New generation of project scheduling and follow up methods

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Nouvelle génération de planification et méthodes de suivi

Neue Generation von Planungs- und Fortschreibungsmethoden

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SUMMARY

The paper will present overall experiences from the practical application of a "new generation" of project scheduling and follow up methods. The experiences cover about 12 real life projects in which the principles behind Successive Time Scheduling have been applied since 1977. Most have been carried out on a professional basis with active participation of the author. The latest of the projects have further integrated the Gillis concept of group participation and consensus.

RÉSUMÉ

Ce document présente les expériences générales de l'application pratique d'une "nouvelle génération" de planification et de méthodes de suivi. Les expériences proviennent d'environ 12 projets effectivement réalisés dans lesquels les principes de planification successive dans le temps ont été appliqués, depuis 1977. La plupart ont été exécutés avec la participation de l'auteur. En outre, la notion de Gillis concernant la participation du groupe et le consensus a été intégrée dans les derniers projets.

ZUSAMMENFASSUNG

Der Artikel umfasst die Erfahrungen über die praktische Anwendung einer "neuen Generation" von Planungs- und Fortschreibungsmethoden. Die Erfahrungen decken etwa 12 praktische Projekte, in welchen die Prinzipien der sukzessiven Zeitplanung seit 1977 verwendet werden. Die meisten von diesen sind auf professioneller Basis mit der aktiven Teilnahme des Verfassers durchgeführt worden. Bei den jüngsten Projekten wurde auch der Gillis-Begriff von Gruppendynamik und -konsens integriert.

OVERRUN is a NORMAL PROBLEM for many projects. The reasons for this may be legion, but the following is probably general:

I. The TIME SCHEDULE normally seems to build on:

"optimistic conditions" - a) all parties are supposed to be motivated (in spite of possible own interests), and are expected to work perfectly, b) strikes and slow-down are not considered, c) financing problems etc. do not come up, d) resources are spared at the start waiting for a possible "unexpected luck".

"TABOOS" are not included i.e. a) the time used for negotiations with authorities and approvals from same are excluded or underestimated, b) the project manager's own efficiency level is ignored, c) investor's ability to decide (maybe change of specifications).

II. The FOLLOW UP normally builds on "the part realized" (work made, financial development etc.). As, of course, there is a minimal input on "part realized" in the beginning, the follow up work often starts too late. Consequently, evaluation of trends of "production speed" etc. starts even later.

III. The LEVEL OF DETAIL normally is too detailed having the effect that it takes too long after the start before a COMPREHENSIVE VIEW is obtained. If changes are made during the construction period, much work might be wasted and a comprehensive view at an essential stage is even more problematic to get. Some solutions to these problems are available in the use of newer "advanced" project scheduling methods.

TIME SCHEDULING / TIMING

In calculations, budgets etc. we have the term "top-down" which we apply in the Successive Principle (ref. 2). We are applying a corresponding term in the activity planning which we call SUCCESSIVE TIME SCHEDULE (ref. 3).

This new method is working on

a) realistic conditions (estimated with regard to uncertainty),

b) inclusion of TABOOS and "general conditions".

c) relative high level analysis (details not until they are found necessary),

d) "follow up" can be made immediately from the beginning as "lacking data" are replaced by triple estimates of "production speed", trends etc. until actual data (corrected for general conditions) can be placed in the prognosis (thus reducing the uncertainty).

By using the method correctly the following is obtained:

1) to get - already from the START - a comprehensive view of what is essentail (and what can wait). In addition, the time prognosis gives the project management a foresight, so far unknown.

2) a current co-ordination of activities (timing) and a simple updating of the plan without any appreciable waste of time and resources as well as a clear picture of where it pays best to adjust the plan in case of any need of changes. - When this happens, the losses will be the least possible.

As a rule you may say that ordinary TIME SCHEDULES calculate "forwards in a logical order - and see what happens" whereas the Timing Method "calculates backwards from delivery wanted - all conditions considered - and controls on this basis".

Figure 1.

PRINCIPLES OF TIMING METHOD

In the following a concentrate of the principles which are applied in SUCCESSIVE TIME SCHEDULING (Timing Method) is given:

1. TIME OF DELIVERY is chosen from aim and means and is maintained as a basis of all time- and resource calculations.
2. FIGURES (triple estimates) (ref. 4) form the basis of evaluations of all activities and conditions of general character - verbal descriptions may cause misunderstandings.

   UNCERTAINTIES and biases are recognized and an attempt is made to obtain a neutral and realistic evaluation of the future conditions expected.

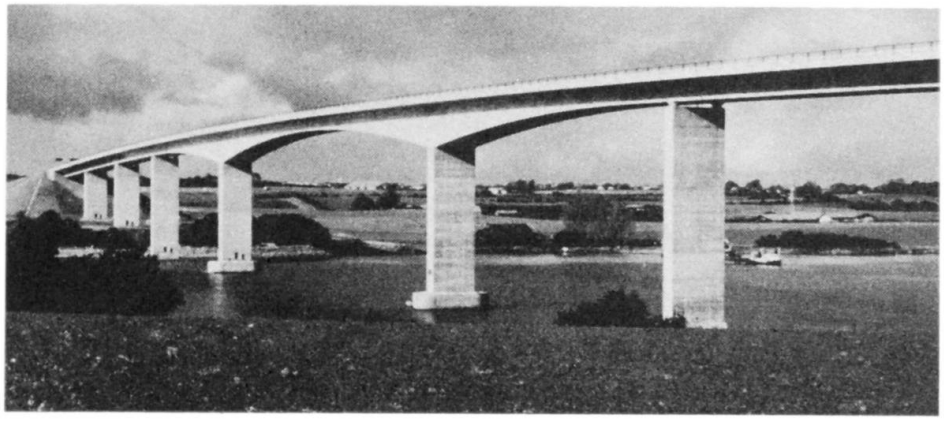
   The causes of uncertainty are placed in order of priority.
3. SIMPLIFICATION is aimed at by concentrating on the most important uncertainty moments and a detailing of the further conditions is postponed until this is found relevant. Hereby a current COMPREHENSIVE VIEW of the essential is obtained.
4. INTERESTED PARTIES of importance to the project are engaged actively from the start and are currently informed of progress so that a motivated teamwork as back-up of the project is made.
5. NO TABOOS - all external and internal conditions of general and specific character of importance to the project are estimated and placed in the plan where they belong.
6. CENTRAL EVENTS in the corresponding netplan are treated with special care; here "stochastic time supplements" are calculated and milestones laid down.

   Critical and near-critical paths are estimated for critical index (CI) which weights the variance of the single activities. Hereafter the total plan is balanced so that the necessary stability is obtained (ref. 5).
7. UPDATING / REVALUATION is made regularly - most frequently at the start - not so often when the necessary "progress" and "realistic degree" have been obtained.
8. DECISIONS for changes can in this way be made IN DUE TIME.

PRACTICAL EXAMPLES

In the following three major physical projects, of which the author has been the project manager or consultant are examined: No. 1 and No. 2 were delivered in the autumn of 1981 and No. 3 was delivered in the spring of 1982 - all in due time !

A: A Major Bridge Project (The "Alssund" Bridge")



Picture 1.-

This project dealt with a bridge of about 600 metres in the southern part of Denmark, built from April, 1978 until 23rd September, 1981 (delivery wanted was 19th October, 1981).

Successive Time Scheduling was applied here to the extent which is described in H.H. Gotfredsens Paper on the 6th INTERNET Conference 1979 (ref. 6).

The client was the Danish state, VEJDIREKTORATET (The Road Directory) which had made a contract with the Danish consulting company, COWICONSULT. This company made the time evaluation in co-operation with Glahn & Lichtenberg ApS according to the new method described above. The contractor was the Danish company C.G. Jensen A/S, a subsidiary company of the Swedish giant contracting company Skånska Cementgjuteriet AB, Malmö. The time schedule and the control of the time of delivery can be seen from the time schedule below.

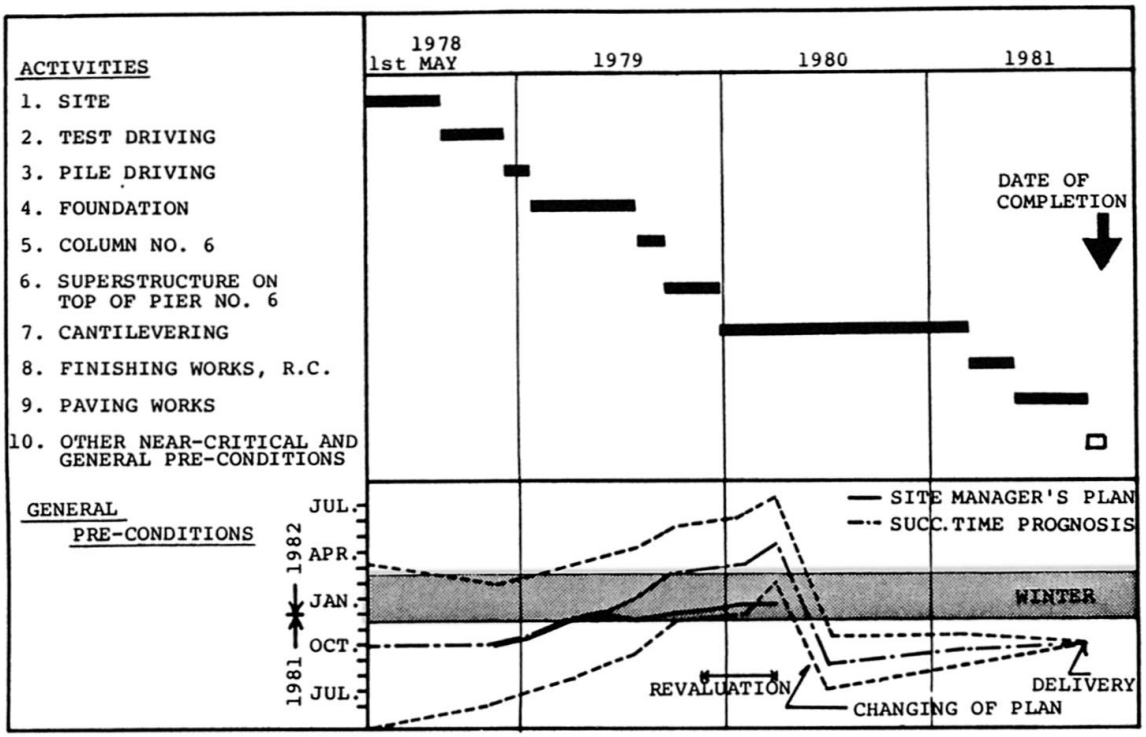


Figure 2.

PROGRESS:

The project started somewhat traditionally, but there was a delay compared to the time of schedule demanded. The reasons for this amongst others were problems in connection with transfer of technology (Swedish/Danish bridge tradition) and a rather small group of workmen with Swedish foremen and Danish foremen - in the beginning about 40 men.

By means of the new method it was proved (see the sketch above) that - when taking the general conditions into consideration - the project would after a building time of 18 months probably be 4 - 6 months delayed and the practical follow up confirmed these calculations even more clearly in spite of an increase of crew to 70 men in August, 1979.

With the new COMPREHENSIVE VIEW the serious situation was realized so early (October, 1979) that there was still time to do something to help the delay and in January, 1980 a number of supplements (new plan) were made: The working crew was increased to about 80 men and a "special agreement" was made including securing of near-critical activities etc.

The result was that the accumulated delay of 3 months as well as 1 - 3 months extra for winter, during which period the finishing works could not be made,

were made up for and the delivery took place the 23rd September, 1981 - about 3 weeks before the time wanted. The opening took place 19th October, 1981.

B: An Urgent Housing Project in a Developing Country

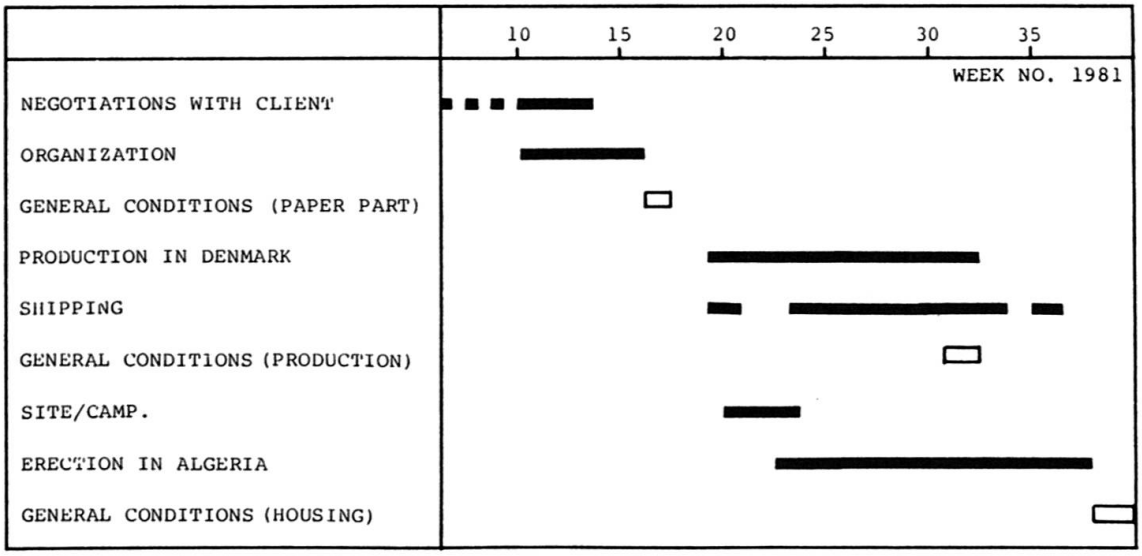


Figure 3.

The project consisted of production in Denmark, container transport by ship to Algeria, and erection of 1.000 single-family houses in an area in EL ASNAM which had been hit by earthquake; the last part of the project was to be made in four months from site allotment. The project was made for the Algerian state by the Danish contracting company A. Jespersen & Søn A/S with a number of sub-contractors, among others Prebox A/S and some minor builders in Jutland.

PROGRESS:

After long negotiations in Algeria it was in the middle of February, 1981 obvious that the order would be given and financing plans and organization work etc. were started.
During one month we worked out the time schedule together with the contractor. The result of the estimates are shown in the sketch below - please note: Time of delivery expected gets earlier from each evaluation !

Plan No.	Made out	M	(S)
1	22.2	45,4	(8,5)
2	25.2.	43	(6)
3	11.3.	41	(4,5)
4	25.3.	39,6	(4,1)

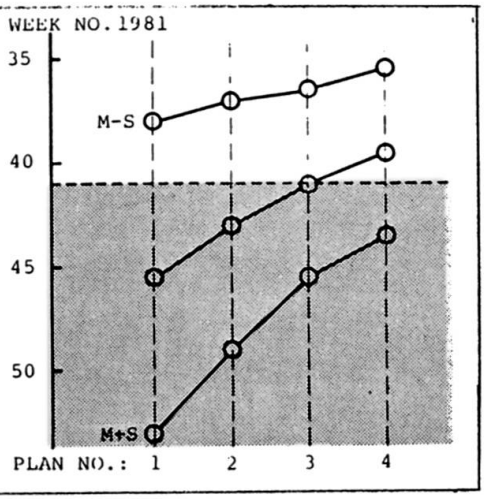


Figure 4.

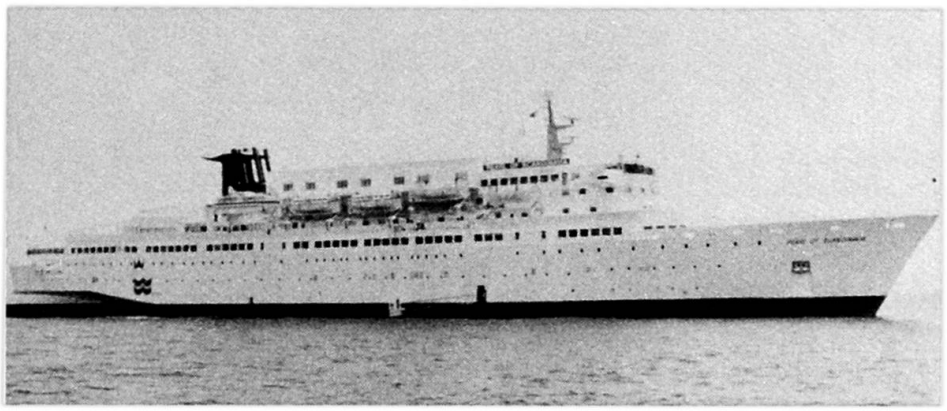
Successive reduction of the uncertainty for the time schedule by means of the new method. Delivery took place in week No. 39 in 1981 - as planned - without any revaluation in the meantime.

The project was successful both with regard to production and transport as well as with regard to the building technique. The most important problem turned out to be that - when building up the organization so quickly (and with only limited experience with such a job) - the financing part was not quite brought along too. This partly meant that the export credit was delayed for a couple of weeks just at the time when the purchases had to start; however, this was made up for by resolute activity from the management. Later on the follow up system on the financing side was delayed and consequently a comprehensive view was missing for a minor period. However, this was re-established quickly and the project ended with a satisfactory result for all parties concerned.

An essential reason for the good result and for the solution of the current and suddenly arising problems was the fighting spirit / team building (both in Denmark and in the camp) which inspired everybody and which reduced the "bureaucracy" to a minimum. Another reason for the good result - to which all the parties involved agreed - was the time schedule in which the uncertainties were focused immediately from the beginning; although the financing of the project for a short period did not follow the schedule, eventually, everything turned out to be under control.

C: An International Cruise Liner Project

This project started in 1980 with strategic studies of the profitability (ref. 7) of the cruise-liner activities in the 1980-1990'ies in the "de luxe" class. The project continued with the establishment of a joint venture between two Scandinavian shipowners, building up of a marketing organization in U.S.A., an operation organization in the Far East as well as the purchase of an existing ship. As service and software project have their own quite special "quality assurance" conditions which will be all too extensive to explain here, only the renovation project is dealt with in the following.



"PEARL OF SCANDINAVIA" was built in Finland in 1967 and re-built in the Aalborg Yard from 1st September, 1981 to 5th April, 1982.

Picture 2.

After having signed the contract, in which the time of delivery was fixed, about 22% of the contract was re-negotiated and the quantity of work was increased by about 10% - but still the time of delivery promised was kept !

An uncertainty analysis at the start showed that especially the following points should be carefully observed:

1. Sub-suppliers - 4 big Diesel generators, more than 100 WC/shower cabinets for new passenger cabins from Finland as well as Alu-sheets from England for a new penthouse-deck. Furthermore a number of auxiliary equipment, galley, hospital, laundry, passenger service etc. etc.

2. Dock programme for construction and fitting of bulb and sponsors. This was fit in between the other building programmes of the yard. Here the weather (storm, ice etc.) meant an essential uncertainty factor. "The surprise" factor when demolishing "old" parts in a rebuilding was also constantly controlled as this might prolong the time in the dock and thus destroy the plan.
3. Industrial disputes during the work also meant an uncertainty factor and therefore - before signing the final contract - a "special agreement" was made with the 3-400 men who were to do the work. Resource equalization in order not to create "bottle necks" towards the end was also considered immediately from the start.

PROGRESS:

The project followed the yard's plan satisfactorily all the way. Clarification of such a complicated and extensive specification quite naturally gives "too slow a start, but as there was enough work to start with", it did not mean any delay worth mentioning.

It was necessary for the purchasing parties to make "a tight follow up" with the producers of for instance the Diesel generators. The reason for this was that they had to be placed on board before Christmas, an important milestone in the plan to be reached - and it was made! An explosion in another place on the yard, which caused the death of 4 persons, resulted in an unexpected delay of about one week.

That the project was carried out so successfully is above all due to a very positive co-operation between the shipowners, the yard management and workmen, authorities, sub-suppliers etc. who all showed the best will to succeed even in difficult situations during the project.

Natural Gas and Other Projects

The projects mentioned here are chosen among 12 projects which since 1977 have been made on the basis of the Successive Time Schedule Method - and all the projects have been delivered in due time. A fourth project, which is also planned according to this method, is the Swedish natural gas project with SYDKRAFT AB, described in greater detail by Mr. Leif Ögård, civil-engineer, in his INTERNET 82-Paper (ref. 8).

RESULTS

The experiences from these projects are the following:

- overruns can be foreseen and practically avoided by this forecast / timing method,
- the human factors always seem to be the most critical problems (special precautions),
- a plan built up in this way appears to be a very suitable tool to motivate all parties to co-operate in the project (team building),
- traditional delaying problems are obviously less serious when they - with the new tool - are detected in due time and specially treated,
- delays can be eliminated while a lead time is being built up and deadline kept with the necessary safety margin,
- when the time schedule is kept, the budget will normally also be on track.

Figure 4.

SPECIAL EXPERIENCE

PROJECT INERTIA may be difficult to control - too slow a start - wrong speed of progress and difficulties in "braking". An example of the latter is: 1) "small improvements" by internal development projects, know-how projects etc. are made or 2) delivery of the last unit in a mass production is delayed until the next job has been received !

EDP-PROGRAMME

A special EDP-programme has been developed on the basis of the experiences gained from among others the projects mentioned above. The programme has been used on several projects, for instance the following:

- off-shore project: A condeep project of large dimensions (Norwegian Contractors A/S, Oslo).
- software projects for telephone systems: Several development projects (L.M. Ericsson AB, Stockholm).

REFERENCES:

1. R.B. GILLIS, Canadian Pacific Ltd., Montreal, Canada: Time Control of Project Work, 1979.
2. STEEN LICHTENBERG: The Successive Principle - Procedures for a Minimum Degree of Detailing, Proceedings, Project Management Institute, Sixth International Seminar, Washington D.C., 1979, p. 570, 9 p. (in English).
3. STEEN LICHTENBERG: Project Planning - Third Generation Approach (Doctoral dissertation), Polyteknisk Forlag, Copenhagen, 1974, p. 543 (in English).
4. STEEN LICHTENBERG, JENS HALD MORTENSEN, J. ROBERT TAYLOR, SØREN TENGVAD: Risk Management - Terminology, Methods and Examples.
5. STEEN LICHTENBERG and LARS B. MØLLER: Three Types of Biases in Schedule - and Solutions Applicable in Practice. 6th INTERNET Congress, 1979, vol. 2, p. 173 - 184.
6. H.H. GOTFREDSEN: Aanalysis and Planning of Major Bridges. 6th INTERNET Congress, 1979, vol. 4, p. 225 - 238.
7. JESPER E. GLAHN: A Systematic Project Evaluation through the Successive Principle, or Lichtenberg's Principle - A Practical Story. 6th INTERNET Congress, 1979, vol. 2, p. 173 - 183.
8. LEIF ÖGÅRD: Experiences from New Planning Methods, Risk Estimation and Team Building Concept in the Sydgas Project, the First National Gas Project in Sweden. INTERNET-82, Copenhagen.
9. JENS OVE RIIS, JAN LAURIDSEN, MORTEN FANGEL, FRITS RUNGE, STEEN HILDEBRANDT (eds.): Proceedings on the 7th INTERNET World Congress on Project Management, Teknisk Forlag, Copenhagen, 1982.