
UseCase uc_1_NavigateToEbooksPage "Navigate to E-books Page" : EntityRead [
    actorInitiates a_User
    actions a_OpenPage, a_VerifyText
    description "User navigates to the e-books page of the QA Testing Hub."
]

UseCase uc_2_AddEbooksToCart "Add E-books to Cart" : EntityUpdate [
    actorInitiates a_User
    dataEntity e_Ebook
    actions a_AddToCart, a_HandleAlert, a_UpdateTotal
    description "User adds one or more e-books to the cart, and the cart total is updated."
]

UseCase uc_3_ConfirmFinalPrice "Confirm Final Price" : EntityRead [
    actorInitiates a_User
    dataEntity e_Cart
    actions a_VerifyFinalPrice
    description "User reviews the cart and confirms the total price."
]
```

Figure 9. Use Cases section before correction.

- Use Cases – After review



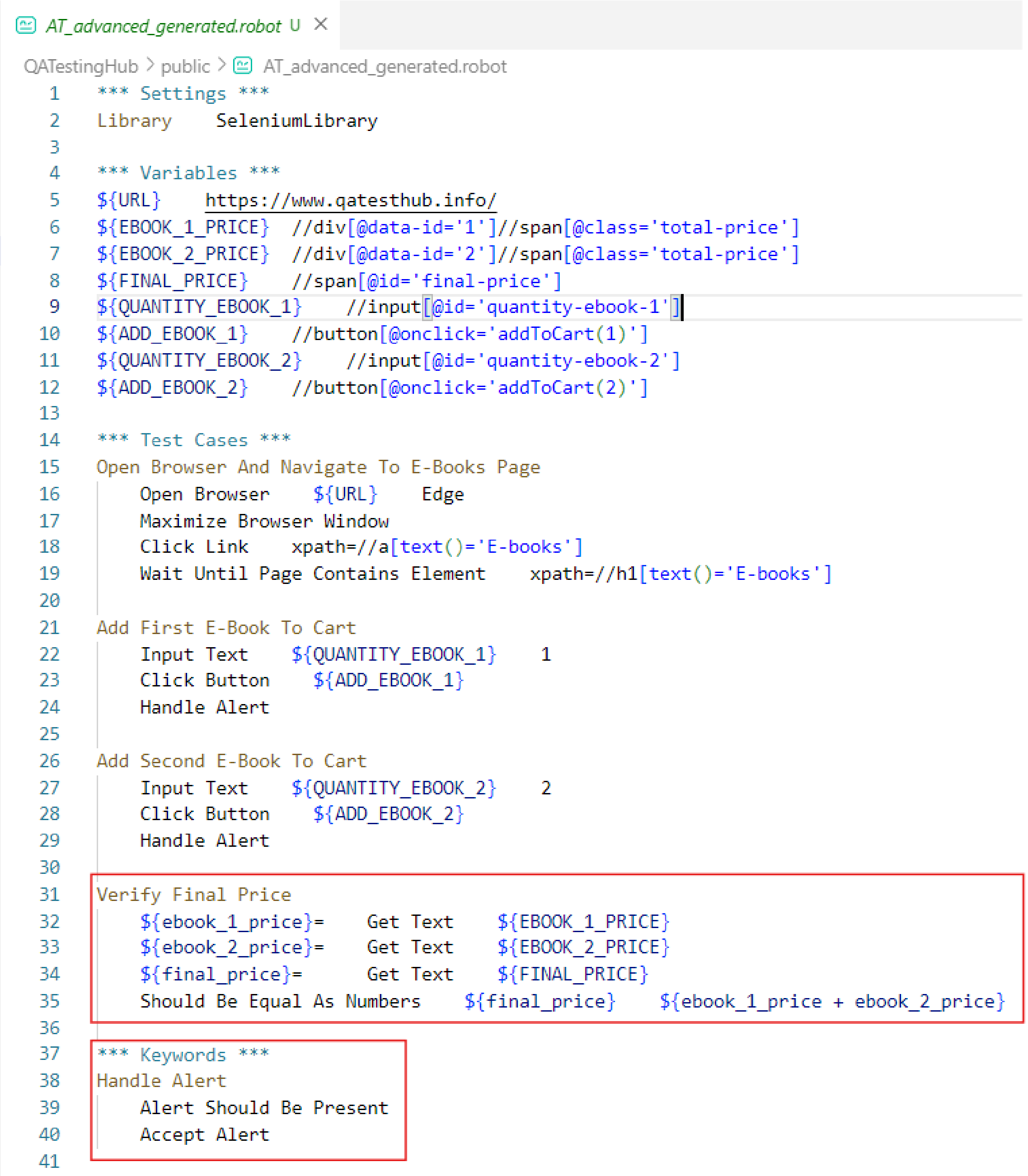
```
/********************************************************
   Use Cases
*********************************************************/
UseCase uc_1_NavigateToEbooksPage "Navigate to E-books Page" : EntityRead [
    primaryActor a_User
    actions a_OpenPage, a_VerifyText
    description "User navigates to the e-books page of the QA Testing Hub."
]

UseCase uc_2_AddEbooksToCart "Add E-books to Cart" : EntityUpdate [
    primaryActor a_User
    dataEntity e_Ebook
    actions a_AddToCart, a_HandleAlert, a_UpdateTotal
    description "User adds one or more e-books to the cart, and the cart total is updated."
]

UseCase uc_3_ConfirmFinalPrice "Confirm Final Price" : EntityRead [
    primaryActor a_User
    dataEntity e_Cart
    actions a_VerifyFinalPrice
    description "User reviews the cart and confirms the total price."
]
```

Figure 10. Use Cases section after correction.

2. Automation script generation – Advanced scenario

Below is the automation script before and after review. Errors are marked in red and corrections in green (**Figure 11** and **Figure 12**).

- Automation script – Before review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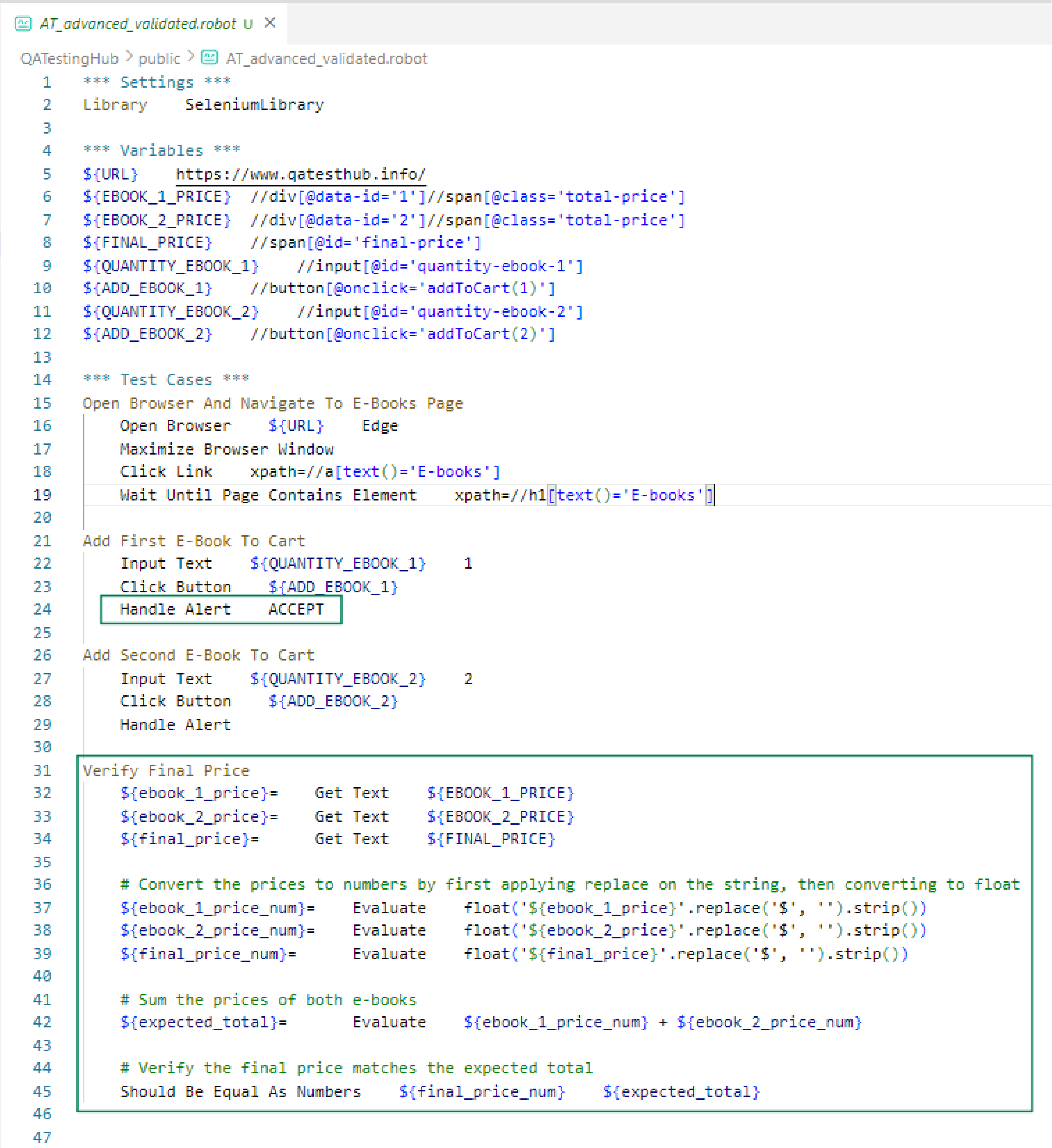
QATestingHub > public > AT_advanced_generated.robot

```
*** Settings ***
Library    SeleniumLibrary

*** Variables ***
${URL}    https://www.qatesthub.info/
${EBOOK_1_PRICE}  //div[@data-id='1']//span[@class='total-price']
${EBOOK_2_PRICE}  //div[@data-id='2']//span[@class='total-price']
${FINAL_PRICE}    //span[@id='final-price']
${QUANTITY_EBOOK_1}    //input[@id='quantity-ebook-1']
${ADD_EBOOK_1}    //button[@onclick='addToCart(1)']
${QUANTITY_EBOOK_2}    //input[@id='quantity-ebook-2']
${ADD_EBOOK_2}    //button[@onclick='addToCart(2)']

*** Test Cases ***
Open Browser And Navigate To E-Books Page
    Open Browser    ${URL}    Edge
    Maximize Browser Window
    Click Link    xpath=//a[text()='E-books']
    Wait Until Page Contains Element    xpath=//h1[text()='E-books']

Add First E-Book To Cart
    Input Text    ${QUANTITY_EBOOK_1}    1
    Click Button    ${ADD_EBOOK_1}
    Handle Alert

Add Second E-Book To Cart
    Input Text    ${QUANTITY_EBOOK_2}    2
    Click Button    ${ADD_EBOOK_2}
    Handle Alert

Verify Final Price
    ${ebook_1_price}=    Get Text    ${EBOOK_1_PRICE}
    ${ebook_2_price}=    Get Text    ${EBOOK_2_PRICE}
    ${final_price}=    Get Text    ${FINAL_PRICE}
    Should Be Equal As Numbers    ${final_price}    ${ebook_1_price + ebook_2_price}

*** Keywords ***
Handle Alert
    Alert Should Be Present
    Accept Alert

```

Figure 11. Robotframework script before correction.

- Robotframework script – After review



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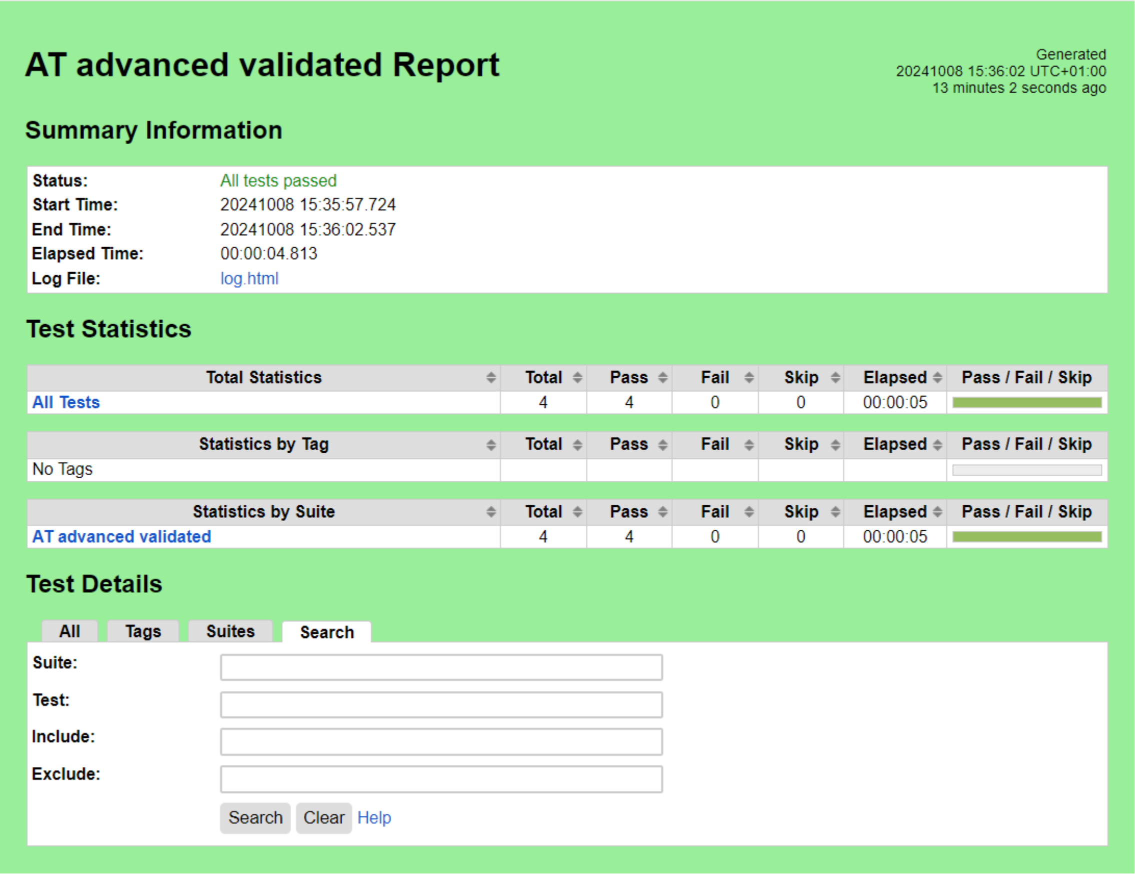
QATestingHub > public > AT_advanced_validated.robot

```
*** Settings ***
Library     SeleniumLibrary

*** Variables ***
${URL}     https://www.qatesthub.info/
${EBOOK_1_PRICE}  //div[@data-id='1']//span[@class='total-price']
${EBOOK_2_PRICE}  //div[@data-id='2']//span[@class='total-price']
${FINAL_PRICE}    //span[@id='final-price']
${QUANTITY_EBOOK_1}     //input[@id='quantity-ebook-1']
${ADD_EBOOK_1}    //button[@onclick='addToCart(1)']
${QUANTITY_EBOOK_2}     //input[@id='quantity-ebook-2']
${ADD_EBOOK_2}    //button[@onclick='addToCart(2)']

*** Test Cases ***
Open Browser And Navigate To E-Books Page
    Open Browser    ${URL}    Edge
    Maximize Browser Window
    Click Link    xpath=//a[text()='E-books']
    Wait Until Page Contains Element    xpath=//h1[text()='E-books']

Add First E-Book To Cart
    Input Text    ${QUANTITY_EBOOK_1}    1
    Click Button    ${ADD_EBOOK_1}
    Handle Alert    ACCEPT

Add Second E-Book To Cart
    Input Text    ${QUANTITY_EBOOK_2}    2
    Click Button    ${ADD_EBOOK_2}
    Handle Alert

Verify Final Price
    ${ebook_1_price}=    Get Text    ${EBOOK_1_PRICE}
    ${ebook_2_price}=    Get Text    ${EBOOK_2_PRICE}
    ${final_price}=      Get Text    ${FINAL_PRICE}

    # Convert the prices to numbers by first applying replace on the string, then converting to float
    ${ebook_1_price_num}=    Evaluate    float('${ebook_1_price}'.replace('$', '').strip())
    ${ebook_2_price_num}=    Evaluate    float('${ebook_2_price}'.replace('$', '').strip())
    ${final_price_num}=      Evaluate    float('${final_price}'.replace('$', '').strip())

    # Sum the prices of both e-books
    ${expected_total}=       Evaluate    ${ebook_1_price_num} + ${ebook_2_price_num}

    # Verify the final price matches the expected total
    Should Be Equal As Numbers    ${final_price_num}    ${expected_total}
```

Figure 12. Robotframework script after correction.

Below is evidence of the final execution of automation, after the mentioned corrections (**Figure 13** and **Figure 14**).



AT advanced validated Report

Generated
20241008 15:36:02 UTC+01:00
13 minutes 2 seconds ago

Summary Information

Status:	All tests passed
Start Time:	20241008 15:35:57.724
End Time:	20241008 15:36:02.537
Elapsed Time:	00:00:04.813
Log File:	log.html

Test Statistics

Total Statistics	Total	Pass	Fail	Skip	Elapsed	Pass / Fail / Skip
All Tests	4	4	0	0	00:00:05	🟩

Statistics by Tag	Total	Pass	Fail	Skip	Elapsed	Pass / Fail / Skip
No Tags						

Statistics by Suite	Total	Pass	Fail	Skip	Elapsed	Pass / Fail / Skip
AT advanced validated	4	4	0	0	00:00:05	🟩

Test Details

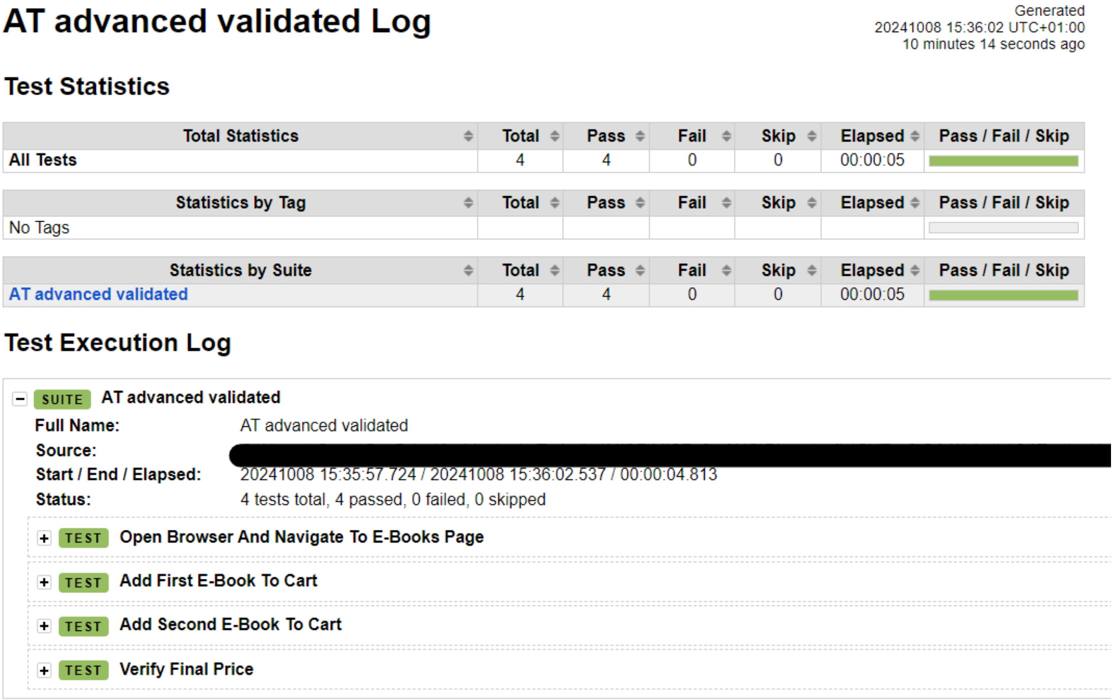
Suite:

Test:

Include:

Exclude:

Figure 13. Successful automation Report.



AT advanced validated Log

Generated
20241008 15:36:02 UTC+01:00
10 minutes 14 seconds ago

Test Statistics

Total Statistics	Total	Pass	Fail	Skip	Elapsed	Pass / Fail / Skip
All Tests	4	4	0	0	00:00:05	🟩

Statistics by Tag	Total	Pass	Fail	Skip	Elapsed	Pass / Fail / Skip
No Tags						

Statistics by Suite	Total	Pass	Fail	Skip	Elapsed	Pass / Fail / Skip
AT advanced validated	4	4	0	0	00:00:05	🟩

Test Execution Log

− SUITE **AT advanced validated**

Full Name:	AT advanced validated
Source:	[redacted]
Start / End / Elapsed:	20241008 15:35:57.724 / 20241008 15:36:02.537 / 00:00:04.813
Status:	4 tests total, 4 passed, 0 failed, 0 skipped

+ TEST **Open Browser And Navigate To E-Books Page**

+ TEST **Add First E-Book To Cart**

+ TEST **Add Second E-Book To Cart**

+ TEST **Verify Final Price**

Figure 14. Successful automation Log.