



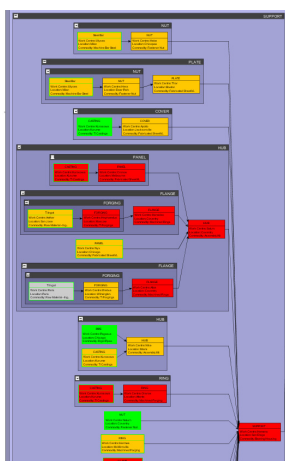
Planning for success in complex supply chains and projects in Aerospace and Defence



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What is Plexus Used For?

An introduction to understanding the key ways that Plexus can help you

Broadly, Plexus is used for Engineering and Supply Chain. In this feature we will introduce Plexus as a Supply Chain Design, Development, Risk, and Opportunity Framework, that arbitrates many disciplines, and that is made for complex aerospace & defence supply chains.

In today's business model, vertical integration has all but disappeared. First and second-tier suppliers now supervise a huge portion of subsystem integration, and, with it, a huge segment of the supply chain.

The result is: Supply Chain complexity and increasing interdependence, risk diversity and fragmented responsibility.

This is where Plexus scores. Plexus allows you to map the entire value chain to produce a joined up model.

You can view suppliers in the context of the value chains they are in, and vice versa.

Everyone who needs to, can be part of the process, since the analysis is collaborative, multi-tiered, and multi-dimensional.

Plexus complements existing ERP with decision support that has the value chain at its heart.

What this allows you to do is: design & build

supply chains that are optimised in the first place, then continuously make them more profitable and responsive.

You can achieve and maintain planned production rate increases at spec, while managing risk to minimise surprises and disruption.

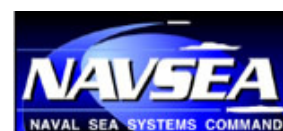
Technically, Plexus is a hub to integrate, add to, and exploit a myriad of data relevant to extended supply chain analysis, design & management.

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US Navy uses Plexus for highly complex Ship Design Process Modeling

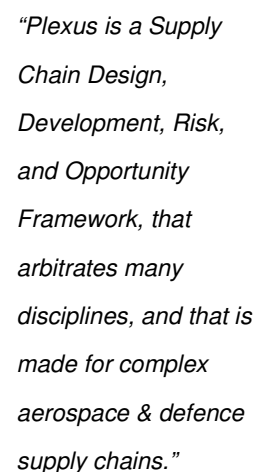
The US Navy is using Plexus as the key tool for its Ship Design Process Model for naval surface combatant ships – an extreme example of complexity management.

The US Navy Design Community has long sought for a model of the overall ship design process, but given the complexity of the process, and without a suitable methodology and tool, this has been impossible to achieve.



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Within each of these functional areas there are many different situations, or 'Use Cases' where Plexus can solve a previously intractable or difficult business issue.



US Navy uses Plexus for highly complex Ship Design Process Modeling

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Now, with Plexus, the US Navy has a unique ability for the collaborative construction of boxes-and-arrows diagrams that can then be viewed as Design Structure Matrices (DSMs) and subjected to a wide variety of analyses to produce Gantt Charts and other critical views.

Plexus is a versatile tool and powerful methodology with outstanding ability to elicit and represent complex networks of activities and dependencies with alternative or cyclic logic.

Plexus supports activity grouping in multiple hierarchies and significantly facilitates sequencing, scheduling and other trade-off

analysis for multiple objectives.

The end result is a model capable of tracing many activities and their associated products through several alternative paths of a ship design process.

For each alternative path, the process can be ranked in terms of its cost, schedule, and risk.

Clearly, this type of model can be used to improve the design process and planning for ship design projects, and it can also be used to show technology investment tradeoffs, train systems engineers, and assess existing capabilities.

".....a model capable of tracing many activities and their associated products through several alternative paths of a ship design process."

For more details : Three very detailed presentations which show examples of Plexus models and processes used in the 'Ship Design Process' project, have been put into the public domain by the U.S. Navy's Naval Sea Systems Command, Washington, D.C. Copy the following link into your browser- http://www.navsea.navy.mil/nswc/carderock/pub/who/departments/ship_design.aspx



Plexus for Product Lifecycle Management (PLM) in Aerospace

Product Lifecycle Management (PLM) software helps designers to store, share and manage information with everyone across an organisation by doing all the legwork.

Within the aerospace industry, PLM is one aspect of a trend towards digital manufacturing techniques which are helping aerospace designers make alterations to new products in seconds and see how every minute change will affect the entire supply chain.

Professor Jim Scanlan, director of Plexus Planning discussed this topic, in an article in the February 2012 edition of Aerospace Manufacturing.

AEROSPACE
MANUFACTURING

"The development of an aerospace product is essentially a race against time whilst at the same time trying to minimise risk.

At every stage of product development, decision makers continually try to ensure that resources are targeted at the highest priority areas.

At the early design stage, for example, designers use PLM tools and sophisticated optimisation workflows to undertake sensitivity analy-

ses to prioritise design effort.

Later in the product development process the sheer scale of product data makes the identification of priorities extremely difficult."

"Why is supply chain design such a challenge in the aerospace industry? There are several difficulties.

Firstly, unlike automotive and consumer goods industries, the production volumes in aerospace products are small.

Secondly aerospace primes try to build a supply chain based on risk sharing, but the gestation period for a new aerospace product is often measured in decades.

Finally, because of the very high level of performance expected from aerospace products, there's little opportunity to use standard parts as widely as other industries.

Hence the supply chain becomes deeply embedded in the design process, which requires complex interchange of information and careful negotiation of contracts, confidentiality and

"...the supply chain becomes deeply embedded in the design process, which requires complex interchange of information and careful negotiation of contracts, confidentiality and ownership of IP."



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ownership of IP.

A typical aerospace supply chain is an extremely complex multi-dimensional network of connections involving, geography, time, responsibilities and often politics.”

“Aerospace prime contractors used to undertake the majority of manufacturing in-house.

In recent decades primes have, largely for reasons of efficiency, placed the vast majority of manufacturing outside their organisation.

A discipline that has emerged in recent years has been that of supply chain ‘design’ where right at the beginning of a project, key suppliers are systematically identified and the supply chain built holistically to minimise risks and costs.

Plexus has been designed and proven to fit this role by gathering and manipulating all of the relevant knowledge for an engineering development in order to optimise the product development process and provide a complete PLM environment.”

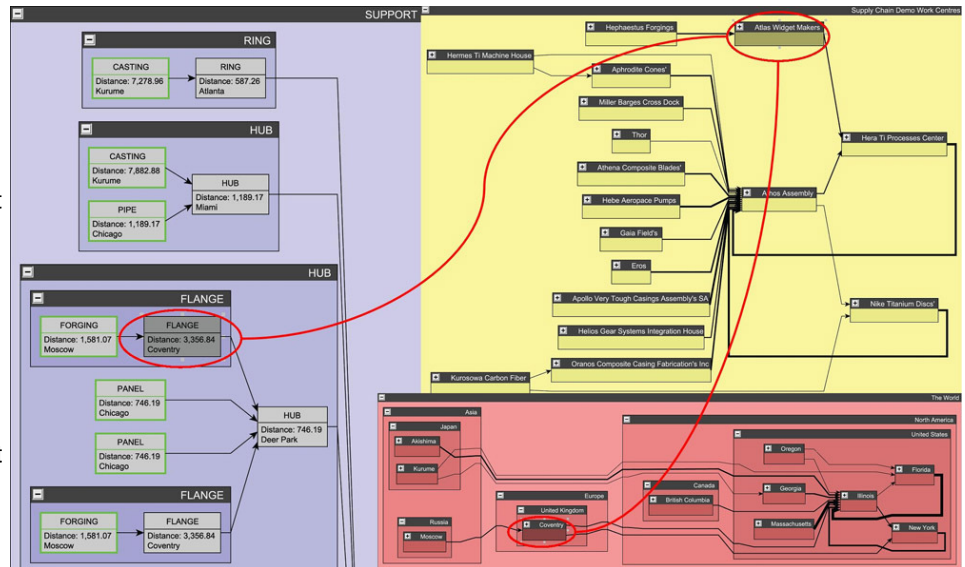
Plexus has been introduced into large aerospace organisations with great enthusiasm. This reflects the fact that it provides a unique solution to a complex high priority problem in the aerospace industry.

“Plexus is widely welcomed by everyone that uses it. Where there is a legacy PLM system then this can be retained.

Plexus will interact with this system and will build a complete database of product and project data by adding supplier, BOM, and know-how from project knowledge workers and other

sources to give a model that visualises the complete value chain.

This type of complete value chain picture is normally only achieved painfully through an unstructured mass of separate spreadsheets,



Plexus takes PLM and MRP data to auto-produce supply chain maps that can overlay design and data dependencies. The graphic shows MBOM view in blue, Supplier view in yellow and Geographical view in red.

meetings and post-it note sessions.”

“A recent trend is the increasing use of ‘direct digital manufacturing’ - also known as rapid prototyping.

Aerospace companies are now starting to exploit this technology to develop parts with sophisticated geometries that would be impossible to manufacture using conventional CNC processes.

This capability changes the dynamics of the supply chain and can dramatically reduce development lead-times.”

“.....solution to a complex high priority problem in the aerospace industry..... widely welcomed by everyone that uses it. ”

Plexus Design Models presented at US ship designers meeting

Plexus has increased its profile in the US shipbuilding industry when the Plexus solution was presented at a meeting of ship design specialists covering both defense and commercial ship design.

At the Ship Design and Materials Technology

(SDMT) Panel Meeting, in Orlando, Florida, on 15th February, organised by the National Shipbuilding Research Program, a presentation was given by the US Navy Sea Systems Command, which included details of the complex

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process models for ship design that have been produced using Plexus; and how these may be expanded and shared to increase the effectiveness of ship design.

Ian Poccachard, Chief Executive of Plexus Planning said, "The models produced by

Plexus have shown how well it can produce plans for the very complex Ship Design Process. We are confident that Plexus will provide even greater benefits as it is extended into other areas of ship design and into the downstream detailed design processes."

Focus on Dr. Robert Smith

Rob Smith is the Chief Consulting Scientist for Plexus Planning and is the focal contact point for our customers and prospective customers in North America.

Rob has a Ph.D in Engineering Science and Mechanics from the University of Alabama. He is a co-founder of Plexus Planning and is responsible for deploying the very best optimisation technology in the Plexus optimiser.

Rob also has positions as Senior Research Fellow in the Intelligent Systems group at University College London (UCL); President of RESystems Consulting Inc. and leader of the Intelligence, Computing, and Networking Group at Scientific Systems Company, Inc.

He is a former Director of The Intelligent Computer Systems Centre at The University of The West of England, and former Associate Professor of Aerospace Engineering at the University of Alabama.

He conducts research and development efforts in complex-systems-based artificial intelligence, including evolutionary algorithms, ma-

chine innovation, knowledge representation, evolving agents, and cooperative computation.

As an acknowledged expert in these areas, he has authored over 20 journal articles, 10 invited book chapters, and over 50 conference papers on these subjects.

He has conducted research projects for the U.S. Army Strategic Defense Command, The Center for Nonlinear Studies, Los Alamos National Laboratory, Oak Ridge National Laboratories, NASA, Boeing, NSF, EPSRC, The European Union, DERA, British Aerospace, Airbus, and British Telecom.

In his spare time Rob plays guitar, mandolin, and has been in many bands over the years.

His wife is a travel writer, and Rob also shares this same passion, having written and performed short fiction for Words Allowed Ltd., a Bristol, UK based performance prose group.

Find out more at <http://www.robertelliottsmith.com/>



Contact Us

Head Office

University Gate East
Park Row
Clifton
Bristol
BS1 5UB
United Kingdom
telephone: +44 (0)845 643 9640
fax: +44 (0)845 643 9641
Email: info@plexusplanning.com

North America

Email: rob.smith@plexusplanning.com
Telephone: +1 617 800 7255

Visit our website for more information
www.plexusplanning.com

Feedback

Please send any comments or suggestions to: richard.wightman@plexusplanning.com