

Revolutionizing Quality Engineering for Validating the Life Insurance Value Chain





QMT:Revolutionizing Quality Engineering for Validating the Life Insurance Value Chain

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Executive Summary

The life insurance industry grapples with numerous quality-related challenges stemming from intricate, multi-variant processes, limitations in traditional testing methods, and the risks associated with production defect leakages. This white paper articulates these pressing issues and introduces QMT, a groundbreaking product designed to tackle them. Leveraging a knowledge graph model-based approach, Emtech Group Inc. offers a comprehensive solution, QMT, by understanding the complex interdependencies within life insurance workflows. QMT significantly scales down testing efforts and costs, with an 80% reduction in Full-Time Equivalent (FTE) demand for Quality Assurance (QA) capabilities captured in an independent case study by Mantissa Group. Additionally, QMT minimizes the risk of externally exposed production defects, thereby safeguarding both customer trust and brand reputation. With its unique algorithms and advanced features, QMT is poised to revolutionize QA in the life insurance value chain, delivering full, end-to-end test coverage at a fraction of the cost and time.

Introduction

In an era where the insurance landscape is rapidly digitizing, the race is on for companies to deploy digital solutions that not only cater to evolving business needs but also ensure top quality from the start. With the pressure to catch up with the digitization across the insurance value chain, IT teams in insurance carriers aim to release products without any unexpected 'Day 2 quality issues'. This is crucial in the life insurance industry which is known for its complex processes. However, here's the challenge: how do we guarantee thorough QA testing, when QA is not a core competency, whether managed in-house or outsourced, without consuming significant FTE resources or compromising on quality?

In this paper, we explore these challenges, focusing particularly on life insurance, and introduce Emtech QMT – a novel solution crafted to address these challenges.

Problem Statement

Even though digitization unveils a window to develop innovative and consumer-centric products quickly, it has also intensified the risks associated with quality-related issues, adding to the hurdles of providing consistent, flawless outcomes, particularly in the context of life insurance, a sector known for its complex, multifaceted workflows. In this section, we delve deep into three critical problem areas that life insurance carriers face in their journey towards achieving high quality in product offerings:

A. Complexities in Multi-Variant Insurance Processes

The life insurance sector in the insurance industry is usually characterized by a wide variety of process flows. These many variants arise from factors such as various insurance policies, changing regulations across jurisdictions, as well as customization options made available to the customer. Although options bring flexibility and a tailored experience to customers, they introduce complexities and challenges in the process flow of insurance operations, in particular in the area of QA and testing.

For instance, consider the life insurance e-application Part-A and Part-B process. It begins with basic personal information, such as "What is your full name?" and "What is your birthdate?". After collecting these initial details, the inquiry moves on to employment, asking, "Do you have a job?" Depending on the answer, the application might further explore the applicant's profession, industry, and yearly income. The application then investigates whether the insurance is for the respondent or someone else. If it's for the respondent, questions related to citizenship and residency, such as "Do you hold United State citizenship?", come into play. Depending on citizenship and place of birth, there might be deeper dives into topics like previous insurance attempts or existing policies. Each answer leads to specific follow-up questions, creating a tailored path for each applicant (depicted in Figure 1).



Understanding the Origins of Variants

Below, we examine the factors behind variants in insurance processes.



Diversity in Product Offerings: Insurance carriers usually have a diverse range of life insurance products, such as term life, whole life, and universal life, where each might have its own unique features, benefits, and underwriting rules.



Customizable solutions: Insurance carriers often offer customizable solutions to their customers that better suit their needs, such as accidental death benefits or premium waivers.



Variability in Geographical and Regulatory: Since different countries and even states within countries have their own laws and regulations related to insurance, it is required to have a mechanism in place for process adaptation.



Responding to consumer preferences: There are always new trends in consumer behavior, such as the desire for online policy management or IoT devices for health tracking, which result in the need for more diverse processes.

The Hurdles in Traditional Testing Scenarios



Complexity: Traditional manual testing usually falls short in fully covering the variety of scenarios introduced by these variants.



Time-Consuming: Comprehensive manual testing can be extremely time-consuming due to the large number of possible combinations and scenarios.



Human Error: The likelihood of human errors increases due to the complexity and fatigue associated with manual testing.

Addressing the Shortcomings of Existing Solutions

Although existing QA tools and methodologies offer a degree of testing scope, they often fall short in comprehensively tackling the challenges introduced by the numerous variant choices in the insurance process flow.

Existing testing solutions generally lack the capacity to consider all the different combinations created by the variety of process flows in life insurance application. This means that only a fraction of possible scenarios is being generated, leaving gaps in testing coverage.

B. Scaling Challenges in Manual and Automated Testing Methods

Manual and automated testing approaches are commonly used traditional options for ensuring the quality of life insurance products. However, when it comes to scaling, their limitations restrict business growth and quality.

Slowed Momentum and Increased Costs



In manual testing, an exponential increase in FTE hours is needed to address the need to scale testing needs. This leads to a significant increase in costs and slowing down business momentum. Let's consider a new customization feature that allows five additional policy options. This will exponentially increase the number of test scenarios that need to be tested, leading to a surge in FTE hours and associated costs

Loss of Competitive Edge



The time required to write new test cases or rewrite existing ones to adapt to new changes could result in a delay in product launches. This not only impacts revenue streams but also gives the competitors a chance to outpace you in the market. Therefore, failing to scale efficiently can make both manual and automated testing methods a bottleneck in achieving full coverage, leading to compromising the quality of the product and leading to "qualityrelated Day 2 Issues".

C. External Exposure of Production Defect Leakage

Production defect leakage presents a unique challenge. Undetected defects in the life insurance product during internal QA cycle, whether in policy features, ACORD[®] XML103 between core systems, or customer interaction processes, may make their way into the live environment, thereby impacting end-users or distribution channels.

The external exposure of production defects not only undermines customer trust, but it also causes both immediate and long-term damage to the brand reputation. Additionally, if regulatory standards are compromised, it might lead to compliance issues and substantial fines. Moreover, when the defects are identified late, it might result in a significant rise in remediation cost involving providing hotfixes, rollbacks, or, even worse, product recalls. For instance, a minor glitch in the policy issuance process may result in a financial loss of millions of dollars for a mid-sized insurance carrier to rectify the defect. Aside from the long-term impact on the carrier's brand and customer relationships.

Solution Overview

Life insurance carriers face diverse challenges ranging from complexities in multi-variant processes to limitations in scaling both manual and automated testing methods. Moreover, the risk of embarrassing production defect leakages poses threats to customer trust. Recognizing these hurdles and the need for specialized solutions, QMT, our pioneering product, is specifically tailored to address the challenges in the life Insurance industry.



QMT leverages a high-throughput, knowledge graph model-based approach that provides a deep understanding of the intricate relationships within various insurance processes. By modeling complex policy life cycles, QMT allows carriers to visualize and manage different insurance policies, customizations, geographical regulations, and consumer preferences, all in an interconnected model. This not only simplifies change management but also supports prompt adaptation to any regulatory or consumer-driven changes.



Scaling traditional testing methods can severely hinder a carrier's ability to meet product delivery dates due to increased FTE efforts and costs. However, QMT provides full Coverage at a Fraction of the Cost. According to our Life Insurance Customer results, QMT automated generation and execution of test cases through the knowledge graph model has led to an 80% reduction in FTE demand for QA capabilities. Our clients have experienced a significant shift from approximately 2,500 manual person-hours to just 30 hours of automated testing runtime, while simultaneously increasing coverage.



QMT proactively identifies defects that might otherwise lead to significant financial, reputational, and compliance-related repercussions if left undetected. QMT's powerful variance analysis ensures that any changes since the last test execution are thoroughly checked, thereby Eliminating Quality-Related Day 2 Issues.

Technology Behind the Product

Following up on identified challenges and the initial introduction of QMT, this section explores deeper into the technological aspects of QMT. It provides insight into its unique algorithms, architectural design, and innovative features such as model-based testing and the utilization of knowledge graphs.

A. Technological Aspects

QMT Utilizes a robust model-based testing (MBT) approach that enables automatic generation of the test cases from models representing the expected behavior of the insurance applications. It captures complexities of diverse insurance procedures, leading to the elimination of limitations seen in traditional testing scenarios.

Automated Test Case & Data Generation. One of the key highlights of QMT is its capability for automated test generation. Differing from traditional methods that require extensive manual input, QMT utilizes model-based testing algorithms to automatically derive an optimized set of test cases, along with automatic test data, which ensures coverage of the most complex scenarios that exist in life insurance process flows. In order to ensure the generated test cases are both comprehensive and relevant, it considers factors such as policy types, customizable features, etc. Through the automation of this crucial testing phase, QMT not only saves valuable time but also enhances the overall testing quality.

Test Execution Framework. QMT's Test Execution Engine is designed to work seamlessly with Jenkins and serves as the backbone for executing the generated test cases to execute test cases efficiently and effectively. As a part of its flexibility, it can accommodate various test automation frameworks such as Selenium and Appium. This interoperability feature allows organizations to effortlessly integrate QMT into their existing testing ecosystems without the need for a significant "rip and replace". Additionally, it offers a comprehensive solution that brings together automated test generation and execution into a single platform.

Graphical User Interface (GUI). QMT's GUI is designed to offer an intuitive interface for managing your testing activities such as building models and generation of test cases. It acts as the hub where all components of QMT come together and offer a user-friendly experience. As the GUI presents visual representations of the generated models, it helps in understanding the complex relationships and flows inherent in life insurance products and processes. QMT enhances system comprehension and maintainability, allowing test managers and QA teams to make fast and informed decisions. Now, let's take a closer look at how all these GUI functionalities come together, as illustrated in Figure 2.



Figure 2. Visual representation of a system in the QMT environment and sample node content.

As shown in Figure 2, this graph provides a comprehensive, interactive representation of the system in the QMT interface, eliminating the traditional rigid structures (of modeled test steps or UI components) that lack automation, flexibility and scalability. Each node of this graph provides insights into specific process components or decision points, enhancing system understanding and maintainability.

B. Technological Aspects

One of the core technological foundations of QMT is its use of Knowledge Graphs that is built on a Node and Edge Architecture. In the context of our QMT model, a 'node' is a building block that represents a specific element or functionality in the insurance application process. Nodes are connected by directed arrows (or edges) that indicate the sequence or flow of the underlying business logic. Each node also contains attributes that define its specific role or action within this process.

Unlocking Insurance Insights with Knowledge Graphs. Leveraging Knowledge Graphs allows the QMT user to unveil the complex relationships and dependencies that exist in multi-variant insurance processes. This enables insurance carriers to obtain unique understandings of their operations and diagnose bottlenecks, potential error points, and areas for improvement.

Enhancing Test Generation with Knowledge Graphs. In automated test generation, nodes and edges serve as the basic building blocks. The Knowledge Graph ensures that the generated tests are meaningful combinations derived from the actual process flows and relationships represented by these nodes and edges, adding a layer of reliability and comprehensiveness to the testing process.

Integration with Desktop Canvas. The desktop canvas feature in the QMT GUI offers direct integration with model's nodes and edges which facilitate a more intuitive understanding of system intricacies thanks to its tight integration with the Knowledge Graph. Knowledge Graph serves as an interactive layer that helps make real-time changes to the graph or node-specific details.

Enabling Root Cause Analysis. The Knowledge Graph's Node and Edge Architecture facilitates rapid root cause analysis upon the detection of a defect. It provides a systematic approach for fixing immediate issues and understanding larger systemic flaws, all thanks to its event traceability capability.



CASE STUDY

Transforming Quality Assurance

AT A GLANCE

A 100-year-old Life Insurance Carrier faced significant challenges in QA. The carrier struggled with an increasing number of complexities in multi-variant insurance processes, scaling difficulties. Additionally, there were limitations in both manual and automated testing approaches.

Challenges Faced

- Increasing Complexity: Due to having a wide range of insurance products covering multiple customization options, QA turned into a nightmare, with just over 30 defined test scenarios to account for.
- Resource Constraints: The exiting comprehensive manual testing required approximately 2,500 person-hours, leading to high FTE effort and costs.
- 3. Limited Test Coverage: Only a fraction of the entire value chain was covered by generated test cases, as they were limited by available resources and time constraints.

THE QMT SOLUTION

The carrier adopted QMT as the Core Element of its new QA strategy.

- 1. **Increased Automation:** With QMT's model-based testing approach, the carrier achieved a 30x increase in automated test coverage vs. their manual testing method.
- Less Time: The time required for testing was significantly reduced, from approximately 2,500 manual person-hours to just 30 hours of automated testing runtime.
 Reduced FTE Effort: The carrier experienced an 80%
- 3. reduction in FTE demand for QA capabilities due to increasing the level of automation.

Full Test Coverage: QMT's automated test generation

4. enabled the carrier to shift from approximately 30 test scenarios to more than 35,000 test cases, covering the entire value chain.

RESULTS ACHIEVED

- Elimination of Day-2 Issues: Utilizing QMT's variance analysis, the carrier successfully eliminated embarrassing quality-related Day-2 issues.
- 2. **Cost-Effectiveness:** The significant reduction in FTE demand led to substantial cost savings for the carrier.
- 3. **Competitive Advantage:** By significantly reducing the time required for testing, the carrier was able to speed up its product launch cycle, gaining a competitive edge in the market.

Implementing QMT transformed the QA process at the centuryold life insurance carrier has led to comprehensive test coverage and significantly reduced time and resource requirements.

Conclusion

In the digital era, the insurance industry faces pressing demands for QA and risk management. This is accentuated in the life insurance sector, characterized by its multi-variant insurance processes, diverse products, and shifting regulations. The challenges in quality assurance stem from complexities in process flows, inefficiencies in traditional manual and automated testing methodologies, to the adverse impacts of production defect leakage.

QMT is a strategic enabler, to help IT executives meet desired business outcomes. It merges as a transformative solution which leverages a unique knowledge graph model-based approach. It not only comprehends the complex relationships within various insurance processes, but also automates and optimizes the testing phase. It addresses the limitations of both manual and automated testing approaches through providing a significant reduction in testing time and providing full coverage. Additionally, it minimizes the chances of potentially severe production defect leakages, preserving customer trust, brand reputation, and ensuring regulatory compliance all thanks to its detection. Utilization of proactive defect model-based testing and knowledge graph techniques, such as QMT, is projected to be accepted as common industry practices. Carriers investing in advanced products like QMT will not only secure their present but also lead in a future defined by excellence.

About Emtech Group, Inc.

Emtech Group Inc (ETG) is the leading provider of enterprise software quality value engineering solutions for validating insurance carrier chains. Our customers are enabled to deliver quality products while avoiding the expensive and embarrassing consequences from the exposure of production defect leakage.

Contact Information

For more information, or to see how QMT changes the way quality engineering is done, contact Emtech at **sales@emtechgroup.com**



