TFD Europe

The Anatomy of Logistics Analysis

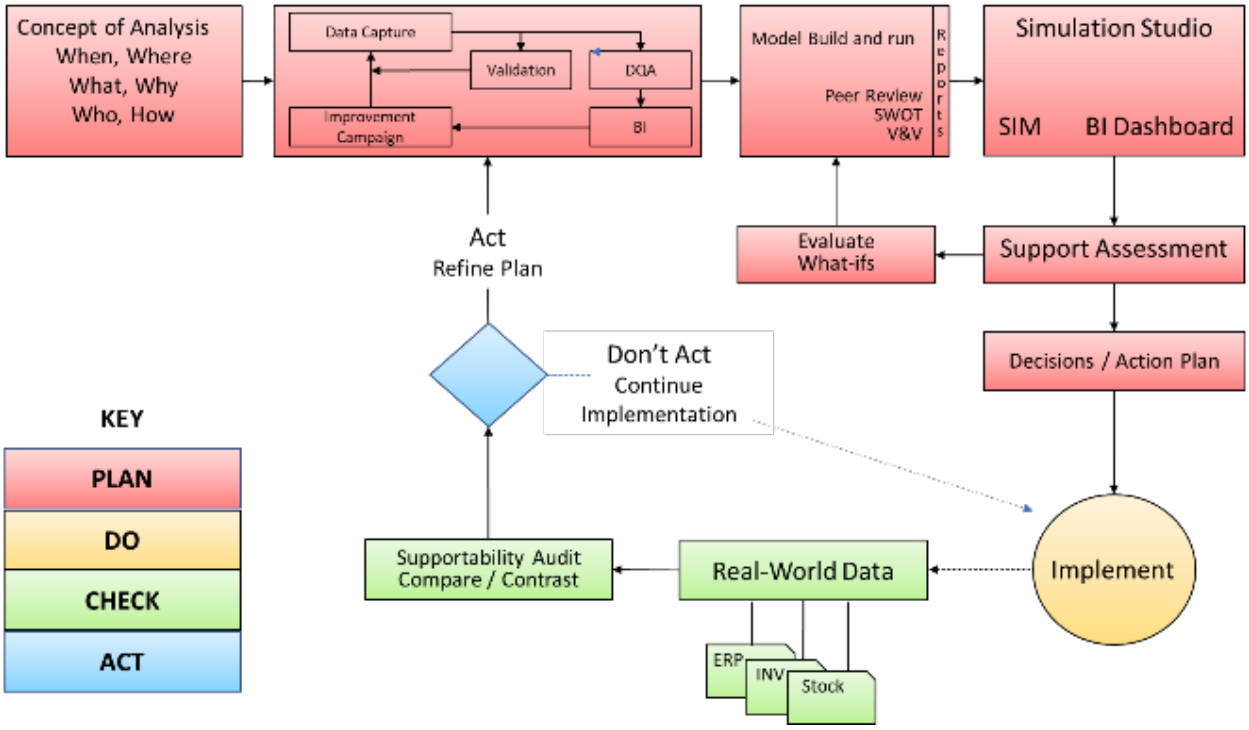
Through-life planning and control of logistic support must rest on robust analysis using trustworthy data within a processes or Anatomy of Logistic Support.

TOP LEVEL BUSINESS PROCESS

The top-level business process to plan, budget and control the provision of spare parts and repairs in any organisation comprises 4 key stages:

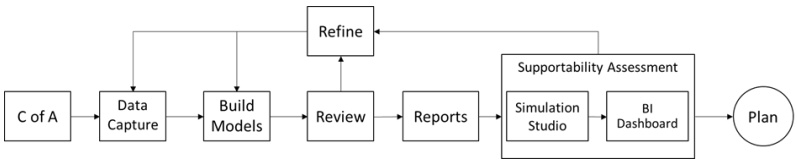
- **Plan** logistic support including making decisions about optimal budgets and their allocation across fleets based on detailed modelling.
- **Do** (Execute) the logistics plan by ordering spare parts and repairs.
- **Check** (Monitor) performance by comparing logistics plans with feedback of actual in-service data to identify any variations from the plan.
- **Act**, or decide not to act, to remedy weaknesses or make improvements dependent on cost and benefit.

The process is a classic ISO9000 Plan-Do-Check-Act cycle. The diagram below illustrates in block form, a skeleton of the necessary steps.



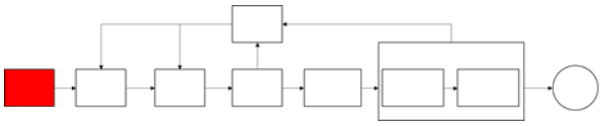
PLAN

The first stage is to **Plan** as shown in expanded form below.



Planning comprises data capture for use within analytical models that generate outputs. These must be reviewed and refined before conducting a Supportability Assessment using Simulation Studio and Business Intelligence Dashboard. These assess and test the plan to ensure that it is coherent, robust and achievable. Each stage can be decomposed into functional steps, each with its own disciplines, detailed processes and a defined outcome.

Concept of Analysis

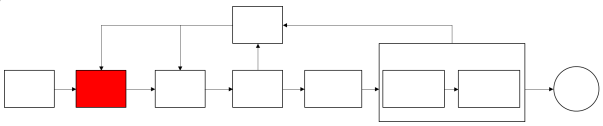


A Concept of Analysis (CofA) is the fundamental first step for all logistic modelling and analysis. It is a structured mechanism to define clearly and correctly the decision problem; data requirements, sources and assumptions; stakeholders, roles and responsibilities; analysis method and tool selection; and tasks to provide results presented in an understandable and objective format. The report provides the customer with a scheduled, resourced and costed plan of evidence-based recommendations to support decisions.

The CofA also describes why the modelling and analysis can be trusted because of data validation and quality assessment, sensitivity analysis, SWOT, peer review and Verification and Validation (V&V) processes that ensure a robust, trustworthy environment and results.

Customer agreement of the CofA is important as it gives authority for the work and method.

Data Capture and Management



Data exists in many forms and from many sources ranging from complex enterprise databases to photocopied documents. Whatever the source and format, the data must be reviewed against the data requirement within the CofA. Where necessary, assumptions must be made, agreed by stakeholders, and recorded within a Master Data and Assumptions List (MDAL). 3 key factors help to validate the data.

Authority. Is the specific data from the primary authoritative master data source? Data sources will contain information for many attributes. A parts database will probably contain the authoritative Part Number, Description and Codification data but may be only a secondary repeat source for Price, Order Quantity etc which originate in Finance or Procurement systems.

Complete. It is very likely that there will be gaps in the available data population for either specific data fields or complete items. Understanding data completeness helps the analyst to understand how they should combine data from multiple sources to construct a complete picture.

Quality. Quality, or accuracy, can be hard to judge. Ideally, all data can be drawn from recognised authoritative sources with clear provenance and an audit trail of where the data came from, when it was created and when it was last reviewed. However, such high quality is rare and, in most cases, data must be checked line-by-line, or at least sampled, to establish the appropriate level of confidence.

TFD's Data Vault (TFDdV) is a robust, common source repository for modelling data. Features include:

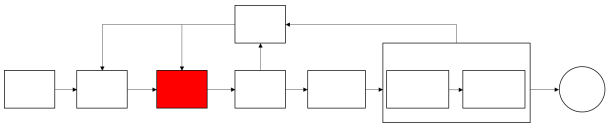
Library Structure. Every data element is accessible and reusable. Parts, systems, system structure, units, multi-level support arrangements and entire scenarios are contained within libraries for quick access and drag-and-drop use. Data is available for the full range of TFD tools which all use the same database.

MS SQL Server-based. MS SQL allows data to be stored and managed securely and robustly. In large organizations where data is security or commercially sensitive, centralised IT specialists can manage data availability, backups and access control while data management teams can control data updates.

Multi-user. The TFDdV allows multiple users to work on data simultaneously, subject to access control and authority, which enhances effective team working.

The TFDdV provides the capability to allocate a derived score, the Data Quality Attribute (DQA), for all data fields. DQAs provide a mechanism to describe the authority, completeness and quality of data. DQA attribution is an intrinsic part of data capture to understand any gaps, the achieved confidence level and to identify any additional steps required within a data improvement campaign. They are a vital and significant factor in judging confidence in the results. The quality attributes collectively or by data field, and at individual, sub-system or system level can be viewed through a BI dashboard to share and discuss DQA status, weaknesses and improvement progress with stakeholders.

Build Models

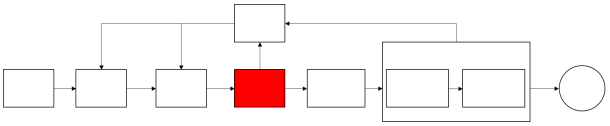


Once sufficient data is assembled, model building can commence. Perfect and complete data is not necessary as it can be updated later. It may be necessary to iterate data and modelling approach to calibrate the model results against known outcomes.

Use of the MDAL to record modelling assumptions, using what data from what source, or data assumptions as placeholders, are important steps to judge quality improvement and confidence growth during the process. The MDAL is a key document to inform peer review, Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis and Verification and Validation (V&V) which all underpin confidence in the modelling results.

At this early stage, modelling should identify the key drivers of cost and availability. These will indicate the primary contributors to focus effort on improving data quality in those areas rather than on items with little or no significant impact.

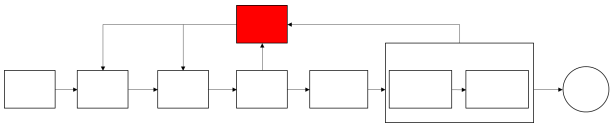
Review



Initial models and outputs are highly likely to be raw with uncertain confidence in the outcomes. It is critical to review and confirm the modelling approach and tools used, to consider the data quality, cost and performance drivers and results within a SWOT analysis. It is not possible to achieve data perfection and chasing data quality for its own sake can be extremely expensive. Modelling results are usually required to inform decisions which have critical time constraints; perfect but late results may miss the opportunity to influence and add no value.

It is often a difficult but critical judgement to decide what is 'good enough' to answer the original problem with an acceptable level of confidence and in a useful timescale. Sensitivity analysis provides a useful test since inaccurate data for some items will have a significant impact on the outcome but not for others.

Refine

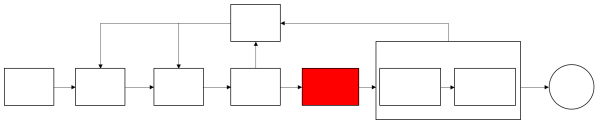


The Review process should determine where to focus Refinement effort to achieve acceptable confidence within critical constraints such as time and available data.

Review and Refine are iterative to improve and enrich the model and grow confidence in the outputs. Re-modelling may be necessary in some areas to reduce the margins of error and grow confidence with each iteration.

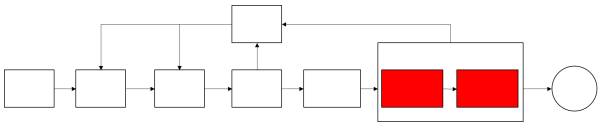
The Review, Refine, Re-model loop needs to be repeated sufficient times through peer review, SWOT and V&V until the fidelity of the data, the model and the results can be assured as Fit for Purpose within a V&V Statement. It is this document that delivers the robustness and quality that you and your team of analysts have put into the task. The modelling database should be archived using the task reference such that it can be revisited at any point in the future, together with the modelling assumptions and log to identify the process and reasons for the decisions and assumptions that were used.

Report



Once the model is assured, the required results and their format are defined within the CofA usually as a required deliverable. The results must be supported by the CofA, MDAL and a V&V Statement that the outcome can be trusted within any stated limitations.

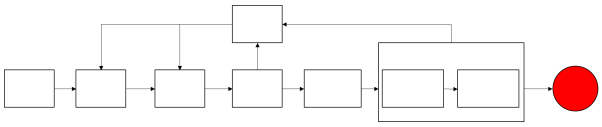
Supportability Assessment



The output data, which should include the associated input data, can also be post-processed in other applications such as simulations to generate further data with which to evaluate support performance over time in normal conditions and under stress. All the data can be presented in more flexible ways within BI tools such as MS PowerBI which can produce rich graphics based on data outputs from most data structures. BI provides visual insights with increasing granularity using filters and drill-down functions to allow the user to focus on specific data points. Multiple runs can be compared within a single BI Dashboard to illustrate, for example, Before and After views of a specific data or policy change.

Supportability Assessment is a structured analytical technique to capture, analyse, identify and evaluate remedial measures to improve the cost and performance of a support solution. The same techniques can also identify and evaluate the cost-benefits of possible improvement measures. BI Dashboards are a key enabler to support the analytical thought process.

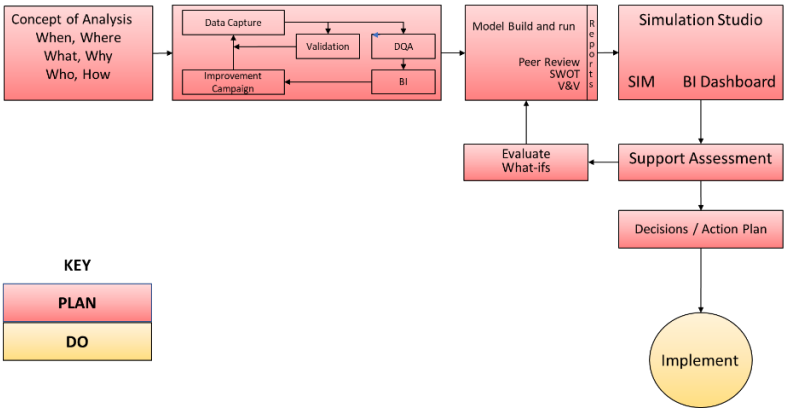
Develop Action Plan



The outputs of the analysis, including evaluation of potential remedial measures and improvement actions within Supportability Audit, provide the knowledge from which to construct an Action Plan.

DO

The Support Plan for specific operating patterns can be executed once additional implementation data is developed. The plan will comprise maintenance policies and plans, resources requirements including for people, spare parts, tools, test equipment and facilities. Development and implementation of information systems to capture real-world data from in-service sources such as ERP, inventory transaction, asset management and work order systems is key. This logistics and corresponding usage data will provide the critical feedback data with which to compare actual experience with the original plans. The DO stage is shown in orange in the Plan, Do, Check, Act schematic below.

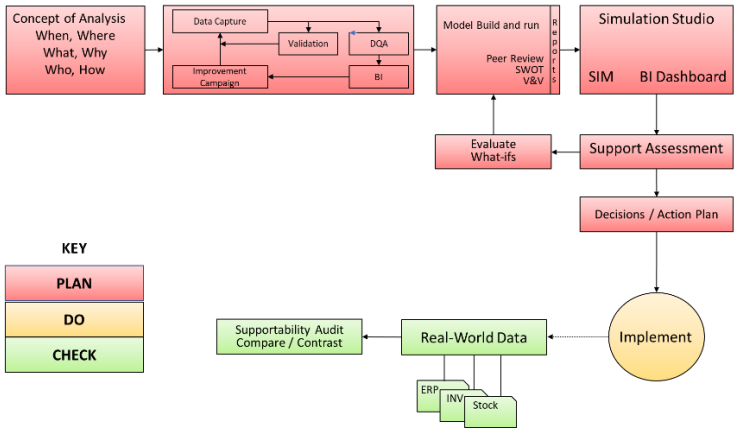


CHECK

Check is the process to assess how the Support Plan compares with actual in-service experience. Use of BI is a powerful tool to compare and contrast the real-world data feedback with the original plan and to analyse and present the data. Typical questions are whether the planned system performance is being achieved at the expected cost. What are the causes of budget deficiencies or resource shortfalls such as spares or manpower shortages, and are these global or at specific locations? Is the support system performing as expected for repair turnround and transportation times? Are there cost-effective opportunities for improvement or to reduce waste?

Supportability Audit (a close cousin of Supportability Assessment used to assess the original plan) is a structured process and technique to identify variations that are sufficiently different to warrant action because the evaluated benefit will exceed the remedial cost. Just as importantly, it will identify areas where remedial action is not warranted and it would be better to tolerate the implications of the variance

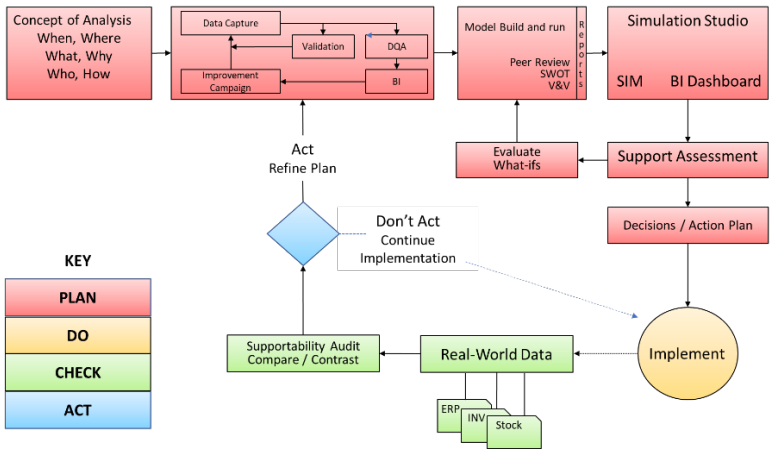
although, of course, the source data should be updated. Supportability Audit is also critical in reviewing and refining both the modelling and analysis activity. It provides the answers for the next stage – to Act, or Not Act. The CHECK stage is shown in green in the Plan, Do, Check, Act schematic below.



ACT

To Act, or Not Act, is the critical decision stage to either to remodel and replan support or to tolerate the implications. It closes the feedback loop.

The results of the Supportability Audit provide support managers with the necessary information on both benefit and cost. If the original spares recommendations have proved inadequate, perhaps because insufficient spares were purchased or the assumed demand rate was underestimated, the data within the model should be reviewed and refined to more closely match actual usage or consumption. The revised recommendations will inform the scope, cost and benefit of additional spares procurement and evaluate the improvement in support performance and confidence. Similarly, where spares stocks are excessive, remedial actions such as repair holidays to reduce R&O costs can be evaluated. This regular iterative review provides the fundamental basis for continuous improvement or Kaizen. The Act stage is shown in blue in the Plan, Do, Check, Act schematic diagram below.



This brief description or anatomy of the Plan, Do, Check, Act logistic analysis process which TFD Europe has used and refined over many years is a proven approach to deliver a high-quality analysis service. It comprises skilled and experienced analysts, armed with the right tools, training, access to data, and most importantly the processes to cement them together, into an effective capability. It is applicable to every Support Solution and will deliver significant benefit and guidance for every support decision.

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