AUTOMOTIVE SPECIAL

OptimiSE

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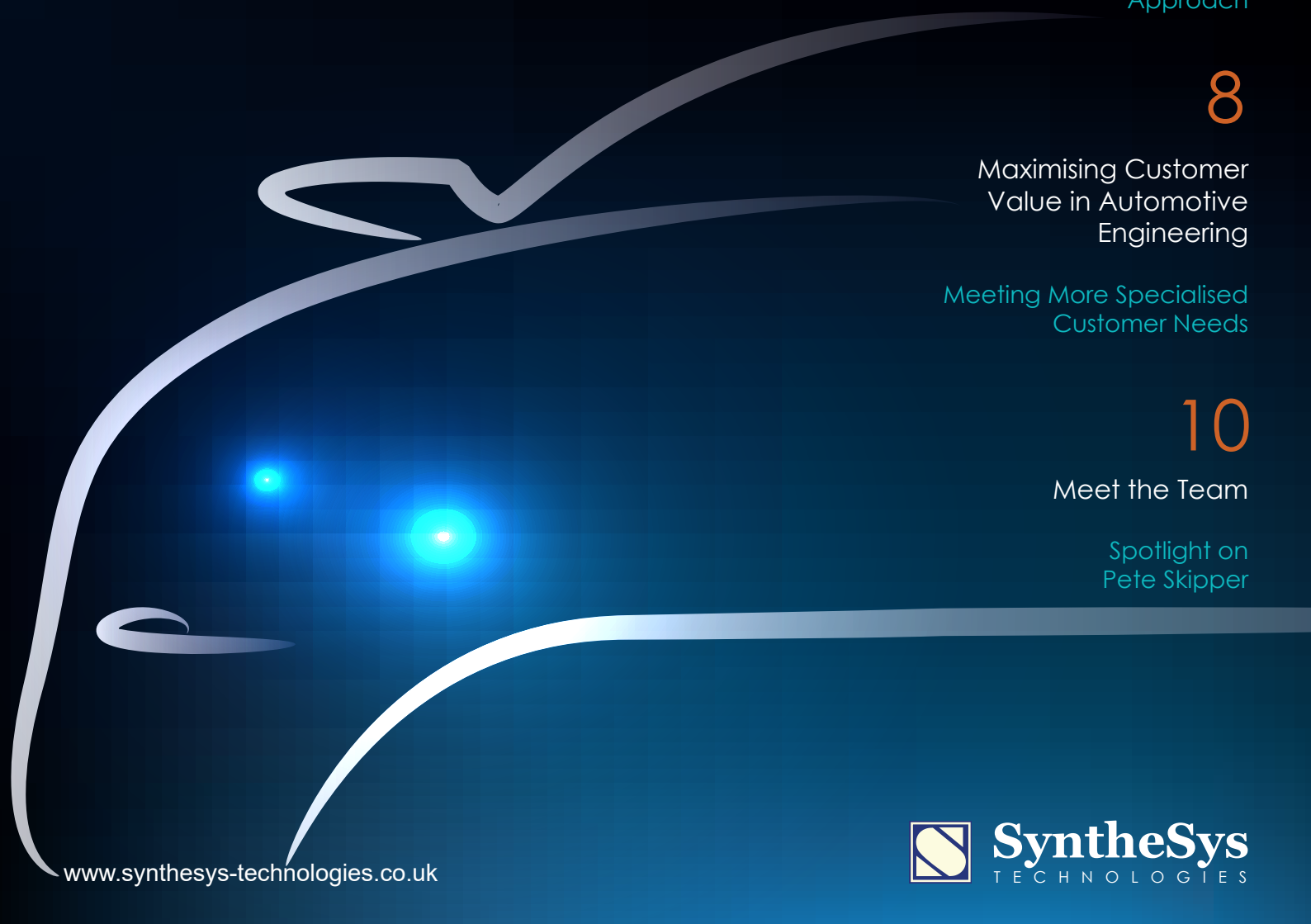
Industry News & Events | Software & Systems Engineering Acceleration | Useful Resources



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SyntheSys TECHNOLOGIES

EVENTS 21

WE ARE EXHIBITING

SyntheSys TECHNOLOGIES

SAVE THE DATE

North East Automotive Alliance (NEAA) NEAA Expo

30 September 2021 | Beacon of Light Stadium | Sunderland

INCOSE UK Annual Systems Engineering Conference (ASEC)

23 & 24 November 2021 | Royal Armouries | Leeds

For more information on the events we are attending, visit: http://www.synthesys.co.uk/events/index.html

SyntheSys TECHNOLOGIES

Letter from the MD

Mark Williamson Managing Director
SyntheSys Technologies

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SyntheSys TECHNOLOGIES

Automotive Engineering Excellence in the Face of a Rapidly Shifting Environment

It's no secret that things are moving fast in the automotive industry. As manufacturers consider how to shift towards digital manufacturing, decarbonisation, electrification, connected and autonomous vehicles and green manufacturing, there is huge opportunity and scope for automotive players. The United Kingdom (UK) is at the cutting-edge of new automotive technology with arguably one of the strongest global supply chains. The UK's strong manufacturing capability is matched by its pioneering technological innovation influence and is home to some of the best-in-class innovators in electric vehicles, lightweighting and battery development.

Automotive engineers build some of the world's most complex assets and nowhere is the complexity of technology more evident than in the modern vehicle / platform. Engineering vehicles with a much greater demand for advanced driver functionality comes with a huge number of challenges. So, with that in mind, and with so many landmark innovations under way, we felt it fitting to dedicate Issue 7 of OptimiSE Magazine to the automotive industry.

This latest magazine is filled with features dedicated to automotive engineering and manufacturing. On Page 8 we pose some thought around how automotive players can maximise customer value. Those working in highly specialised, bespoke production will find this particularly useful. Compliance is a major factor to consider right now, and for those currently navigating Automotive Software Performance Improvement and Capability dEtermination (ASPICE) and other automotive standards, we have a feature on Page 6 which looks at how you could automate this effort seamlessly with the IBM® Engineering Lifecycle Management solution.

I am also delighted to introduce our latest 'Meet the Team' feature on Page 10, which shares more insight about Consultant, Pete Skipper.

At a time when collaboration and communication is more important than ever, if you or your organisation would like to contribute an article to a future issue, please do not hesitate to contact us via the editor. I hope that OptimiSE Magazine continues to prove to be useful and enjoyable within the engineering, systems and software development communities.

Very best regards,

Mark Williamson- Managing Director
SyntheSys Technologies

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SyntheSys News

SyntheSys Confirms its Membership with Silverstone Technology Cluster

As our foothold in new and existing markets grows and, in a bid to strengthen our knowledge and connection in advanced manufacturing and engineering markets, SyntheSys is thrilled to announce its membership with the Silverstone Technology Cluster (STC).

STC exists to help advanced engineering, electronics and software businesses in the wider geographical area surrounding Silverstone. Bringing like-minded companies together and encouraging them to collaborate is very much at the heart of what the STC does, and as a not-for-profit organisation supported by founding members such as Barclays, Buckinghamshire Council, EMW Law, Grant Thornton, Hexagon, Silverstone Park and West Northamptonshire Council, it aims to deliver what its membership requires, without chasing any political or financial agendas.

Pim van Baarsen, CEO of Silverstone Technology Cluster commented:

''SyntheSys' membership with the cluster strengthens our diverse and growing members network and I am pleased to have them on board. We look forward to working with them and create mutually beneficial collaborations with fellow members, and I am sure there will be a lot of opportunities to do so.''

We are eager to engage and collaborate with the impressive cohort of members.

To read more about STC, visit: https://www.silverstonetechnologycluster.com/

If you would like to learn more about engineering services, visit: www.synthesys-technologies.co.uk.

To speak to us directly about our STC membership or your current programmes, contact us by emailing: info@synthesys.co.uk

New Technology Partner: Creating Unique Value through a Collaboration with Software Development Company, BoostHigh

In an exciting time of change and growth, we are pleased to announce our latest strategic alliance with Poland-based software development company, BoostHigh.

Recently voted as the top software development provider in Poland, BoostHigh are software competencies providers specialising in the delivery of web-based commercial and industrial systems and applications. Composed of experienced developers, the team is proficient in implementing: systems; web applications and dedicated software; C++ (Qt) software for hardware platforms; Internet of Things (IoT) networks and devices; Application Programming Interface (API) and system integrations.

SyntheSys' Managing Director, John Hartas commented:

"Throughout our 33 years of trading we have always viewed commercial partnerships as an important element of delivering value to customers through an adaptable and flexible portfolio of services. BoostHigh brings a high-level of expertise to our already established software development capability. I feel positive that this collaboration will enable us to reach new customers with high-value services in both the UK and wider geographical regions and I very much look forward to working with the BoostHigh team''

Pawel Czerniewski added to the sentiment by saying:

"At BoostHigh, we see great value in strategic cooperation. I am very pleased that BoostHigh is entering into a partnership with SyntheSys, adding our software development capabilities to their already impressive portfolio of services. We are looking forward to new challenges and exciting projects. As digitisation across industries keeps gaining momentum, joining forces to deliver top quality digital services will bring great value to our UK and EU clients."

To read more about SyntheSys, visit: www.synthesys.co.uk

To read more about BoostHigh, visit: https://boosthigh.com/

Gold Business Partner IBM

AUTOMOTIVE ENGINEERING MANAGEMENT & COMPLIANCE WITH IBM®

The Challenge

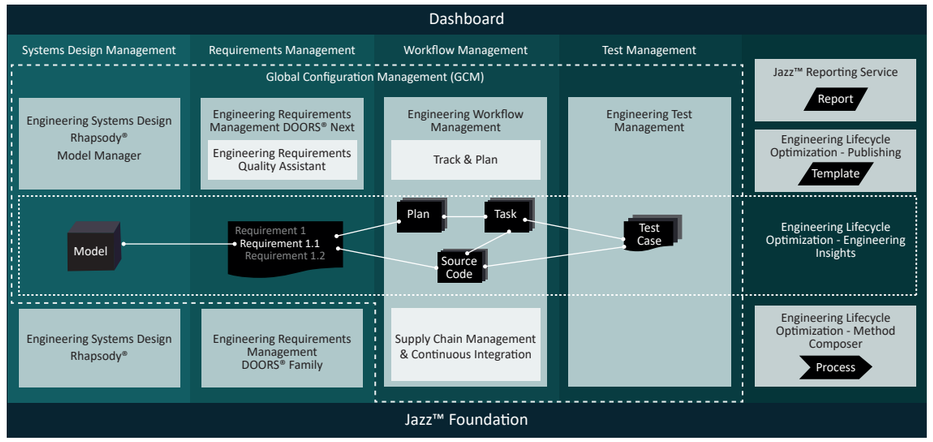
We live in an age of constant technological change, and automotive engineers build some of the most complex assets on the planet. Nowhere is the complexity of technology more evident than the automotive industry. Under the best of circumstances, engineering a vehicle is challenging. Engineering them with an ever-growing list of Advanced Driver-Assistance Systems (ADAS) is exponentially more difficult. Automotive companies continue to struggle with increasing complexity, and a need for strategic reuse, faster go-to-market and improved vehicle quality, changing the way in which manufacturers and supply-chain players operate.

The Solution

Leverage the power of IBM® Engineering Lifecycle Management (ELM) suite for Automotive; a solution specifically designed for the complex and evolving needs of the Automotive industry. The solution offers a pre-defined process, as well as corresponding workflow and reporting, to work compliant with IBM® tools, and captures and manages requirements and test cases in a pre-defined structure that supports industry-best practices. Planning and tracking of tasks, risks, change requests and problems with pre-defined work items. The Agile solution helps to streamline engineering, cut costs and demonstrate compliance.

Integrated Work Product Management

IBM® Engineering Lifecycle Management (ELM) allows for integrated work product management



For a free demonstration of the IBM® Engineering Lifecycle Management suite for Automotive, or if you would like a discussion about your current development projects, start the conversation by contacting: cet@synthesys.co.uk

Benefits

Demonstrate Compliance - IBM® ELM Automotive Compliance contains extensive mapping on how the solution satisfies Automotive Software Performance Improvement and Capability dEtermination (ASPICE)-based practices. For ISO 26262, expert work product checklists are available. IBM® ELM Automotive Compliance is built on a life cycle data model designed to provide traceability through requirements, tests and systems design, as well as management and supporting processes. React to change faster and understand how Agile methods can be effectively applied in a regulated context. IBM® ELM Automotive Compliance supports SAFe® 5.0.e.

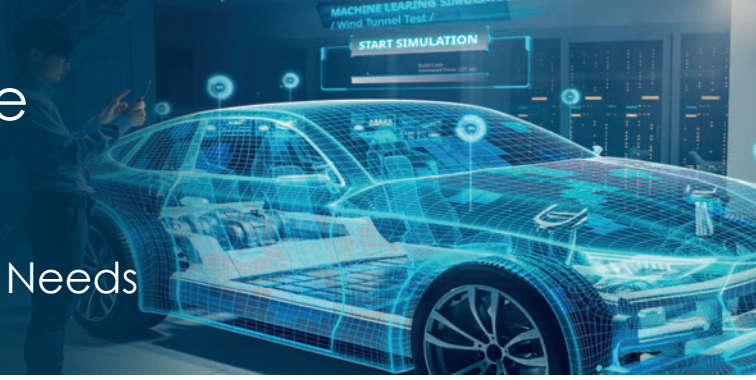
Reuse / Variant Management - Engineering teams can reduce errors and increase productivity by effectively managing versions and variants of software intensive products and systems. Proper software reuse greatly saves development time, while reducing defects and warranty costs. IBM® uniquely manages different artifacts including requirements, models, software code, test plans and results, under a common global configuration model.

Model-Based Systems Engineering (MBSE) - Allows you to understand how you can model your system architecture and systems behaviour. Rely on a best-practice profile to kick-start a successful journey into MBSE.

Reporting and Analytics - Traceability lets teams do cross team reporting and analytics whilst effectively conducting impact analysis across the entire team. The robust reporting capability allows you to understand how a requirement change images other requirements, functional, logical and physical design in order to assess the impact of change on validation planning.

Maximising Customer Value in Automotive Engineering

Meeting More Specialised Customer Needs



There's a delicate balancing act to be struck in contemporary automotive engineering. Customers increasingly demand a more personalised experience, and a bespoke product that reflects and respects their particular needs. For manufacturers and designers, there are certainly opportunities in being able to meet these more specialised demands. But the stronger this pressure gets, the harder it becomes to understand what your customer's priorities are, and how to best leverage your resources to address them.

When your products are becoming more complex at the same time as becoming more bespoke, automotive companies are in danger of wasting time reinventing the wheel – maybe even literally! And if customer needs aren't fully understood, that duplication of effort could be doubly wasteful, as you may not even be going in the right direction. Lean manufacturing has become a widespread staple of good practice in the automotive industry, but best practice in applying similar principles to the engineering process hasn't yet become as widespread.

It's worth remembering that Lean principles aren't just about minimising cost by eliminating waste, they also add a lot of customer value by ensuring consistent quality. In taking a similar approach to the engineering process, these value-adding aspects of orderliness and standardisation are even more pronounced, and often become the primary way it delivers benefits to both the business and its customers.

The practices and tools associated with the discipline of Systems Engineering (SE) are emerging as the best way to obtain the benefits of Lean engineering in the automotive industry. Developed by the defence industry and in continuous, evolving use since World War II, the systems engineering process has a long-proven track record of reducing risk in contexts where reliability and performance are a matter of life and death.

What's more, studies show a clear and significant relationship between project performance – measured in terms of cost, schedule and satisfaction of technical requirements – and high levels of systems engineering capability. As the systems developed by the automotive industry grow ever smarter and more complex, many automotive manufacturers have turned to SE as a way to ensure they keep enhancing the value of their products in a more technically demanding market. Systems engineering is about drawing on the science of finding patterns in organised complexity, and the analysis of the emergent properties of a whole rather than the specific behaviour of individual components. Thinking in this way has produced a robust and scientific approach to requirements management and verification, a greater focus on the full life cycle of a product, and novel modelling techniques for complex emergent behaviour.

Almost all SE activities are the sort of thing that any engineering team will be doing as a matter of course: collecting and managing customer requirements; designing a product and modelling its behaviour; managing implementation workflows, and providing the basis for verification and validation tests. SE adds value to those processes by: introducing techniques for analysis and information-gathering that close the gap between the scientific and engineering methods; introducing a single source of truth that persists throughout the product life cycle and beyond it to new variants; and introducing ways of managing the stakeholder relationship to give you assurance right from the start that you are building the right product for the market, in the right way. In other words, SE helps you level up your engineering knowledge, not just in terms of knowing your customer and your product better, but also in terms of knowing your own history, and leveraging work you have already done in the service of, even specialised, customer needs. By targeting requirements more precisely, and making sure you don't retread old ground needlessly, SE can eliminate wasteful activity in your engineering process, and deliver higher quality products faster and more reliably.

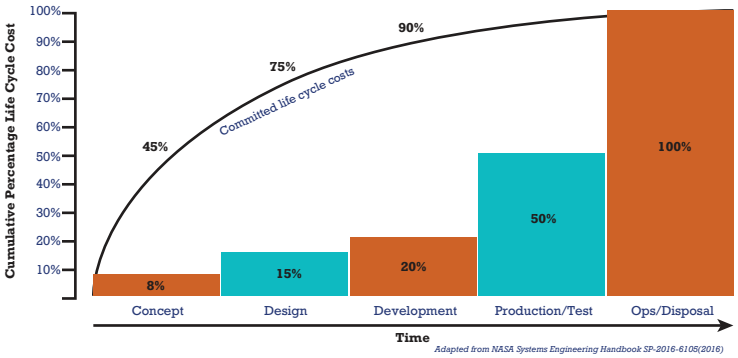
Knowing Your Customer

Having the right processes, the right skills and the right tools for systems engineering can provide benefits throughout the product life cycle, across requirements, design, workflow management and test management. But often the best place to start, and the place where many, if not most, of the primary benefits are derived, is applying SE methods to requirements.

According to the Project Management Institute's global 2020 'Pulse of the Profession' study, Project Managers (PMs) in the manufacturing industry report poor upfront planning as the primary cause of project failure[1]. In the same study, manufacturing PMs reported that 40% of project budgets are lost in a case of project failure. In all, the survey reported that 13.5% of total project and programme spending in the manufacturing industry was wasted due to poor project performance - ***more than any other industry***. In an environment driven by customer value, where products are customised to meet specialised customer needs, these risks are encountered both more frequently and more acutely, because requirements are more tightly specified and have to be revisited more frequently.

The best way to mitigate these risks is to build a strong understanding of your project requirements at an early a stage as possible. The later in the project your requirements change, the more expensive that change will be, and those costs start accumulating very quickly. As the diagram below shows, life cycle costs of an engineering project tend to get locked in early in design and development, even before expended.

[1] PMI (2020). Research Highlights by Industry and Region 2020.



Adapted from NASA Systems Engineering Handbook SP-2016-6105(2016)

This can rapidly multiply the cost of changing design direction at a late stage. Naturally, this leads to budget and timetable overruns, or even cancellation. An SE approach to requirements is designed to cleanly and specifically identify ambiguities and gaps in stakeholder needs. Getting stakeholders to articulate their needs can often be an extremely frustrating process. Half the time – even more when the stakeholders are not technical experts, as can often be the case in automotive – they don't even know what they want themselves. The best way to get a straight answer is to ask a straight question, and the SE process is very good at generating straight questions. Systems engineering treats the requirements engineering process like formulating a scientific hypothesis.

The philosopher of science Karl Popper famously said that for a statement to be considered scientific, it must be falsifiable; it has to be possible to tell the difference between a world in which the statement is true and a world in which it is false. Similarly, systems engineers work towards requirements by which it is possible to tell the difference between a system that achieves them and one that doesn't.

If an SE process for generating requirements is followed, it is immediately and specifically visible when individual requirements are not clear, verifiable, functional or minimal, as well as when they are together incomplete or inconsistent. As a result, the question that needs to be answered either by stakeholders or by engineering is specified precisely and robustly. An SE approach to requirements can reduce waste and enhance value by helping you discover something is wrong before the associated costs have been committed. By defining stakeholder needs appropriately and translating that functional understanding of the project into scientifically rigorous specifications, engineers can be sure they are delivering maximum value to their customers with much lower project risk.

Knowing Your History

Systems engineering isn't just about knowing what to do with a blank sheet of paper; its processes and tools enable you to maintain a single, unambiguous source of truth about a product. All teams involved in making and maintaining the product at every stage of its life cycle can participate in that shared project definition, both inside your organisation and when you have to collaborate with suppliers.

If SE processes are followed and SE-specific tools are utilised, that information is retained in a modular way, with requirements, designs and workflows for individual components easily separable from the project as a whole. Information is retained, and its value maximised, not just within a single project, but from one project to the next.

Requirements kept in Word or Excel documents, even if they are kept free of comments, annotations and modification, are often prone to errors, miscommunication and poor traceability. When the time comes to revisit those documents for a new project, such documents are often extremely unhelpful: it can be difficult to separate out components of interest from the system as a whole; modifications and annotations made over time can introduce ambiguities and gaps, and in the worst case information can be totally lost. We've all had the experience of trawling through a poorly-structured document history, feeling sure we have already solved the problem at hand somewhere before, and wasting time and effort that could be fruitfully spent on new work.

If your goal as an engineering function is to provide your customers with a more specialised and bespoke product, it becomes all the more important to manage information about work already done; many of the problems associated with meeting complex customer needs can be treated, not so much as questions of development, as of configuration management. Specialised designs can be readily assembled from modular definitions of individual components, and where genuine innovation is necessary it becomes readily visible, and engineers have a much more precise statement of the problem, as well as far more time to work with.

Furthermore, in an environment where compliance and certification drive a lot of engineering decisions, this modular approach to requirements management enables you to apply those constraints consistently across multiple engineering projects, without having to solve the same problems repeatedly in a slightly different context.

A systems engineering approach to configuration management starts by distinguishing a special category of 'baselines' configurations, which are known to work. Deviations from these baselines are carefully tracked and interpreted in terms of changes to the requirements for the system. Variant components are defined separately, and the design and modelling of a new configuration is built from the baselines out of these atomised subsystems, allowing you to minimise duplication of effort in reusing components.

As a result, when you need to reuse requirements, you don't have to just duplicate the entire set of requirements and then manage them separately: you can reuse those components that are not changing; use the correct version of those that do change; and be able to add or remove components as necessary.

In a specialised automotive context, being able to track the change in product requirements and configurations over time, and reutilise existing knowledge in new projects, prevents your engineers from having to go back to square one. Instead, they can start from where they ought to start, with the properties of the existing system known, understood and ready for change.

If you have found this article useful, and would like to hear more about how your organisation may use systems engineering to accelerate time to market, manage risk and improve quality, visit: www.synthesys-technologies.co.uk
or contact us on: cet@synthesys.co.uk

Meet the Team

Pete Skipper

Consultant

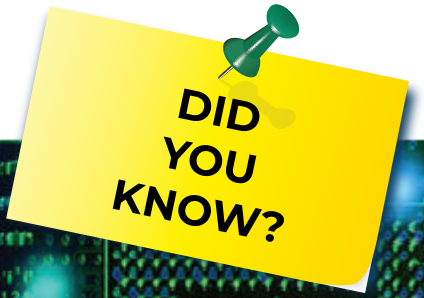
Consultant, Pete Skipper, has over thirty years' experience covering all aspects of software development from project management and system design, through development to integration and acceptance testing.

Much of this experience has been gained working on projects for the Ministry of Defence (MOD) and the Defence Evaluation and Research Agency (DERA) and more recently at the UK Meteorological Office and EUROCONTROL.

His most recent role was as the Project Manager / Lead Developer on a project for the Kenyan Meteorological Department developing a system as part of the Aircraft Meteorological Data Relay (AMDAR) program initiated by the World Meteorological Organization. AMDAR is used to collect meteorological data worldwide using commercial aircraft and required developing a website frontend and storing the data using a Microsoft SQL Server database.

Pete has developed systems using a broad range of languages and has extensive experience of working with clients, from participating within client teams, to leading and management of projects and staff.

A keen interest in various sports, both watching and participating, has also led Pete to develop timing and result generation software and television captioning systems for a wide range of sports from F1 and British Touring car racing to Golf, Football and Sheep Shearing.



SYNTHESYS OFFERS BESPOKE SOFTWARE DEVELOPMENT SERVICES

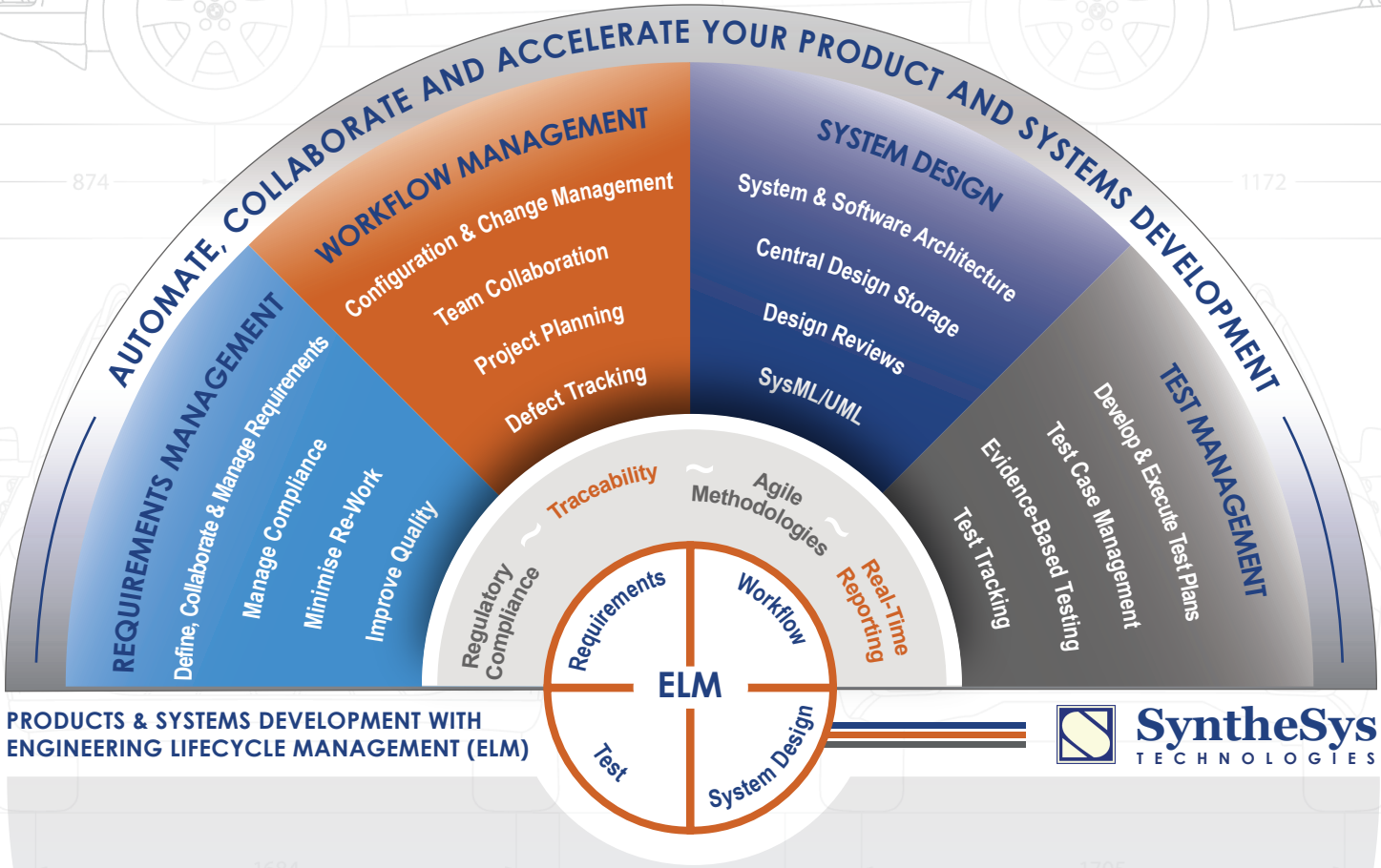
Our software development team has a wealth of combined technical experience which is complemented with a deep commercial acumen that enables us to build solutions which create efficiencies throughout the broader organisational environment.

Our flexible software and system delivery approach has proven to reduce costs, increase efficiency and further leverage staff through the automation and extension of many business, infrastructure, and data processes.

To read more about our system and software development capability, visit:

http://www.synthesys-technologies.co.uk/systems---software.html

IBM® Engineering Lifecycle Management (ELM)



Engineering Lifecycle Management extends the functionality of standard Application Lifecycle Management tools, providing an integrated, end-to-end solution that offers full transparency and traceability across all engineering data. From requirements through testing and deployment, ELM optimises collaboration and communication across all stakeholders, improving decision-making, productivity and overall product quality.

HEALTHCHECK

IBM® Engineering Lifecycle Management Health Check Service

During a thorough review and check-up, our consultants will review your technical and operational environment, the tools and applications you currently have implemented, and associated mechanisms. We will evaluate and identify any issues with performance, outstanding tickets, operational usage and technical constraints. We are experienced in reviewing the development processes and associated application configuration deployment, so as to promote continuous improvement of your implementation.

After analysis and consultation with your team, we will provide a comprehensive formal report with recommendations for proactive tool and application management, which will allow you to release maximum benefit from your IBM® software investment.

What you can expect:

- Full review of your current IBM® Engineering Lifecycle Management (ELM) implementation;
- Experienced guidance from our best-in-class application consultant (remote or on site);
- Formal report containing recommendations and solutions for success.

If you are currently utilising IBM® ELM tools and would like to discuss the potential that lies in upskilling your team, please contact us by emailing: cet@synthesys.co.uk or telephone: +44(0)1947 821464.