

Whitepaper

Predictive Analytics and Standardization in Testing of Insurance COTS

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Executive Summary

This White Paper focuses on business assurance, use of predictive analytics in functional testing, and achieving an overall standardization in testing of Insurance COTS (Commercial Off-The-Shelf) products. It highlights the communication made to testers, who are comparatively less experienced. It emphasizes on enabling testers such that they can test critical business scenarios; identify the impacted areas of change. Also, it talks about automatic creation of test cases. Through this, the effort required for test case writing is largely reduced due to standardization making it more

effective. Predominantly, this white paper suggests on how a business analysts or SME can share their knowledge such that a tester, with minimum efforts, utilizes the SME knowledge, and brings desired business assurance. It also suggests on how a framework can be developed, and what steps are necessary to fully utilize it. Lastly, it focuses on the business scenarios, which are effective in finding defect (Not just finding defect-prone areas of application).

Challenges

- “Testing Center of Excellence”, maintains a repository of critical business scenarios of functional areas in Testing. But they end up in creation of huge repository, where choosing from it becomes a huge effort.
- Analysis of production defects, escape analysis and root-cause analysis have helped to determine areas in the application, which are defect-prone or with high defect density. But every time, we see new areas with higher defect density.
- If Testing is done by junior resources, who struggle to meet deadlines in completing their Testing. However, on the name of business-oriented testing, they are made to attend various domain trainings, and asked to go through the above said huge repository of business-critical scenarios.
- Effort in review is huge, either review is not effective or it requires same efforts as that of creation of test artefacts, since reviewer has to verify word by word to ensure test coverage.
- Knowledge of business analysts, subject matter experts, and senior testers is not retained, and is vanished as these people leave the project. i.e. Testing is largely people-dependent than process dependent.
- Trust between business and QA is on all-time low. Testing team finds difficult to convince business that rigorous Testing has been performed, and they can well go into production i.e. Testing is performed with complete test coverage.
- Lot of efforts are laid for writing textual test cases. It is observed that most of the time, test cases are written in excel, and then imported to any test management tool. These lengthy texts are prone to many errors.

Observations

Efforts are required to resolve problems faced by front line testers, who have the total responsibility to ensure high quality of software. Following are some of the observations, which are the foundation of this paper.

Patterns in Test Cases

It is observed that when it comes to functional testing of COTS product, there is always a pattern, because all the COTS are created to support a specific business process. If it is an Insurance COTS product, then it is actually created as per the Insurance life cycle. Moreover, it has critical areas as per the business of insurance, like regulations and reporting requirements.

Also, it is observed that there are some mandatory transactions or scenarios, which are ought to be added for a specific area of Testing. For example: in rate testing, transactions like new business, endorsements and renewal are to be added without fail.

Errors and omissions

Copy Paste, this is an obvious thing which is followed by every tester while creating a textual test case, but copy paste has the biggest loss exposure in terms of omissions and errors.

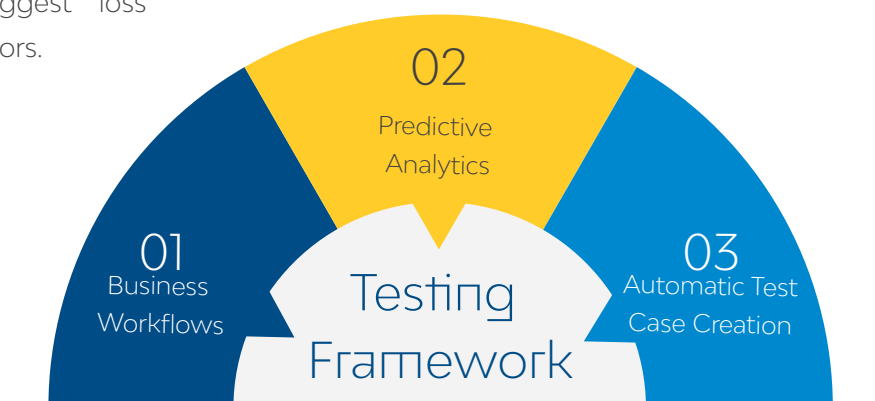
(Sometimes replacing functionality does not work well, or a tester forgets to change the form name or edition date in copy paste.)

Tough Task - Review of Test Cases

With a great skill of copy paste, a tester is now successful in creation of lengthy textual test cases, where critical validations are hidden i.e. a reviewer has to scan through word by word, and determine that validations are covered to achieve test coverage.

Workflows (Pictorial Representations)

Workflows, business process models, flowcharts, etc- the biggest reason of their existence is "communication" i.e. a quick understanding communication. When it comes for communication between a tester and a subject matter expert, nothing can do better than a pictorial representation in form of workflows, depicting critical business areas, and system breaking points.



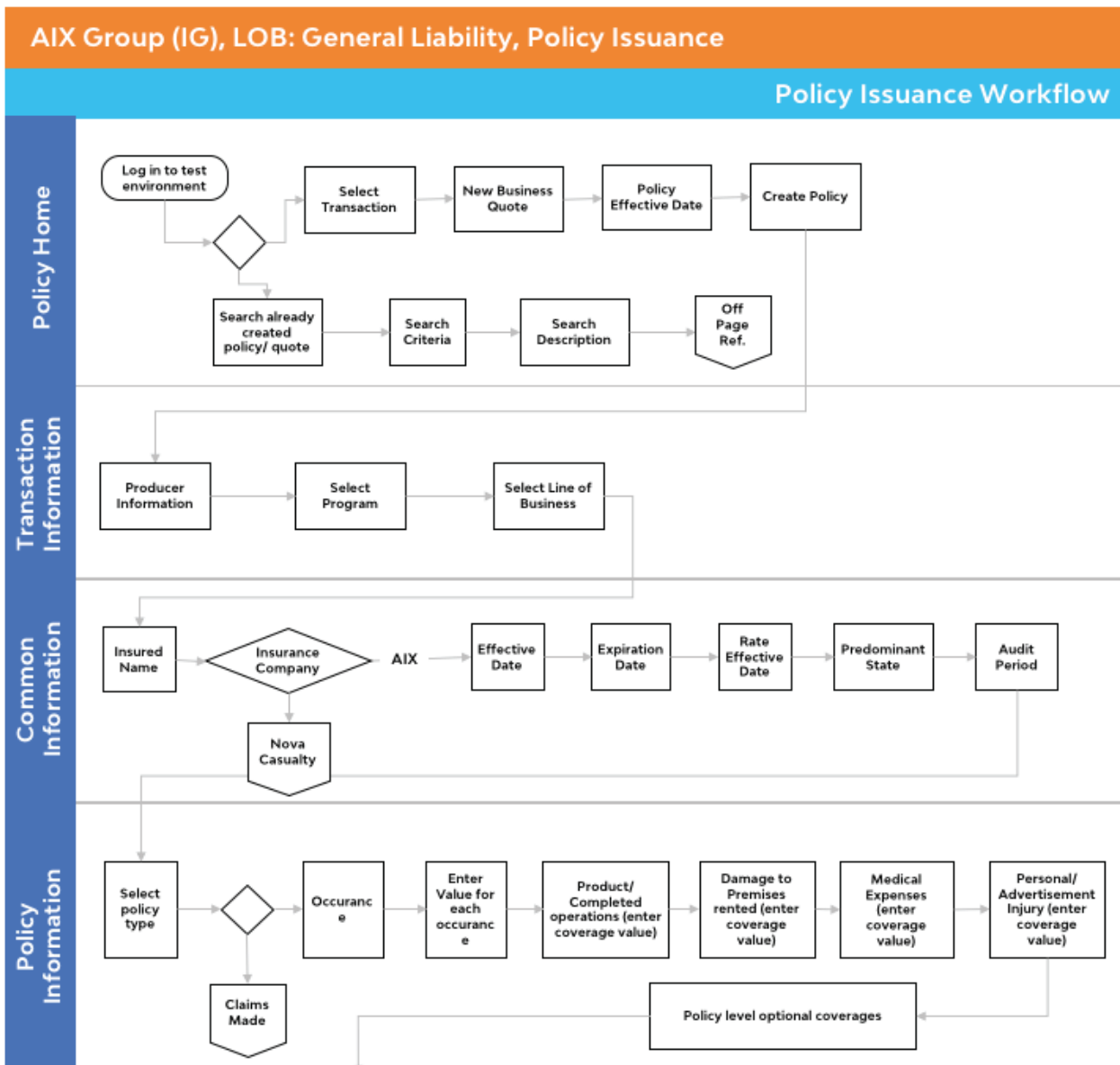
Framework

COTS products are rigorous software application involving complete insurance life cycle, supporting system and various line of business. When we aim of developing a framework, which is expected to help in testing of Insurance COTS, then this

framework cannot be restricted to one facet; it has to be taking inputs from multiple sources. Let's look at these one by one. Real-time examples are taken to explain how these sources will help in Testing.

Business Workflows

Workflow – XIX Policy Issuance, GL



Above is a workflow, which has comments enabled. Workflow not only provides a pictorial representation on the complete navigation of application, but also highlights critical functionalities. In the above workflow, an SME has given comments, so that a tester understands the process. It guides a tester on possible business scenarios, which can be included to test various functions represented in a workflow. For example: At policy effective date, a comment is provided to add negative testing on effective date i.e. boundary value analysis. Likewise, while selecting

a line of business, workflow is recommending taking package policy including multiple LOBs. This is an effective way of communication between subject matter experts and testers. This also makes sure that knowledge of SME or BA is retained in a project, even if they eventually move out of project. The workflow is also helpful in determining the impact of change. For a change in a specific functionality, all the impacted path and alternate flows can be easily identified, and subsequently tested.

Predictive Analytics

Usage of predictive analytics is extension of accelerators, which are developed in the form of repository of business-critical test scenarios. SMEs and BA have laid huge efforts in determining the critical test scenarios, which should be included in testing, but the issue with this kind of a repository

is that it is huge. Referring the repository itself is a challenge. Below is a snapshot of an example of business-critical scenarios, to be used for home owner's LOB for a COTS product of policy administration system.

Policy Administration System - Home Owners						
KPA : Key Performance Area					Note: Rating Range (1 to 5)	
KPI : Key Performance Indicators					L: Least Impact	H: High Impact
Sub KPA						
No	Scenarios	LOB's	Factors (L)	Factors (I)	Factors (H)	Factors (L)
1	Creation of New Quote-Applicant Details	Home Owners	5	4	3	3
11	Validation of product related attributes	Home Owners	5	4	3	3
11.1	Validating the default period of insurance	Home Owners	5	4	3	3
11.2	Validating the maximum period of insurance.	Home Owners	5	4	3	3
11.3	Validating minimum period of insurance	Home Owners	5	4	3	3
11.4	Validating if the product is available for automatic renewal.	Home Owners	5	4	3	3
12	Agency/Agent Information	Home Owners	5	4	3	3
12.1	Validation of Agent code/ Sub-code/ Segmentation Code	Home Owners	5	4	3	3
12.2	Verify that the Agent is of related state and licensed.	Home Owners	5	4	3	3
13	Basic Policy Information	Home Owners	5	4	3	3
13.1	Validation on policy state (states of USA where policy is to be issued)	Home Owners	5	4	3	3
13.2	Validate the policy type: New business/ Rollover/Cross Sell	Home Owners	5	4	3	3
13.3	Validation on start date of insurance policy i.e. backdate and future date	Home Owners	5	4	3	3
13.4	Verify that the start date/effective date of insurance policy is defaulted to today's date	Home Owners	5	4	3	3
13.5	Validation on policy expiration date i.e. short-term and long-term policy	Home Owners	5	4	3	3
14	Applicant Information	Home Owners	5	4	3	3
14.1	Validate applicant telephone no.	Home Owners	5	4	3	3
14.2	Validate applicant SSN, Prefix, First Name, Middle Name, Last Name, Suffix, date of Birth	Home Owners	5	4	3	3

For a test engineer, above utility becomes very challenging for implementation, as referring to all critical scenarios, and then deciding on which all scenarios should be taken for his scope of testing.

Through predictive analytics, this whitepaper proposes that system should predict the scope of testing (as per the initial information provided), and suggest critical test scenarios on its own.

Rate Testing

Loss Cost Multiplier for

Client Name

Line of Business

Random selection of LOB in test cases

Effective Date

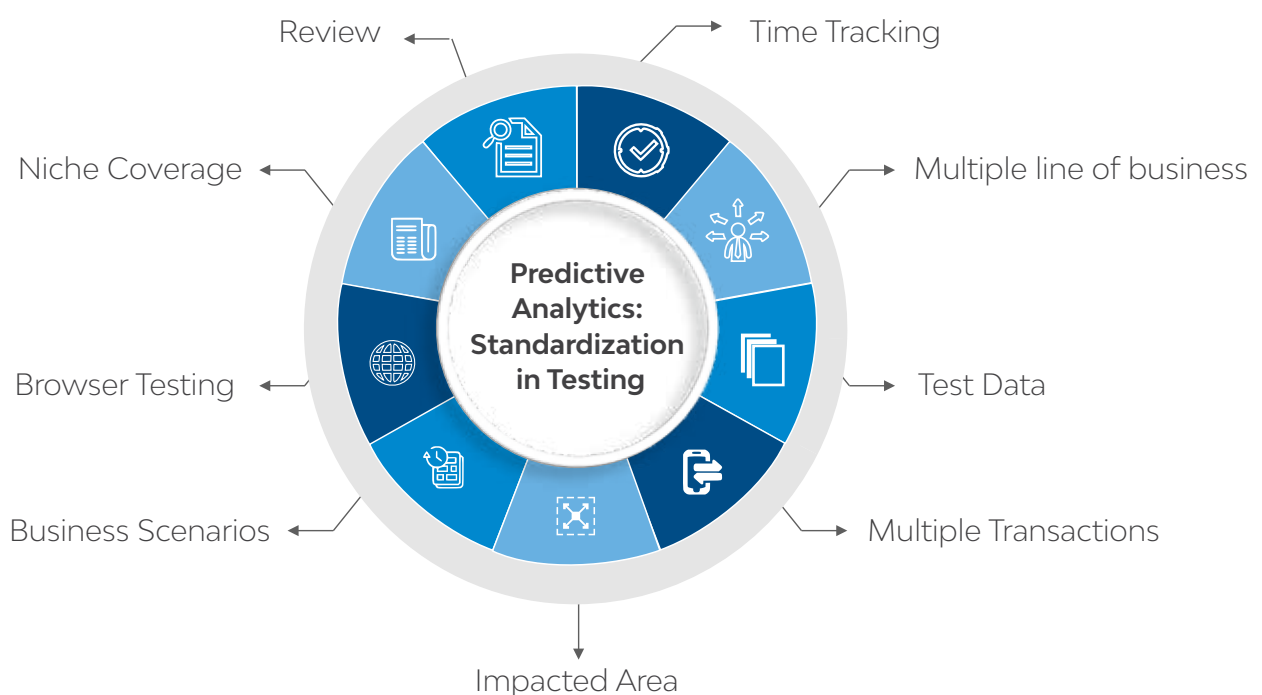
Predominant State

System suggestion for Scenarios to be covered:

- # Create a short term policy (to verify applicable short term/ prorata rates)
- # Process mid term cancellation (to verify applicable refund on short term or prorata basis)

The snapshot above displays a simple example of predictive analytics, where the scenario of short term policy and cancellation are suggested to perform rate testing. Also scope of predictive

analytics can be extended to below areas to fully utilize the potential of predictive analytics in bringing standardization and achieving effectiveness in testing



Predictive Analytics leading to Standardization in Testing

Manual testing can prove to be subjective i.e. it does have an impact of one's opinion, which gets influenced from the experience and domain knowledge. So, how to bring standardization in manual testing? Answer may lead us to predictive analytics, which will suggest standard scenarios and help achieving standard results from wide variety of manual testers. Predictive analytics, will not only suggest critical scenarios to the test engineer, but will also record on suggestions which are accepted or declined by the test engineer. This will further help enhance complete repository of testing scenarios. This will also lead to standardization in terms of test coverage.

Handling large volume of Testing

History is testimony that to handle large volume, the best solution is standardization. Test Automation is the best way we have achieved the standardization in software testing, but this is also a truth that higher percentage in overall testing is actually performed through manual testing, major reason is the stability of application itself, and mostly automation testing is used in regression testing. For functional testing, it requires robust manual testing with ever-changing requirement of business scenarios. So there is a need to bring something between manual testing and total test automation. Answer of same can be a predictive analytics, which can bring standardization in manual testing, and hence, can increase the execution rate with close monitoring.

Predictive Analytics for determining the Impacted Area

Predictive analytics will not only hint on probable test scenarios/cases, which should be the part of test plan, but will also highlight the impacted areas. For example, any change in policy administration system on rates, may highlight impacted areas in billing and agency commissions.

Another example can be of adding a specific form, which may impact already generating forms of a specific line of business.

Predictive Analytics in Test Data

Test data is instrumental in breaking the system/ finding defect. From as simple as having a "&" or Apostrophe(') in the search criteria to the complex test data such as using "North Dakota" as a state in workers compensation policy, as it is a monopolistic state offering workers compensation policy, with unique set of business rules like stop-gap coverage. It is always test data which differentiates the testing done by a test engineer and domain expert business user. If this expertise of business user on test data becomes the part of predictive analytics, the results provided by test engineer can be enhanced..

Predictive Analytics in required Policy Transactions

Insurance COTS product testing is based on lot many transactions, as there are so much possible transactions. Selecting a specific transaction in testing is always a key to find a defect, not only

selecting a transaction, but selecting a transaction in such a way that it tests multiple functionalities in minimum time, is the key. For example – performing negative testing of effective date for a form generation in new business issuance transaction, and then positive testing of effective date in the renewal of same policy, saves time and tests multiple scenarios. Selecting Audit transactions in General Liability and Workers Compensation Line of Business Policies, are helpful in testing. Out of sequence endorsements are again a good test for verifying the correct flow of data to data base.

Predictive Analytics in different LOBs

It is noticed that issues observed in one line of business, are often duplicated in another line of business. However, it is also observed that there are different testing teams, so the issues which are identified in one LOB, are totally alienated, though there is an equal chance of getting similar issues in other LOBs as well. Once fended in Predictive Analytics, all the related LOBs can have a check for issue occurring in one LOB. For example - Issues in producer selection functionality can be found in every LOB; or rating errors for a specific state can be replicated in other LOBs.

Predictive Analytics in browser-specific Testing

With the increase of availability of multiple browsers and different versions of the same browser, it is a cumbersome task to do complete testing in

multiple browsers. People, who have done browser testing, have experienced the clear fall out in some areas which are found in multiple browser testing. If this experience becomes the part of predictive analytics, it can help in efficient browser testing. For example: grid selection in user interface, data being saved properly, pop up screens, and interface with web services are seen as area of issues in browser testing.

Predictive Analytics in niche coverage

With the growing variety in needs of insurance, there are huge numbers of available coverage and related conditions and business rule associated with these coverage. Mostly, these are the part of overall business scenarios available for a specific LOB, but the “coverage” requires a special mention in predictive analytics. Some states require more insurance policies for “Snow Mobile Vehicle”, some states are with higher requirement of “sink-hole collapse”. There is an obvious requirement where a system guides a tester on which coverage should actually be selected to meet real-time business requirement. Another example will be covering niche coverage in Auto insurance like Loan Lease coverage or specific state surcharge in rating, can prove to be required testing scenarios.

Predictive Analytics in Time Tracking

Now we are coming to the most difficult part. How can a test manager ensures that the time taken by team is justified, or simply the estimations are correct. When it is a manual testing, one person

will test it in an hour, another may test the same functionality in more hours. Time tracking is another area where predictive analytics can be used. Time taken to test specific functionality or transaction-based effort consumption, can become a part of predictive analytics. This will act as a self-monitoring tool for test engineers. Also, managers can have a tool which can help them judge the productivity of their team.

Predictive Analytics in Review

Reviewing the work of testers is difficult for managers. A framework which can monitor on how many recommendations were made by predictive analytic system and how many are accepted and implemented by a tester can be a good source of review. The additional defects found because of recommendations from predictive analytics can also be tracked and can help in enhancing the overall predictive analytics system.

Automatic - Manual Test Case Creation

If we have patterns in required test cases, then there can be a system, which can replicate this pattern and automatically create a test case. It is observed that a simple form and rate testing have a pattern in their test plan, where testing is performed around an effective date, predominant state, preselected form, etc. This white paper suggests creation of framework, which will take limited information from the tester on scope of testing and business transactions. As per the selection of test engineer, the framework will generate the test case. A simple utility can be created on excel macro or through minimal programming effort, which can generate test cases in required format.

Form Testing																						
Form Name	XX-0110																					
Client Name	XXX Insurance																					
Line of Business	AU																					
Random selection of LOB in test cases	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																					
Fill in form	<input checked="" type="checkbox"/> Static form <input type="checkbox"/> (Fill-in information will be verified in test case)																					
Mandatory form	<input checked="" type="checkbox"/> Optional Form <input type="checkbox"/>																					
Effective Date	E2/1/2017																					
Predominant State	NY																					
States to be randomly covered in test cases	<table border="1"> <tr> <td>Transaction Type</td> <td>CA</td> <td>NC</td> <td>SC</td> <td>NJ</td> <td>VA</td> </tr> </table>	Transaction Type	CA	NC	SC	NJ	VA															
Transaction Type	CA	NC	SC	NJ	VA																	
Transactions (Auto Selection)	<table border="1"> <tr> <td>NBQU (New business Quote)</td> <td></td> <td rowspan="10">Note: Test case will convert same quote to policy for easy test execution</td> </tr> <tr> <td>NBS (New business issue)</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>PCNM (Endorsement)</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>RCQU (Manual Renewal Quote)</td> <td></td> </tr> <tr> <td>RCIS (Manual renewal issue)</td> <td>Negative</td> </tr> <tr> <td>REQU (Renewal Quote)</td> <td></td> </tr> <tr> <td>RES (Renewal issue)</td> <td></td> </tr> <tr> <td>Out of sequence endorsement</td> <td>NBS</td> </tr> <tr> <td>Test package policy covering all LOB</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Test individual state policy</td> <td></td> </tr> </table>	NBQU (New business Quote)		Note: Test case will convert same quote to policy for easy test execution	NBS (New business issue)	<input checked="" type="checkbox"/>	PCNM (Endorsement)	<input checked="" type="checkbox"/>	RCQU (Manual Renewal Quote)		RCIS (Manual renewal issue)	Negative	REQU (Renewal Quote)		RES (Renewal issue)		Out of sequence endorsement	NBS	Test package policy covering all LOB	<input checked="" type="checkbox"/>	Test individual state policy	
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REQU (Renewal Quote)																						
RES (Renewal issue)																						
Out of sequence endorsement	NBS																					
Test package policy covering all LOB	<input checked="" type="checkbox"/>																					
Test individual state policy																						
Negative testing (boundary value analysis) for effective date	<input checked="" type="checkbox"/>																					
Negative testing for valid state	<input type="checkbox"/>																					

The snapshot above and below show that the system is capturing data for form testing to

provide output in the form of ready test case creation.

Test Cases & Results							
Area Completed by Test Case Author							
Test Case #	Step #	Requirement Tested	Specification Tested	Test Coverage Checklist Scope No. (see tab)	Test Description	Test Type	Expected Results/Test Condition
1	1	NA	NA	NA	Perform new NBIS for following details- Form No. XX *** 01 19 LOB AU Effective Date 12/1/2017 Transaction Type NBIS State NY Client XXX Insurance	Positive	XX *** 01 19 form should generate with its edition date.
2	1	NA	NA	NA	Issue the policy	Positive	XX *** 01 19 form should generate with its edition date.
3	1	NA	NA	NA	Perform PCNM on above policy	Positive	XX *** 01 19 form should generate with its edition date. proceed
4	1	NA	NA	NA	Perform FEIS on the above transaction	Positive	XX *** 01 19 form should generate with its edition date. proceed
5	1	NA	NA	NA	Perform new NBIS for following details- Form No. XX *** 01 19 LOB AU Effective Date 1/3/2017 Transaction Type NBIS State NY Client XXX Insurance	Negative	XX *** 01 19 form should generate with its edition date.

Conclusion

The key objective of this white paper is to empower the Tester by providing business-critical scenarios such that they are not only easy to understand, but easy to implement as well. This paper suggests three sources (workflow-enabled with comments, predictive analytics, and automatic test case creation), which can contribute

to effective test coverage, and increase the productivity of test engineer. Another objective of this white paper is to bring standardization in Testing, thus providing more time to the manual tester, so the efforts can be laid to not just perform the procedural testing, but to also find defect in the system.

About the Author(s)



Atul Kumar Jain is a Senior Consultant-Insurance Practice at LTIMindtree. He has 10 + years of experience in Property & Casualty Insurance. He is a “Chartered Insurer” and Associate of Chartered Insurance Institute UK, Fellow of Insurance Institute of India (FIII), Associate in General Insurance from AICPCU (AINS), US. Apart from insurance designations, Atul has an engineering background, and is Master of Business Administration (MBA) in Finance & Marketing. Atul is currently working as Senior Consultant for a leading North American Insurance Product Company.



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