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FOR MORE INFORMATION VISIT: www.synthesys-technologies.co.uk/training.html OR CONTACT: cet@synthesys.co.uk +44 (0)1947 821464



Letter from the MD

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Systems Engineering....the Proven Way Forward

Dear Colleagues and Customers,

Our experience shows that managing the complexity of operations is a paramount concern to many engineering organisations whose role it is to build effective products and accelerate these to market in a timely and efficient fashion.



Dr J S Hartas Managing Director

As we enter 2020, we look forward to helping organisations operating in highly complex environments take advantage of the significant cost savings brought by employing a systems engineering approach.

OptimiSE magazine gives us the opportunity to share our customer experiences and approach with the wider engineering community and we trust that you find Issue 4 continues the trend to be as useful and as informative as previous issues.

Welcome to SyntheSys Technologies

With that sentiment in mind, I'd like to share that we have recently undergone a restructure as part of a strategic shift to consolidate and extend our systems engineering business. The restructure sees the merging of the former SyntheSys Direct and SyntheSys Systems Engineering Companies to form 'SyntheSys Technologies'.

SyntheSys Technologies is led by Mark Williamson and provides engineering services, products and training across a variety of industry sectors and now handles all licensing, transactional and technical matters connected with engineering services and software sales. To read the full statement, please visit: https://bit.ly/2Tq0bYU

So it can be seen that SyntheSys has the tools and expertise to help maximise your success in 2020, whatever field your products or services thrive in.

At this exciting time of expansion, may I thank our loyal customers, suppliers and other stakeholders for their valued interest and support to date.

Very best regards,

John S. Hartas

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SyntheSys News

Whitby Youngsters Impress Once Again in the SyntheSys Sponsored STEM Challenge

We believe that inspiring young talent to engage with Science, Technology, Engineering and Mathematics (STEM) disciplines is vital in ensuring that high-growth markets secure the right skills and competencies to drive future innovation.

These fields are the key building blocks to securing Britain's future thriving economy and place in vital global markets.

Once again, SyntheSys is thrilled to have sponsored the annual STEM Challenge, which aims to give talented youngsters from Caedmon College the opportunity to impress by putting contemporary challenges and themes in the spotlight.

The challenge tasks students with researching their chosen subject to produce an informative paper on key findings, which they then deliver as a presentation to a panel of internal and external judges. Our congratulations go out to all students who participated in the challenge, including winners as follows:

Key Stage 4: Rebecca Morgan: *Humans Need Not Apply - The Future of Automation* Alexander Harrison Gaze: Artificial Intelligence (AI) and Automation



Key Stage 4 Winners

Key Stage 3: Conner Betts, Josh Harland, Alex Young: *Marine Energy* Josh Trowsdale, Liam Hutchinson, Jake Stephenson: *Black Holes* Neve Barnard: *Dark Matter* Charlotte Crossland: *Cryptography*

Winners received Amazon vouchers which were presented to Key Stage 3 winners at a 'celebration of learning' assembly. Alexander and Rebecca visited the SyntheSys head office at St. Hilda's Business Centre to deliver their presentations to SyntheSys HQ staff.

SyntheSys' Managing Director and STEM Challenge judge, Dr John Hartas, said:

"This challenge is no mean feat, which is why I have been blown away by the standard of submissions. Students with ages from 13-15 deal with complex subjects that can be difficult for even adults to comprehend. Whilst this challenge was originally designed to inspire students, it's had the unforeseen impact of inspiring and educating myself, my team and teachers also."

Mrs Kirsty Brown, Head of Business Studies at the college added: "The challenge has proven to be a great way to inspire students to take responsibility for their learning. It ignited a passion within the students that diverted them from academic pressures, and resulted in some excellent pieces of work from all entries."

For more information contact: info@synthesys.co.uk

A G-Cloud 11 Success: Proud to be Supplying East West Railway Company

East West Rail is a new direct connection, linking communities between Oxford and Cambridge, including Bicester, Milton Keynes and Bedford by rail. The organisation responsible for accelerating delivery of the project, the East West Railway Company, values making meaningful connections and we are proud to be associated with the pioneering organisation through a recent contract.

We make no secret of the fact that Requirements Management is the foundation of any successful engineering development, so we are thrilled to be supplying East West Railway Company with leading Requirements Management application, IBM[®] Engineering Requirements Management DOORS[®] Next, to help the organisation meet passenger safety, regulatory and complex technical requirements. The transaction was serviced through the 'G-Cloud 11' framework which gives United Kingdom (UK) access to a myriad of specialist cloud providers and is a quick and easy route to market.

This latest success further reinforces our position in the rail supply-chain, and we look forward to a successful collaboration with East West Railway Company.

If you would like to hear more about how we are assisting engineering organisations working in fast-paced industries such as Rail, Automotive, Energy and Aerospace, contact us now.

Electrification in the Automotive Industry

From Government subsidies to strategic investment from major automotive players, the UK shift to Electric Vehicles (EVs) is under the spotlight now more than ever. The Society of Motor Manufacturers & Traders (SMMT) recently reported that the UK saw a whopping 76.6% increase in plug-in registrations in 2018 giving us a record 195,410 plug-in vehicles on UK roads.¹ In the same report, the SMMT report CO2 emissions as being 'the lowest on record, down 17.8%' compared with 2008. Insightful stuff. So, as we take major strides towards complete electrification on our roads, this article considers the development of EVs and discusses some of the key elements to which systems engineering methodologies and practices can accelerate EV adoption.

But First, the Case for Systems Engineering

There is overwhelming research which concludes that 'projects that properly apply systems engineering practices perform better than projects that do not'. This supports our own experiences which demonstrate that there is a significant competitive advantage to be gained by applying systems engineering processes in projects, especially if the project is highly complex and challenging. This competitive advantage is generated from the very clear and quantifiable Return on Investment (ROI), as discussed in detail here.

Requirements Management: Fundamental to Successful Collaborative Engineering

Requirements management is the subset of system engineering concerned with discovering, developing, tracing, analysing, qualifying, communicating, planning, monitoring and controlling requirements that define the system at successive levels of abstraction and is an essential element of automotive engineering development. Requirements management is widely regarded as the aspect of systems engineering that underpins most of the other processes; a properly organised approach to requirements management provides the structures around which the systems engineering process can operate. Requirements management is fundamental in reducing costly re-work and ensuring that products are 'right first time'.

Use Model-Based Systems Engineering to Manage Automotive Development Complexity

Modelling within an automotive context is massively useful as it allows developers to design and test the system before it gets built. System models allow engineers to capture complexity and take many different forms. At the most basic level, this could be an Excel spreadsheet containing system properties. As things become more complex, digital simulation tools can be used.



A Systems Engineering View

The idea of model-based systems engineering is pertinent to EV development, as engineers can consolidate models containing data from associated internal and external data without delving into the superfluous detail of each system. The model gives a focused view of the scenario at hand, whilst giving structure and behavioural system detail.

Functional Safety and Standards Compliance

Complexities in standards compliance can increase time-to-market and overall automotive development costs by increasing re-work needed to demonstrate conformance.

Taking a systems engineering approach with the relevant toolset ensures early scoping of standards (such as ASPICE, ISO26262) by giving traceability and visibility of industry standards across the entire product life cycle.

Quality Assurance Through Iterate Testing. Test Early, Test Often

When applied effectively, the systems engineering process forces engineers to take an iterative approach to testing which allows for the early detection of quality issues.

The automotive industry is renowned for the multi-layered, complex systems which require sophisticated methods of quality assurance.

By following systems engineering test methods, automotive engineers can ensure systems are tested at unit, subsystem and system level.

SyntheSys provides coaching, mentoring, and formal training courses to organisations to help them improve their processes and introduce software tools. Please contact us to find out more.

As active members of the International Council On Systems Engineering (INCOSE) community, we have a portfolio of different systems engineering solutions which ease pains and create gains for the automotive industry.

For more information, visit:

http://www.synthesys-technologies.co.uk/electric-vehicles.html

¹ 'Plug-in electric car ownership up 76% in 2018', Gareth Roberts, March 2019, Fleet News. Available at: https://www.fleetnews.co.uk/news/manufacturer-news/2019/04 /15/plug-in-electric-car-registrations-up-76-in-2018

Supply Chain Collaboration in the Cloud

Getting suppliers to understand your requirements can be a time-consuming and costly negotiation. Every business finds themselves dealing with suppliers who will find any way they can to misinterpret your instructions. According to the Deloitte Global Chief Procurement Officer Survey 2018, **two-thirds** of procurement leaders identify generating win-win situations and trust as a key approach to supplier collaborations.

The solution to this has always been to find a way to standardise requirements across the supply chain, but the technology to support this has often been extremely inadequate. Passing Word or Excel documents between organisations, even if they are kept free of comments, annotations and modification, can be prone to errors, miscommunication and poor traceability.

In systems engineering, even in complex areas like civil, aerospace, automotive and defence, the theoretical grounding to solve these problems has been in place for some time. Standards like ISO/IEC 15288:2015 specify the systems engineering life cycle with clear processes for the elicitation of stakeholder requirements, the derivation of systems and sub-system requirements, architecture definition, design, verification and validation.

There have long been very capable and sophisticated tools for managing this process internally, but at points where it becomes necessary to share data across different parts of an organisation, or especially with outside stakeholders in the supply chain, these on-premise tools are rarely much help. With the advent of collaborative solutions like IBM[®] Engineering Lifecycle Management, businesses have an opportunity to introduce a single source of truth across the supply chain. Whether deployed in the Cloud or on-premise, solutions like this provide web browser access to the full development cycle from requirements through to verification and validation.

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		368	O Use Case Template	Use Case Module	Administrator	25 Jul 2019 10:50:54
		367	 Upload Usage Data Locally 	Use Case Module	Administrator	25 Jul 2019 10:50:54
Composition Module Template		366	AMR Stakeholder Requirements Specification	Stakeholder Specification	Administrator	15 Jan 2020 14:50:31
 Case Content 		365	Hardware Requirements Specification Template	Hardware Specification	Administrator	25 Jul 2019 10:50:54
		364	Software Requirements Specification Template	Software Specification	Administrator	25 Jul 2019 10:50:54
		363	AMR Information Architecture	Requirements Specification	Administrator	25 Jul 2019 10:50:54
		362	AMR System Requirements Specification	System Specification	Administrator	25 Jul 2019 14:46:24

Automated Meter Reader (AMR) Example Project



ReqIF Package is Defined and Exported

Furthermore, by enabling compatibility with the industry standard Requirements Interchange Format (ReqIF), these tools enable systems engineering to move beyond bespoke point-to-point integrations between applications, and engage the supply chain in development even where tools and practices differ and where sever-client access to data has historically presented a problem for collaboration.



ReqIF Package is Imported into External Database



External Stakeholder Makes Changes

IBM[®] Watson IoT[™] DOORS[®] and DOORS[®] Next allow the export of requirements in a cross-platform XML format, which can then be imported into a wide variety of ReqIF capable tools across the supply chain, while remaining locked within the host database and closed to editing.



Package with Updates is Exported

Once the supplier has finished deriving and refining their level of requirements from the parent databases a ReqIF file is returned to the parent and synchronised.



.....and Imported Back into our Project

Technologies enabling collaboration across the systems engineering life cycle have come a long way in recent years, and businesses can now access a wide range of tools to increase efficiency and ensure quality across the supply chain.

It may be time for your business to explore how emerging technology can enhance your supply chain management.

Engineering Development in the Cloud

Should you be using the Cloud in your engineering development?

The Cloud has been a growing part of our working and personal lives for several years now. Many of us use the Cloud without realising it, as it sits behind social media, online shopping and government services that we all use every day. More of us use connected devices and the exponentially-growing Internet of Things than ever before.

But not all businesses are taking full advantage of what the Cloud can do for them. As a means to execute software and systems engineering projects in a global 24/7 environment, there are many reasons why cloud computing is a step forward from traditional tools.

The Cloud **lowers cost**. Cloud computing uses a pay-as-you-go licensing model, which means businesses only pay for what they use and don't have to expensively hedge their bets with ultimately unused licensing. This model also eliminates up-front costs for purchasing and installation of software and hardware, as well as for ongoing maintenance and upgrades, and moves the cost from capital purchases to operational expenditure. For small businesses, this model means you can punch above your weight by getting access to cutting edge software applications you couldn't have justified against their full-time licensing cost.

The Cloud **saves time** on the management and maintenance of IT assets, letting organisations concentrate resources on their core business. Applications can also be brought into use faster, and infrastructure can be adjusted rapidly to meet varying demand.

The Cloud is **flexible and scalable**, with the pay-as-you-go model making it very easy to increase and decrease both licensing and performance as needed.

The Cloud is easily **accessible**, and can be made available to a user anywhere in the world with internet access.

The Cloud is **more secure** than many traditional systems because cloud providers can devote specialised resources to security that many customers cannot afford.

cloudbaSE is SyntheSys' cloud-based licensing toolset for IBM® Software.

Gone are the days when software was purchased on an annual basis using unreliable usage forecast. Software licences can now be accessed 'on demand', matching actual usage with actual licences.

What is 'The Cloud'?

Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of networks, servers, storage, applications and services ('configurable computing resources') that can be rapidly provisioned and released with minimal management effort or service provider interaction. A cloud can be either private (to an organisation), public (when it is available for public use), or a combination of the two. The public cloud is usually accessed via the internet.

Cloud Clients (Customer's web browser, mobile app. etc.)



Software as a Service (SaaS)

Platform as a Service (PaaS) (Customer-provided applications. Customer does not manage or control the cloud infrastructure, but has control over the applications and configuration settings for the application-hosting environment.)

Infrastructure as a Service (IaaS) (Any customer-provided software. Customer does not manage or control the cloud infrastructure.)

Information here is based on the Unites States' National Institute of Science and Technology definitions.

Please contact us for more information, including how our cloudbaSE solution is being used in the nuclear and transportation industries.

CREATE A SINGLE SOURCE OF TRUTH FOR YOUR SUPPLY CHAIN

Ensure your Supply Chain Benefits from a Single Source of Truth to Lower the Cost of Producing and Distributing Goods and Services

Common amongst most supply chains is a huge amount of data, and the challenge for manufacturers and engineering businesses is cultivating, sharing and managing this data so that it is useful and shared throughout the supply chain. It is also crucial that suppliers are contributing to a common system of work, and can easily communicate at Tier 1, 2 and 3.

To tackle this complexity, it's crucial that engineers have a 'single source of truth' which flows throughout the supply chain. Our Collaborative Engineering Management approach focuses on how Commercial Off The Shelf (COTS) tools can optimise supply chain performance to lower the cost of producing and distributing goods and services.



www.synthesys-technologies.co.uk

Free Resource

Continuous Engineering DUMMIES

Continuous Engineering for Dummies

Courtesy of IBM[®], we are able to offer readers this foundation level publication which aims to explore what is meant by 'Continuous Engineering' and the merits of continuously improving complex product designs. The useful E-BOOK shares methods for anticipating and responding to markets and clients and suggests ways of getting the most out of your engineering resources.

To download the FREE E-BOOK

visit: http://bit.ly/30rL8iH