The DELTA Chart: A Method for R&D Project Portrayal

(Appendix G)

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Abstract—Flow charts and network methods are vital tools used to facilitate clear concise planning and scheduling of large projects. The limited flexibility and vocabulary of existing tools do not allow the flexibility required for planning and depicting research and development (R&D) projects. DELTA charts described in this paper have been designed to incorporate not only events and activities but also decision and logic functions that enable representation of alternative approaches and feedback paths, both of which are essential in R&D project planning.

A precise syntax for the DELTA chart components is defined in order to make them capable of presenting a clear precise picture that is self-explanatory to a wide audience.

Two examples of DELTA charts are presented, the first of which is a DELTA chart that indicates the procedure for making a DELTA chart.

INTRODUCTION

IN RECENT years, there has been an increasing interest in the use of flow charts and network methods for planning and scheduling large projects and computer operations. [1]-[7] This interest is occasioned by the need to plan and manage large expensive programs whether carried out by people or by computer or by both. While some of these tools have been extremely helpful, there are instances where their use has been dysfunctional. None of the available methods seems highly suitable for certain kinds of planning efforts. Because of this, a new type of chart called a DELTA chart has been developed.

The DELTA chart is a form of flow chart. It was developed to satisfy a need for an improved method for depicting a planned flow of activities in research and development projects. Typical network methods such as PERT [1], while adequate for depicting and controlling a deterministic sequence of well-defined activities, do not conveniently allow the flexibility required for planning and depicting research and development (R&D) projects. Moreover, the limited vocabulary of PERT tends to constrain thinking when planning projects. Other network methods, e.g., GERT networks, suffer from a confusing symbology, as well as limited vocabulary.

Moreover, many of the network methods suffer from what might be called the "aging parasite" effect. As the program evolves, the network tends to become progressively more obsolete, whereupon program efforts are drained from the technical areas into areas of paperwork designed to bring the "management tool" back in alignment with what is actually happening in the shop [8]. Thus, what started out as a beneficial planning tool becomes a drag on operations. Some enthusiasts have been inclined to require that data be obtained for management use of networks that may not be obtainable at all, may be obtainable only after the program in progress is finished, or may be obsolete by the time it has been collected. One concludes that too much emphasis often has been placed on the use of network methods to control programs and too little on their use as a communication tool and stimulus to creative thinking.

Flow charts, other than those developed to depict the flow of computer programs and defined by ASA Standard [6], have not been formalized. The DELTA chart has been formalized in order to permit its use to be teachable and to assure that its elements will be clearly understood by a variety of potential users.

DELTA charts have been designed to incorporate not only events and activities but also decision and logic functions that allow the flexibility of planning for alternative approaches and for feedback paths, both of which are essential in R&D project planning. In addition, the actors responsible for all activities and decisions are clearly specified on DELTA charts.

Because PERT does not conveniently allow for alternatives, decisions, and logic, it has promoted both within government and industry a tendency to plan for only a single most likely approach to R&D projects. Promising alternatives are often not considered because PERT does not induce consideration of alternatives, but rather tends to constrain thinking to a single narrow path. Moreover, the lack of clearly defined decision points with assigned responsibility has promoted the tendency to require total package bidding that places a very large premium on clairvoyance.

The use of DELTA charts in project planning clearly illustrates the decision points and can stimulate more meaningful bidding practices. There are many reasons to plan a total program. However, the credibility of forecasts or projections falls off rapidly as one moves well into the future. Hence, a decision point on a DELTA chart, from which emanate alternative paths with significantly different anticipated costs, is a logical point to define an R&D phase milestone. Such milestones deserve to be considered carefully in bidding and funding practices.

DELTA charts were developed especially to help in planning, portraying, and controlling R&D projects. Consequently, considerable attention has been given to making them versatile and capable of presenting a clear precise project picture that is self-explanatory to a wide audience. Hopefully, the DELTA chart representation will motivate innovative and

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