
**Naval Surface Warfare Center CD Code 2230 - Design Integration Tools**

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MINICOMPUTER APPLICATIONS FOR LONG RANGE PLANNING

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SEVERAL YEARS AGO WE, THE PLANNING AND SCHEDULING DEPARTMENT
OF NATIONAL STEEL AND SHIPBUILDING COMPANY, DECIDED TO AUTOMATE A
PROCEDURE FOR ASSESSING THE SHIPYARD RESOURCES REQUIRED TO SUPPORT
POTENTIAL NEW BUSINESS. THE PROCEDURE CENTERED AROUND THE USE
OF “S CURVES” WHICH WERE USED TO SPREAD ROUGH-CUT ESTIMATED HOURS
FOR THE POTENTIAL NEW BUSINESS OVER THE BUILDING SPAN DURING THE
ANTICIPATED TIME FRAME IN WHICH FACILITIES WOULD BE AVAILABLE. DATA
WAS PRODUCED AT THE YARD LEVEL AND FOR VARIOUS CRITICAL TRADES FOR
BOTH PREVIOUSLY COMMITTED WORK AND THE ANTICIPATED NEW BUSINESS.
THE DYNAMICS OF THE MARKET PLACE, COUPLED WITH A MANUAL SYSTEM
MADE IT DIFFICULT TO SUPPORT MANAGEMENT WITH THIS ESSENTIAL INFORMATION IN AN EXPEDITIOUS MANNER.

AT THAT POINT IN TIME WE TOOK DELIVERY OF A TEKTRONIX MODEL
4051 MINI COMPUTER. IT WAS PRIMARILY SLATED FOR PERFORMING LEAST
SQUARES BEST FIT REGRESSIONS WHICH WERE TO BE USED IN MAKING ESTIMATES
AT COMPLETION. THE USE OF THIS MINI COMPUTER AS A TOOL GAINED RAPID
ACCEPTANCE WITHIN THE GROUP AND WE EAGERLY SOUGHT OTHER APPLICATIONS
FOR ITS USE. THE “WHAT-IF” GAMES, AS WE CALLED THEM, SEEM LIKE THE IDEAL CANDIDATE.

IF YOU WOULD LIKE TO TAKE ADVANTAGE OF THE LONG RANGE PLANNING
TECHNIQUE WHICH I’M ABOUT TO EXPLAIN TO YOU, YOU WILL HAVE TO TAKE
INTO ACCOUNT THE FOLLOWING CONSIDERATIONS AS SHOWN ON FIGURE 1. WHILE
WE CHOSE A TEKTRONIX MODEL FOR OUR MINI COMPUTER, THERE ARE MANY OTHER
EQUALLY WELL SUITED COMPUTERS THAT CAN GET THE JOB DONE. THE TEKTRONIX MODEL
4051 IS A GRAPHIC TERMINAL WHICH HAS 32K BYTES OF PROGRAMMABLE
CORE, A TAPE DRIVE, AND AN AUXILIARY HARDCOPY UNIT.
LONG RANGE PLANNING

CONSIDERATIONS

HARDWARE

- TEKTRONIX MODEL 4051
- GRAPHIC TERMINAL
- TAPE DRIVE
- HARDCOPY UNIT

SOFTWARE

- PROGRAMMING
- LANGUAGE
- STATISTICAL PACKAGE

DATA

- COLLECT
- NORMALIZE
- POLYNOMIAL CURVE FIT
- FAMILY OF CURVES
- CONSTRUCT MATRIX

STATUS

- PROGRESS
- ESTIMATE TO COMPLETE
- MODEL CURVE SELECTION
- KEY DATES
- BUILDING POSITION

Figure 1.
A great deal of consideration must be given to the software which must be developed. The computer by itself is a dormant tool until it is programmed. Therefore, you or your people will have to learn to write simple programs. I would suggest that you stick to the BASIC programming language since it is interpretive and very easy to use.

The source data must be available. This historical data could be in several forms such as men or hours per day or week or month. It must accurately represent how a ship was constructed over time. The next step is to normalize the collected data by reducing the dependent and independent variables to spreading 100% of the resource over 100% of the time respectively. The normalized data is then entered into the computer as a paired XY data points file where it is run against a least squares best fit polynomial curve statistical program until an equation of suitable fit is obtained. The process is repeated for different types of ships that you have built until you have constructed a family of model curves. These curves could be in either the cumulative (Ref. Figure 2) or the incremental (Ref. Figure 3) form.

Once the "model curve" library has been established we can build a matrix which will serve as the input file for the spread routine program. The essence of this matrix will be to convey to the program the following information: percent complete, estimate to complete, curve model selection, key dates, along with the available building position for each hull.
Figure 2.
Figure 3.
THE PROGRAM IS THEN EXECUTED YIELDING RESULTS DEPICTED IN FIGURES 4, 5, AND 6. Figure 4 is the schedule of ship deliveries which displays the key dates (i.e., start of construction, keel, launch and delivery) for previously committed work and the anticipated new business (i.e., one barge). Figure 5 depicts how the building ways will be utilized. Finally, the manpower requirements associated with Figure 4 are shown on Figure 6 for both firm and the potential new business, manpower displays may also be produced for critical trades, work centers, or departments.

In summary, I would like to relate to you that we at NASSCO have produced timely and cost effective information for long range planning using this technique, we feel it is essential that our shipyard, finding ourselves in a dynamic market place, be able to make rapid, yet accurate assessment on the resources required to support anticipated new business (i.e., solicited or unsolicited),
Figure 4.
A B C SHIPBUILDING
AND DRYDOCK CO.

SCHEDULE OF
WAYS UTILIZATION

Date: 09/11/79

Legend:
WAYS

REAPS PRESENTATION

Hull Way JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASOND

1	TANKR	ROR01	ROR02

2	BARGE	WIBG1

Figure 5.