

The Strategy to Task Technique and Example Applications

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Abstract

The Strategy to Task Technique (STT) is an approach used to develop low level, often system specific, requirements for a system or capability through a process of decomposition. The approach, which is often implemented by using the Quality Function Deployment technique as an enabler, begins by utilising high level statements of requirement, typically national strategic goals, and then mapping responses against these requirements. The responses are generated by using authoritative sources, such as doctrine publications. The STT approach has been used on a number of projects and in particular lends itself to Capability Analysis at a high level. The paper describes the STT technique, including several examples, and outlines its use for Capability Analysis. The pitfalls and guidelines for its application are also discussed

Introduction

The Strategy to Task Technique (STT) is an approach used to develop low level, often system specific, requirements for a system or capability through a process of decomposition. The technique originated with the USAF and the RAND corporation and was first shared widely in a paper published in 1989 (Ref 1).

The approach is now widely used within the US, by government and industry on many defence acquisition programmes, a notable recent high profile example being the Joint Strike Fighter. It is less widely employed (at least knowingly called STT) in the UK or Europe. Some practical implementation of STT for defence system analysis and capability analysis has been completed within the UK; certainly within major defence contractors and at Cranfield University at the Royal Military College of Science. The Cranfield experience is based on industrial applications, research examples and also through a recent MSc level project implementation and research.

The approach is often implemented by using the Quality Function Deployment (QFD) technique as an enabler and it is this technique which has been used by the authors.

Strategy to Task Outline

The figure below shows Strategy to Task in outline format. The process is a method of commencing at high level requirements usually set at the level of national military/political goals and then cascading these down through layers to lower level tasks. The process of decomposition uses authoritative sources (often military doctrinal publications) to provide a response at each level as to how the requirements will be met. The process is followed until a level is reached appropriate to a particular problem.

STRATEGY TO TASK

- Structured decomposition of tasks/missions
- Continues down to the level in question
- Audited Routes Traceable Paths
- Uses Doctrine or suitable sources
- Judgemental but auditable

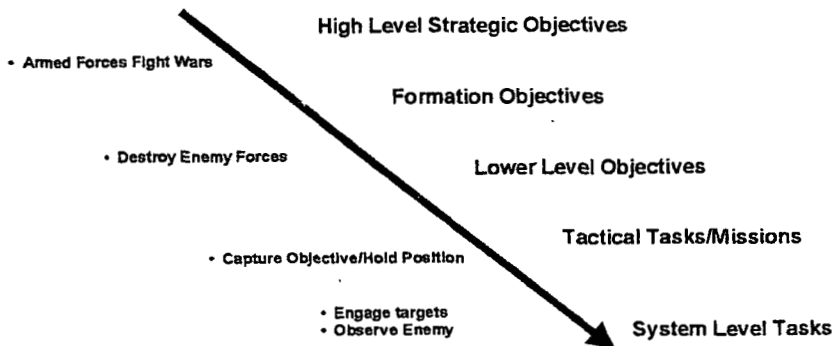


Figure 1 Strategy to Task Overview

The next figure shows a cascade used for an artillery analysis and it includes the sources used (in this case UK Military Doctrine publications).

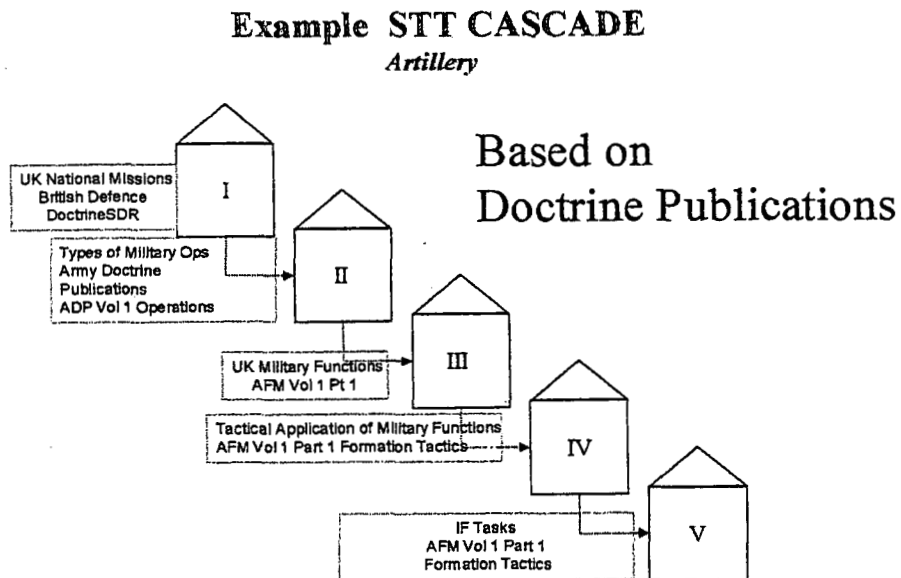


Figure 2 Example Cascade

As an illustrative example; the process has been used to evaluate the balance of emphasis required across low level attributes for a future infantry soldier. The process here started at national goal level (using the Military Missions of the UK published in high level documents including the UK Strategic Defence Review) and identified and decomposed from these requirements down through a number of stages using UK Army doctrinal publications as sources of lower level responses to each higher level requirement. This was followed to the level which was appropriate to the individual soldier ie to that level which described the low level tasks for an infantry section. At this level the actual elements of the soldier system itself could be assessed against the requirements to determine their importance weighted by the cascade of assessments stemming from the very highest level.

The sources used to establish requirements and responses (at all but the lowest level) in both this case and the Artillery example were UK Military Doctrine material. However the approach may use any authoritative source and those used to date by the authors include the

- UK Military Doctrine Publications
 - Army Doctrine Publications
 - Army Field Manuals
 - Concept Papers
- UK Maritime Doctrine Publications
- UK Joint Essential Task List
- MoD Equipment Capability
- US Military Doctrine Manuals

Quality Function Deployment Outline

The mechanisms for completing the Strategy to Task method are varied. The original published concept for Strategy to Task did not provide any specific approach but did outline the overall method architecture. The authors have utilised the QFD method in all applications of STT. It is described briefly here.

QFD is a translation of the Japanese ideograms for Quality, Function and Deployment. Although not a clear translation its title does actually sum up the elements and origins of the process quite well. The process/technique is aimed at identifying requirements that a 'customer' for a piece of equipment or other system requires to satisfy his needs and perceptions and goals and then through a process of analysis identifying the correct and most effective (and efficient) responses to deploy to satisfy these requirements. It supports planning of allocation of resources to a requirement, analyses alternatives to identify the best options, identifies any areas of conflict in responses to requirements and permits comparative evaluation of complete systems, subsystems and for example competitor systems. However, it is a relatively simple and often judgemental process.

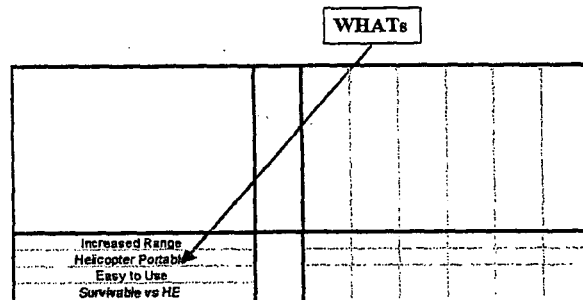
It is often used as an initial tool for analysis of options and may be used to structure projects and provide easily assimilated summaries of situation and status as a function of time.

QFD is now a widely accepted method of flowing requirements from the general to the specific. It originated in the Japanese Automotive Industry It is now widely understood, adopted and employed by Governments & Industry in the US and Europe

QFD is a structured process for articulating requirements (in QFD terms "WHAT" you wish to do) and then identifying how they will be satisfied (in QFD terms -- "HOW" you will do it.)The approach allows the quantification of the relationships between the WHATs and HOWs. QFD was originally created to capture requirements flow from general to specific and as such is well suited to the STT approach.

The process is shown in the ensuing sequence. The first step is to define the requirements, or WHATS.

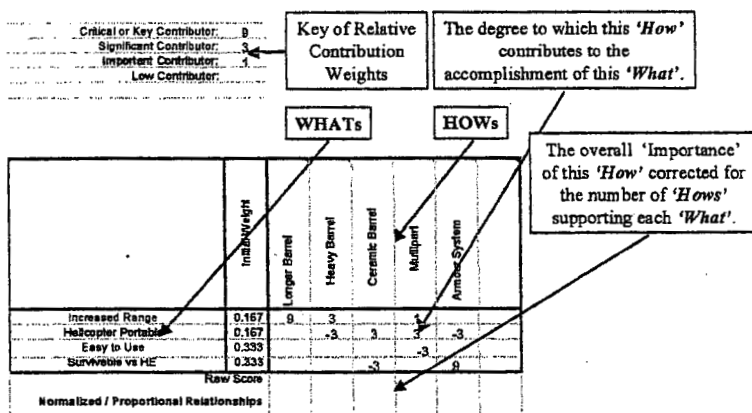
INSIDE A QFD "HOUSE"



The next is to define the responses to these requirements, or HOW you are going to propose to meet the requirements. Usually this is completed by addressing each WHAT in turn but might also simply be populated by a list of pregenerated options for consideration.

The contribution by each HOW is meeting the WHAT is then scored. Often this is done with a 3 point 1,3,9 scale where 9 indicates high contribution to meeting the requirement and 1 is some contribution. This scale is useful as a driver for filling the matrix in and a simple 1,2,3 or other might lead to over population of the matrix.

INSIDE A QFD "HOUSE"



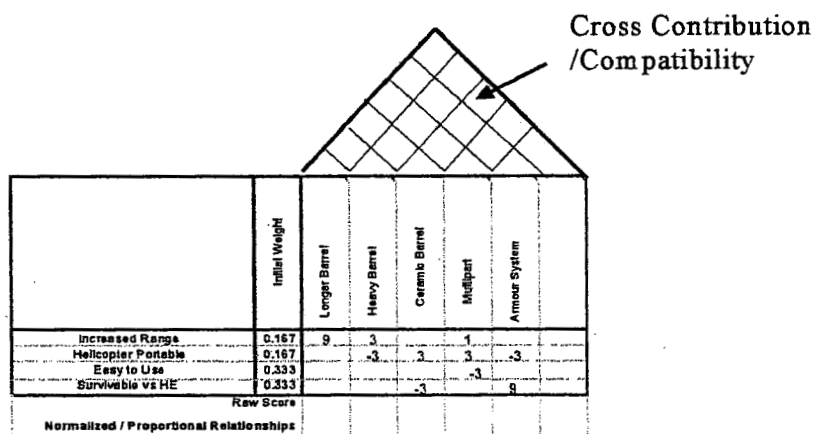
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As an aside the authors have sometimes used (and advocate the use with care of) negative as well as positive numbers in the matrix.

Simple score summing gives an indication of the importance of each of the responses. If the WHATS are weighted then these weightings may be used. The scores for the HOWS may also be normalized using simple or proportionally modified schemes.

INSIDE A QFD "HOUSE"



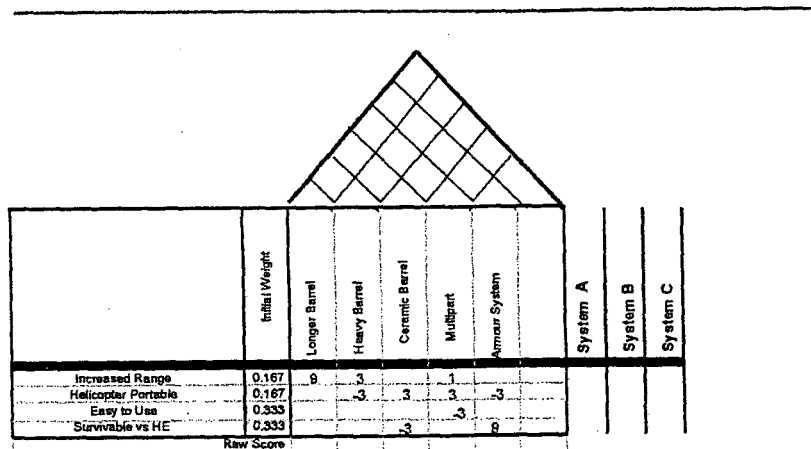
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A further element is the Cross Contribution 'roof' of the house which permits comparison of the HOWs. Any responses that are incompatible or add to risk may be easily identified and also HOWs which are mutually beneficial may be spotted.

Finally, the method permits evaluation of complete solutions or systems. For example the HOWs might be grouped/combined into system solutions and the overall effectiveness in addressing the requirements may be assessed. Thus solution options may be quickly 'designed' by grouping promising HOWs and may be compared. Also, competitor systems may be compared.

INSIDE A QFD "HOUSE"



Best System Option

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STT Applications & Discussion

The principal application in the experience of the authors has been

- to derive requirements for military systems,
- to assess equipment (system and subsystem) options, often as technology options
- and to derive a prioritized set of the most appropriate system options for meeting the requirements.

These have often indicated promising system concepts which have then been subjected to further detailed analysis and evaluation using detailed engineering and operational analysis approaches.

Outputs have also included prioritized and weighted requirements which are useful outside the STT analysis for clarification of published user requirements, derivation of functional requirements and evaluation of competitor options.

The strength of the approach in all cases has been provided by the use of published/authoritative sources. Although subjective judgement is required, it is the use of official, recognised source material and the ease of showing a full audit trail from these sources to the matrix elements and the scores which has provided the confidence for senior decision makers to utilise the tool and the outputs confidently.

In one exercise a UK/US system was analysed using STT based separately on UK and US source documents (doctrine publications). The output, in terms of requirements, assessments of importance of subsystems and the efficacy of concept solutions, was extremely consistent between the two nationally based assessments.

STT for Capability Analysis

Research has commenced at RMCS in the use of STT for derivation and analysis of Military Capability Requirements. It is widely felt that there is scope for further methods (especially in the UK) permitting analysis of capability and in particular of means of meeting future capability requirements. STT provides a method that potentially can produce and refine capability requirements, prioritise them and also permit rapid, expansive and imaginative generation and assessment of options at a broad level.

The potential weakness in the approach is the judgmental element but it is felt that this is actually particularly appropriate at a high level as a means of ensuring the required expansive and imaginative approach.

Other strengths are, again, the audit trail the method brings with it and also the transparency of the method. The latter transparency allows rapid understanding and comprehension of its workings by all stakeholders.

STT for Doctrine Analysis

Finally, since many applications of the STT method have used doctrine publications it holds potential for analysis of the publications themselves in terms of their flow from level to level, their completeness and logical construction. When employing the official publications for an STT analysis it is often very enlightening (and sometimes frustrating) as to where gaps and inconsistencies appear. Its use for ensuring consistency and completeness, particularly between publication levels hold some promise.

Summary

The STT method is a simple and rapid but extremely powerful approach which has proved to be most beneficial in early project weapon system development phases. It is widely used in US government and industrial projects. It holds promise for other areas as well including particularly Defence Capability Analysis.

References

1. Kent, Gen (ret) Glenn A, A Framework for Defense Planning, RAND August 1989
2. Vance, SN, QFD Quicksand, Proceedings 61st MORSS June 1993