

### Groundbreaking digital tool transforms traditional product verification, validation and testing (VVT) processes

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Dr. Khadija Tahera, an academic at The Open University, has created the VVT Prioritisation tool, an interactive online platform that integrates customer requirements, regulatory standards, and business goals in the verification, validation and testing (VVT) process.

The innovative tool guides engineers through a seven-step process that helps prioritize tests, make data-driven decisions and plan necessary tests, offering a dynamic solution to effective testing in product development.

It was supported by [InterAct](#), the Made Smarter Innovation funded programme that brings together economic and social scientists, UK manufacturers, policymakers, and digital technology providers to address the human issues resulting from the diffusion of new technologies in industry.

Professor Jill MacBryde, Interact Co-director from the University of Strathclyde, said: “We are immensely impressed with Dr Tahera’s pioneering research which offers a transformative approach to the VVT process. It has the potential to reshape how manufacturing industries approach product development, ensuring that products meet the highest standards of quality and safety but also drives down costs by addressing risks more efficiently.”

#### The Inspiration

Manufacturing industries aiming to meet net zero targets face the challenge of developing sustainable products and technologies safely, reliably, and as quickly as possible.

A key aspect of this development process is verification, validation, and

testing (VVT), which requires thorough analysis of various stakeholders’ needs.

Traditionally, the VVT process is driven by technical risks identified through the voices of engineers. However, the voice of the engineer is only one part of the equation.

Analysis must incorporate the customer’s, driving product validation, the regulator, driving compliance, and the business, driving profitability.

The challenge is in balancing and coordinating the needs of all three key factors.

Well established methods such as Quality Function Deployment (QFD), Failure Modes and Effects Analysis (FMEA), and Design Verification and Validation Plans (DVP&R) help engineers identify potential problems, manage risks, identify and plan tests to design robust systems. However, these tools are often handled separately by different teams and lack integration, making it challenging to maintain a cohesive, systematic approach.

Building on her PhD in the role of testing in the engineering design process, Dr. Khadija Tahera, from The Open University, has published research proposing an integrated approach to include customer and regulatory requirements to VVT planning.

She explained: “Testing can account for 50%-75% of a product’s development budget, making accuracy crucial. Late-stage mistakes can be costly. Despite advances like Computer-Aided Engineering and virtual testing, many industries still rely on traditional testing methods. I wanted to

find a more systematic, dynamic approach that combines virtual and physical testing, adaptable to evolving technologies. My proposal suggests that integrating diverse perspectives and prioritising needs can save costs and improve product quality.”

InterAct offered Dr. Tahera the opportunity to turn that theory into an online interactive tool.

#### The Innovation

The VVT Prioritisation tool guides users through a seven-step process to analyse critical requirements from the customer, regulator, and business perspectives, helping prioritise VVT activities.

It starts by identifying customer requirements and their importance. Then, it outlines the technical specifications needed to meet those requirements and evaluates potential failure risks (high, medium, low).

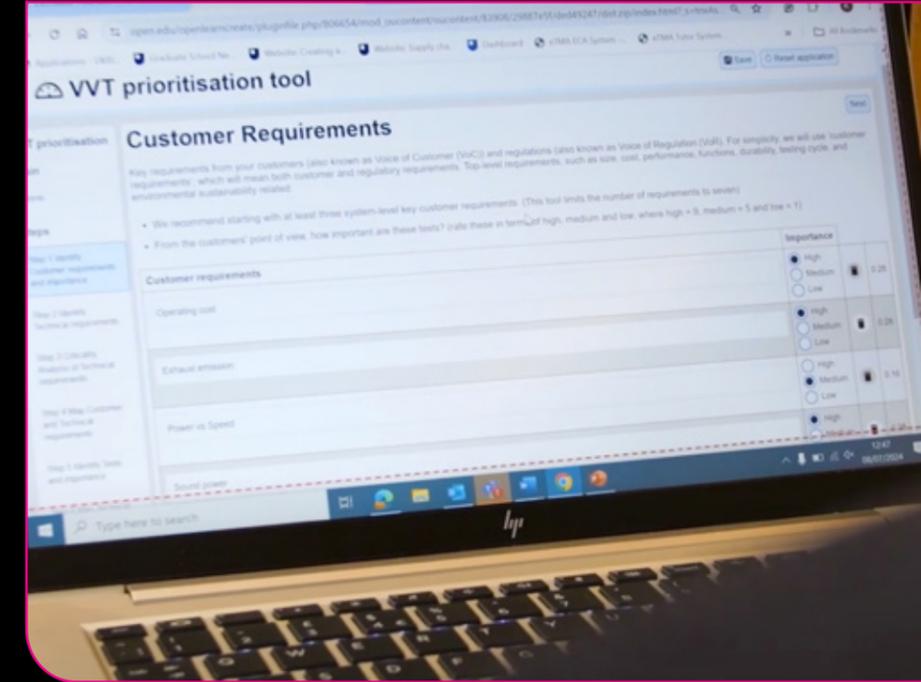
The tool maps customer requirements to technical specs to tests, then ranks tests to ensure product reliability and durability.

Finally, the tool generates visual representations of the mapping of customer requirements and tests, and the prioritisation of tests based on ranking, helping teams make informed decisions. It supports collaboration and iterative improvement by visualising how changes in requirements and risks affect test prioritisation.

Dr. Tahera said: “This tool is unique because it not only addresses failure risks but also asks, ‘Have we designed the right product in the right way?’ from the perspectives of the business, customer, and regulator.”

“It lets users simulate scenarios and adjust variables to see how changes affect test prioritisation, challenging assumptions and finding better solutions.”

“My goal was to simplify a complex process into a clear, step-by-step approach. Though still in prototype, the



tool is powerful, scalable, and promotes data-driven decisions. It helps challenge traditional engineering judgment and fosters collaboration, ensuring the product meets high standards, saves time, and reduces costs.”

#### The Impact

Dr Tahera’s research has expanded the conventional risk-based VVT planning and developed a method to incorporate the voice of the customer, voice of regulation, and voice of business into the VVT planning process, thereby significantly reducing the challenges associated with testing in new product development and manufacturing.

She has developed a new approach to prioritise VVT and focus on what matters most: ensuring that customer needs, safety, durability, and regulatory standards are met.

The tool is now being hosted on a new website - [www.smart-testing.open.ac.uk](#) - which will feature additional research in this field.

Dr Tahera is also in discussions with engineering solution providers and manufacturing companies about

adopting the method in its solutions.

Dr Andrew Halfpenny, Director of Technology at nCode Products, has tested the tool.

He said: “What I really like about this unique tool is that it doesn’t just focus on the risk of failure and mitigating failure, but brings in the voice of the business, the customer and the regulator. It also addresses how to qualify the solution to ensure the design is successful and risk-free.”

There are also hopes that a university in the UK or Europe could integrate the tool as a teaching aid for its engineering students to imbed the practice in the next generation of manufacturers.

Dr Tahera said: “This tool challenges the traditional approach to VVT. I don’t expect overnight change, but I do believe that manufacturers of all sizes should explore this tool. It offers real benefits, opening the door to smarter, more cost-effective product development.”

