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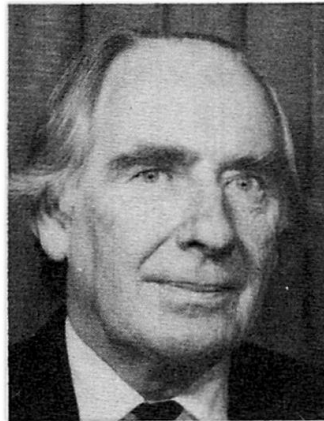
Commissioning – The Final Stage of a Project

Mise en service – la dernière étape d'un projet

Inbetriebsetzung – die letzte Projektphase

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Career started in the Home Civil Service. Subsequently was appointed to the Colonial Service (now the Overseas Civil Service) and served for fourteen years in Nigeria. During the last eight years of service in Nigeria administered a multi-million pound building programme for the Ministry of Communications. On returning to the United Kingdom took up a post in the Scottish Health Service. Since 1966 has held the post of Chief Network Analyst.

SUMMARY

This paper deals with the commissioning – or bringing into operational use – of complex major building projects. It identifies the problems inherent in making such projects functional and suggests the organisation which should be set up to implement the commissioning programme. Using as an example a major hospital it details the main work areas to be shown in the commissioning programme. It also explains the control process, where a master network together with sub-networks are used to programme and control the commissioning. Finally, the paper puts the commissioning process into a time context and closes by examining the results achieved by using the system described.

RÉSUMÉ

L'article traite de la mise en service d'ouvrages complexes et importants. Il identifie les problèmes à résoudre pour rendre de tels projets fonctionnels et propose une organisation à mettre en place pour le programme de la réception et la mise en service de l'ouvrage. Prenant l'exemple d'un hôpital important, il décrit en détail les groupes d'activités qui doivent apparaître dans ce programme. L'article explique aussi le processus de contrôle lorsqu'un programme principal est utilisé avec des programmes partiels pour la mise au service et conclut par l'examen des résultats obtenus par l'usage du système proposé.

ZUSAMMENFASSUNG

Der Artikel behandelt die Inbetriebsetzungsphase von wichtigen und vielfältigen Bauprojekten. Er identifiziert die Probleme, die zu lösen sind, um solche Bauanlagen in einen funktionierenden Betrieb überzuführen und unterbreitet Vorschläge, wie die entsprechenden Arbeiten programmiert und organisiert werden sollen. Im Artikel werden anhand eines Beispiels eines grossen Spitals die Tätigkeitsgruppen beschrieben, welche im Inbetriebsetzungsprogramm aufgeführt werden sollen. Der Artikel erklärt auch den Kontrollprozess, wenn für die Inbetriebsetzung ein übergeordnetes Programm zusammen mit Teilprogrammen verwendet wird. Er schliesst mit der Auswertung der erhaltenen Resultate bei der Anwendung des vorgeschlagenen Systems ab.



1. INTRODUCTION

It is generally accepted that the three principal stages in any major construction project are:-

- (1) Design
- (2) Construct
- (3) Commission

However, while a great deal of application and research has gone into the preparation of control and information systems for the design and construction stages of a project, the published material relating to the control of the commissioning process is indeed scarce. For example, at a recent international congress on project management 130 papers were presented. Of these some 40% related to training, finance, R & D and academic or mathematical topics. The remaining 60% dealt with either the planning or construction stages of a project. There were only two papers on the subject of commissioning.

It is true that many multi-million pound major construction projects, such as bridges or highways, require no more than a symbolic opening, such as the cutting of a ribbon, to mark their being brought into operational use, but there are even more major projects, such as large hospitals, headquarters for multi-national organisations, petro-chemical plants, large automated factories, and so forth, which require long and careful planning before they can fulfil their specified function.

As has been said above, in recent years much has been written about, and there has been a great deal of research into, the management control of the design process for major building projects and also on the control and progress monitoring of the construction of such projects. However, little, if any, attention has been paid to the commissioning process. It is pointless to exercise rigorous control over the design and construction of a project if the same level of control is not exercised over the commissioning stage. The further advanced a project is, the greater is the amount of money which has been expended on it and hence the greater the cost of any delay. Commissioning is the final stage in a project's life and as a result delays at this stage are more costly than at any other time.

For the sake of clarity and because of differing practices in nomenclature it should be emphasised that commissioning, in this paper, is used to signify the process of bringing into operational use a major building project and does not refer to the testing and running-in of mechanical and electrical services which are a necessary precursor of the administrative commissioning.

The Network Analysis Unit of the Scottish Health Service was formed in 1965 to prepare and update networks for the pre-construction planning stages of major hospital building projects. This involved, for each project, programming the work of all the design consultants (architects, engineers and surveyors) together with the work of the client's planning team. In 1968 the Unit was asked to monitor progress on contractor's construction networks. In 1970 the Unit was for the first time involved in the preparation of commissioning networks for hospitals which were approaching completion. Since then the N.A.U. has participated in the commissioning of more than a dozen multi-million pound hospitals and this paper describes the system, which has in part been planned and in part evolved, for commissioning these projects. The general principles involved should be true for most large building projects particularly where there is a high or complex services element, even though the suggested operational sections may vary in importance from project to project.

2. IDENTIFYING THE PROBLEM

In Britain the Health Service is divided into a number of autonomous divisions, each division covering a specific geographic area. For example, there are 15 Area Health Boards in Scotland and 14 Regional Health Authorities in England. Each of these 29 divisions has a Capital Works Programme and an administrative team to progress the programme. Because of the divisions there were many instances where research into aspects of commissioning was duplicated and there was no central agency which could collect, collate and disseminate information on the commissioning process. In Scotland, however, when the Health Service was reorganised in 1974 it was decided that the Network Analysis Unit, which had been part of the Western Regional Hospital Board, should join other service units such as the Ambulance Service and the Blood Transfusion Service in a "Common Services Agency" which would provide services to all fifteen Health Boards in Scotland. Thus this Unit has had the opportunity of participating in the commissioning of a large number of hospitals in all areas of Scotland. In addition the Unit has given advice, assistance and training to several Regional Health Authorities and Post Graduate Teaching Hospitals in England. The Unit is also currently assisting in the commissioning of Belfast City Hospital, Northern Ireland. This last is the biggest building in Ireland and the scheduled date for admission of patients is September 1985.

ESTIMATED OPERATIONAL COSTS FOR A TYPICAL DISTRICT GENERAL HOSPITAL		
1. <u>Hospital Running Costs</u>	Staff Nos.	Estimated Costs £
STAFFING		
Junior Medical and G.P.'s	35	280,000
Junior Dental	1	9,000
Nursing - Trained and Other	688	3,050,000
Students	230	710,000
Domestic & Ancillary	618	2,280,000
Other Hospital Professional & Technical - Para-Medical, Pharmacy, Dental	108	610,000
Hospital Administrative & Clerical	170	595,000
Tradesmen	61	375,000
Miscellaneous Groups	23	145,000
	1,934	8,054,000
<u>Supplies and Services</u>		3,980,000
<u>Net Hospital Running Costs</u>		12,034,000 =====
2. <u>Specialist Services</u> (additional)		
Medical	36	395,000
Dental	2	28,000
	38	423,000
3. <u>Hospital Ancillary Services</u>		
STAFFING		
Laboratory Services (additional)	28	200,000
Occupational Health	1	3,000
	29	203,000
<u>Supplies and Services</u> (Lab. Services)		120,000
<u>Total Hospital Ancillary Services</u>		323,000
4. <u>Total Staffing</u>	2,001	
5. <u>Total Estimated Cost</u>		12,780,000

Table A



ESTIMATED HOSPITAL RUNNING COSTS		HOSPITAL DEPARMTENTS	
<u>Supplies and Services</u>		The departments and sections in a modern acute hospital will include:-	
1. Drugs	£ 386,000	(1) Wards	
2. Dressings	185,000	(2) Short Stay Wards	
3. X-Ray	92,000	(3) Outpatients Department incl. examination rooms, operating theatres and X-ray medical photography	
4. Instruments & Sundries	401,000	(4) Main operating theatres (6-8 suites)	
5. Appliances	55,000	(5) Intensive Therapy Department	
6. Catering	280,000	(6) X-ray Department	
7. Laundry	130,000	(7) Laboratories	
8. Uniforms	40,000	(8) Pharmacy	
9. Bedding & Linen	85,000	(9) Medical Records Department	
10. Cleaning & Domestic	25,000	(10) Chapel	
11. Steam Production	15,000	(11) Shops	
12. Low Pressure Hot Water Heating	510,000	(12) Kitchen	
13. Power & Light	130,000	(13) Staff Dining	
14. Miscellaneous & Ancillary	80,000	(14) Staff Changing	
15. Engineering	65,000	(15) Physical Medicine (Physiotherapy, Occupational Therapy, Speech Therapy)	
16. Grounds & Buildings	90,000	(16) Administration Department	
17. Telephones	80,000	(17) Central Stores	
18. Postage	15,000	(18) Workshops	
19. Printing & Stationery	120,000	(19) Garages	
20. Medical & X-Ray Equipment	80,000	(20) Boiler House	
21. Furniture	25,000	(21) Accident and Emergency	
22. Miscellaneous Equipment	25,000	(22) College of Nursing	
23. Transport	80,000	(23) Psychiatric Day Unit	
24. Rates	986,000	and may also contain some specialties such as:-	
	£ 3,980,000	Neuro-surgery	
	=====	Obstetrics	
		Radiotherapy	

TABLE B

TABLE C

A large modern hospital having a planned capacity of 700 to 800 beds, will have a floor area of half-a-million to a million square feet; directly employ some two to three thousand people (in addition to the many people indirectly involved, supplying goods and services to the hospital); may cost between £20M and £60M to build and between £21M and £25M per annum to run. The cost of staffing the hospital accounts for almost 75% of the total running costs. The initial cost of equipping such a hospital would be of the order of £4M to £6M. Some idea of the complexity of these buildings may be given by the fact that the installation of services costs up to 50% of total construction costs.

Table A gives a breakdown of staffing numbers and costs for a hospital of this size. It should be noted that consultants and senior medical staff are not included in this Table. Table B shows the cost of supplies and services. (Both these Tables were prepared in 1981, so inflation must be taken into account to arrive at comparable costs in 1984). Table C shows the main sections and departments in a modern acute hospital.

The planning and designing of a new hospital will take four to six years and the construction a further four to six years. The time elapsing from the point at which the decision to proceed is taken until the completion of construction can thus be between eight and twelve years. At what point along this span of years should the commissioning process be started - or can it be left until construction is completed? Practice, in this respect, varied. In the early 1970's the N.A.U. was advocating that commissioning should be put in hand a year to

fifteen months before the contract completion date. At the same time some Health Authorities were only starting commissioning six months or so before the scheduled completion date. The end result was interesting - the late starters took some twelve to fifteen months from the handover date to reach the stage where patients were being admitted whilst the hospitals where the Network Analysis Unit was involved in the commissioning were admitting patients some six or eight months after completion.

When the Network Analysis Unit was first asked to give assistance by preparing a commissioning programme for a major hospital project the requirements of the client (i.e. the Area Health Board) were identified as being:-

- (1) to establish what type and size of organisational body had to be set up to undertake the commissioning process
- (2) to determine the programme of work the commissioning organisation would have to undertake
- (3) to decide at what point the commissioning process would have to be started to ensure the earliest possible admission of patients after hand-over of the building by the contractor.

Or to put it more simply - what had to be done when and by whom to ensure minimum delay from handover to becoming operational.

3. ORGANISING THE COMMISSIONING PROCESS

For a period of some twenty years from 1939 there was almost a complete moratorium on the building of hospitals in the U.K. This was caused in the first instance by World War II and its aftermath, then by the formation of the National Health Service in 1947/48. The task of welding together the local authority hospitals (i.e. those run by city and county councils) with the hundreds of hospitals which had been founded and supported by voluntary contributions, into a unified service, created problems of a magnitude and complexity beyond the experience of any existing hospital administrator. These problems were tackled and overcome, but little or no time was left for hospital planning. However, by the late 1950's a series of surveys revealed the inadequacy of the existing hospitals and resulted in the adoption of a massive hospital building programme, which would continue for the next 30 years.

Understandably, when the first of these hospitals was being completed, Health Authorities had had no experience in commissioning such large projects. The tendency was to regard it as an exercise something a little bigger than opening a new ward or a new operating theatre. Predictably, commissioning was started too late and took too long.

Because of their failure to comprehend the vast amount of work which had to be undertaken in commissioning a major project, Health Authorities had in the beginning tended to allocate a number of officers to work on a part-time basis on commissioning. This was another cause of delay. When the Network Analysis Unit examined the methods which had been employed to commission two or three recently completed hospitals it became clear that there was a strong case for appointing a small full-time team to undertake the day-to-day work of commissioning and that they be allowed to get on with the job with as little outside interference as possible. At the same time a system had to be evolved which would keep the Area Health Board informed of the rate of progress and at the same time assure them that their policies on health care were being adhered to in the commissioning process.



3.1 The Commissioning Unit

After some trial and error in the early commissioning exercises it is now generally agreed that a small group led by a senior administrator, who is termed the Commissioning Officer, be appointed as a full-time commissioning unit. The other members of the Unit will be a senior nursing officer and a supplies officer, together with the necessary clerical and secretarial support. Part-time members of this Unit will initially consist of a doctor, physicist and an engineer. As the commissioning programme proceeds it is probable that all three will eventually become full-time members of the unit as a result of their expanding workload. The main function of this unit is to carry out the commissioning programme and to solicit and direct the assistance of the many people who will be involved in varying facets of the commissioning process.

It is desirable that the Commissioning Unit be found office accommodation quite separate from other Health Board sections and that they be located there from as early a date as is possible. If this is not done then almost inevitably they become involved in matters not relating to commissioning.

3.2 The Commissioning Team

To meet the requirement of keeping the Area Health Board informed of progress a Commissioning Team was formed and this team met once a month to review progress and resolve problems (where possible). The Team consisted of the Commissioning Unit together with the Capital Services Administrator from the Area H.Q. and senior medical, nursing, administrative and financial officers. The meetings of the Commissioning Team satisfied the Health Board that their health care policies were being properly implemented, aided the earliest identification of problems and by so doing tended to expedite the solution of such problems.

4. THE COMMISSIONING PROGRAMME

Although the commissioning of a major hospital is in many ways a unique event in view of the multiplicity of professions and services contained within its walls, it could perhaps be likened to the bringing into being of a small township of several thousand people. That being so it will be appreciated that a short paper such as this can only deal with major issues and can devote little space to discuss detail. Do not be deceived because the simplification of these issues tends to make appear much less daunting what is really a mammoth task. The four major work areas in commissioning are:-

- (1) Equipping
- (2) Staffing
- (3) Preparation of Operational Policies
- (4) Preparation of Planned Preventive Maintenance Programme and each is briefly described below.

4.1 Equipping

To establish:-

- (a) that the hospital contains all the equipment required for its functions
- (b) that the accommodation will be adequate to contain the equipment required
- (c) at an early stage an estimate of the costs of equipping the hospital

A draft equipment schedule is prepared early in the planning process.

Some three or four years after its original compilation (i.e. after construction has started) this schedule is revised then broken down into buying groups. (In its original form an equipment list was prepared for every ward, office, department and section in the hospital). To prepare buying orders all the beds had to be brought into one list, all the chairs into another, all the drug cabinets into a third and so forth. On the basis of the consolidated lists detailed specifications were prepared, whilst market research was undertaken and eventually tenders would be sought or estimates obtained and finally buying orders placed. The number of items runs into tens of thousands - one hospital may require 800 beds with full hydraulic movement, 800 over-bed tables, 800 bedside cabinets, 6,000 chairs and 1,000 desks and this would only represent a proportion of total furnishings.

During the preparation of the draft equipment schedule, and in subsequent updating, and during the preparation of specifications, there is continued consultation with the ultimate users of the equipment to ensure that, within the finances available, their requirements are met.

4.2 Staffing

As has been shown the full-time permanent staff of a modern hospital is in excess of 2,000 persons. The two main functions of the commissioning unit in relation to staffing are to determine the total staff requirements and have the resultant figures costed so that an accurate assessment of revenue consequences can be obtained, and to draw up a staff appointments timetable.

Various formulas exist to aid the determination of staffing levels for medical, para-medical and nursing staff and the assistance of Work Study/O & M staff can be obtained to help calculate requirements for administrative, domestic and catering personnel. The operational policies, which define the manner in which the hospital functions, will have to be written before the staffing for certain grades, e.g. portering staff, can be determined. The aid of departmental heads will, of course, be sought in establishing the staff required for all units and departments. Once the staffing levels have been agreed the final tables are passed to the finance division for costing.

It is quite inconceivable that 2,000 people should all start work for the first time on the same day in a new hospital and in fact the staff recruitment programme will commence before the hand-over of the building and will continue for six months or more after the hospital is in operational use. The function of the commissioning unit here is to prepare, in consultation with departmental heads, an advance staffing timetable, so that those staff who are required to be in post before the admission of patients, can be recruited. The time taken to make an appointment can vary from one week for a domestic assistant to six months for a senior consultant or administrator and is influenced by the period of notice which may be required by their present employer, and the need to obtain the references which are required for most posts.

4.3 Preparation of Operational Policies

It is a requirement in modern hospitals that the manner in which the hospital functions be codified in a series of written operational policies. These policies cover every aspect of all works and duties within the hospital. There will be an operational policy which will deal in detail with the procedure to be followed when a new patient is admitted, and another policy will deal with the discharge of patients. There will be a policy delineating ward procedures and



another describing the functions of the portering service. In all some seventy operational policies will be prepared covering every section, department and service in the hospital.

The commissioning unit will instigate the preparation of operational policies by requesting the person in administrative charge of each service or section to produce the policy for that section or service. To aid uniformity of treatment they will be asked to prepare the operational policy under five main headings:-

- (1) Function
- (2) Location
- (3) Accommodation
- (4) Administrative charge
- (5) Operational system

Completed operational policies are returned to the commissioning unit who edit them and perhaps re-write sections as required, to ensure that there is continuity of approach and action in all policies. Great care is taken, however, to ensure that the editing process does not in any way alter the practice or intention prescribed by the original author. Finally, the commissioning unit cross-references each policy to other relevant policies as required. The final publication, which will contain some three to four hundred pages, will be printed and then issued in loose-leaf binders (to facilitate amending or updating policies when required). Copies will be issued to every ward and department in the hospital when it becomes operational.

4.4 Preparation of the Planned Preventative Maintenance Programme

Some indication of the complexity of the mechanical and electrical installations in a modern hospital may be gleaned from the fact that 45% to 50% of the total construction costs relate to the provision of services. In addition to large areas where humidity must be controlled and ambient temperatures must be maintained to within a few degrees, many parts will have ducted ventilation with a strict requirement as to the number of air changes per hour. Hundreds of piped oxygen and suction outlets are required throughout the hospital. All major electrical and electro-medical equipment, as well as theatre lighting and emergency lighting, are connected to an auto-start standby generator so that in the event of a power failure there is no interruption of essential services.

By the same token - the maintenance of services - it is desirable that there be no breakdown during normal use. With this end in view it is standard practice to have a planned preventative maintenance programme drawn up for the whole hospital. This ensures that all equipment is serviced regularly and that all consumable items (e.g. light bulbs and tubes, filters and etc.) are replaced before the end of their scheduled working life.

The works staff for a hospital will number between sixty and eighty persons and will include, as well as senior engineering and building officers, electricians, fitters, planner estimators, painters, plumbers, plasterers, slaters, tilers and joiners. The preparation of the P.P.M. programme, which schedules the routine work for all these trades, is the responsibility of the senior hospital engineer and building officer and it must be available for use as soon as the building has been handed over.

5. THE CONTROL PROCESS

This paper has so far identified the tasks to be carried out in commissioning a new hospital, the people who should carry out these tasks and the manner in which they should carry them out. This section now deals with time, with the control processes, with linking commissioning to construction.

5.1 The Master Network

It is a Health Service contractual requirement that for all building projects costing over £1M the contractor must show his building programme in the form of a critical path network, which must be updated monthly during the contract period. This seemed to be the ideal medium to which the commissioning programme could be tied and the Network Analysis Unit now reproduces the relevant section of the contractor's construction network along the top of the master commissioning network and establishes links from one network to the other. Thus if the contractor's progress is not according to schedule the commissioning programme can be advanced or retarded as required.

The master commissioning network is the major control programme for the commissioning process and it is the programme to which the commissioning unit work. The network is prepared and updated by the Network Analysis Unit in consultation with the commissioning unit. This network and its associated sub-networks can either be put on the computer or manually updated, according to the client's wishes (and the amount of detail which has to be identified).

5.2 The Sub-Network

The Master Commissioning Network is primarily prepared for the Commissioning Unit and it is no problem to give the small number of people involved a course in reading and interpreting the network diagram and the associated computer print-out (if used). However, the number of people involved in various aspects of commissioning will be over a hundred and will include both surgical and medical consultants, senior nursing staff, administrators, heads of departments and so forth. It is not really necessary to give them a networking course, even if it were feasible to bring them together at an appropriate time and in appropriate numbers (e.g. 10 to 12 courses for groups of 8 to 10). It is necessary, however, to identify clearly to them the task(s) they must undertake, when they must be undertaken and the relationship of these tasks to others in the same work area. For this reason it was decided to use phased bar charts which would delineate clearly the work to be done, the time span during which it could be performed, and show both preceding and succeeding activities. By properly numbering bar chart activities the charts could be fed into the computer as subnetworks, or even as sections of the master network. (see Figs. 1 and 2)

The bar charts are prepared and updated by the Network Analysis Unit. Charts are prepared for the four sections detailed in the commissioning programme, above, i.e. Equipping, Staffing, Operational Policies, and the P.P.M. Programme.

The staffing bar charts are prepared by grades, that is there is one chart for nursing staff, one for para-medical staff, one for administrative and clerical staff and so on. In all ten charts may be required to include all the grades involved. A further two charts will be needed for the advance staffing timetable, which will list all grades of staff to be appointed early and show the calendar dates for all the appointment stages.

In the case of equipping, bar charts are required to schedule the meetings and consultations which are required to complete each Buying Group (of which there are between thirty and forty). The chart also shows the process to be followed when supplies are being obtained by the Area Health Board and the slightly different procedure when the Central Supplies Division of the Health Service is undertaking procurement. (This Division will obtain about 70% to 80% of all furniture, fittings, equipment and supplies.) Three charts will cover all the Buying Groups.

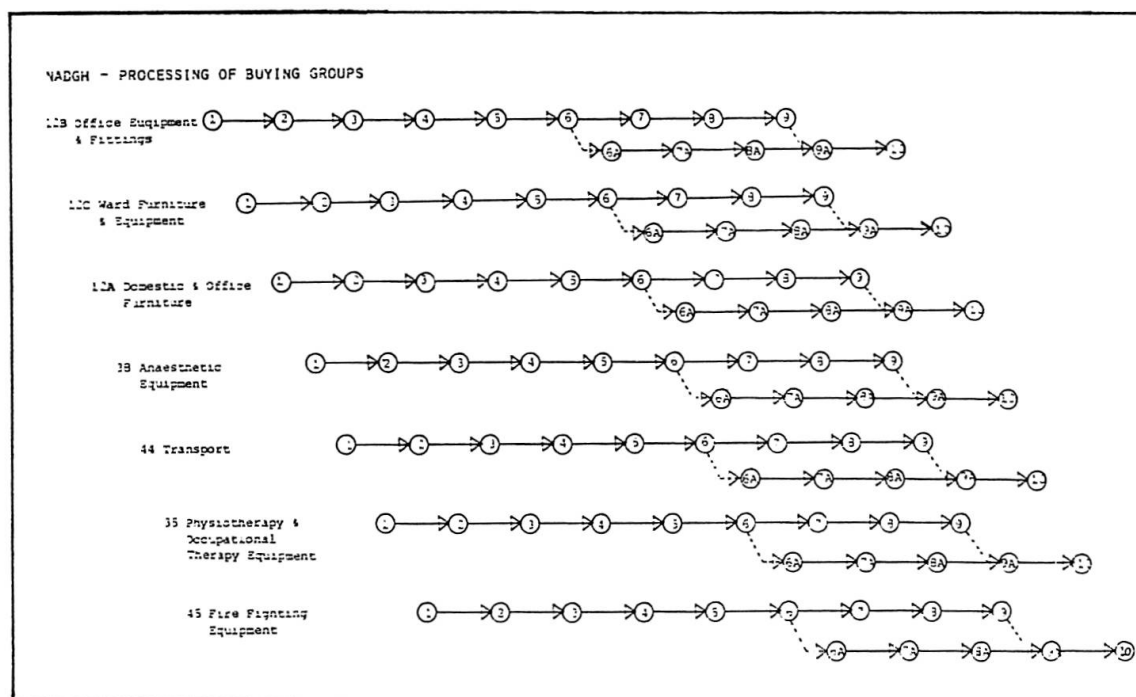


Fig. 1 Typical Bar Chart for the Equipping Process

NODE	ACTIVITY	DURATION
① — ②	issue buying groups to commissioning unit - <u>C.S.A.-S.D.</u>	1 week
② — ③	check buying groups with users - <u>comm.unit</u>	2 weeks
③ — ④	make amendments, deletions, additions, to buying groups - prepare qualifications, comm.unit forward B.G. to area - <u>comm.unit</u>	1 week
④ — ⑤	check buying group and forward to C.S.A. - <u>area H.B.</u>	1 week
⑤ — ⑥	discussion of completed buying group (queries & comments) identify direct buy items - <u>C.S.A.-S.D.</u>	3 weeks
⑥ — ⑦	obtain tenders as required - <u>C.S.A.-S.D.</u>	4 weeks
⑥A — ⑦A	determine purchase dates for direct buy items - <u>comm.unit</u>	2 weeks
⑦ — ⑧	contract meetings to discuss received tenders - <u>C.S.A.-S.D.</u>	2 weeks
⑦A — ⑧A	obtain tenders as required - <u>comm.unit</u>	4 weeks
⑧ — ⑨	prepare purchase orders & arrange delivery as required - <u>C.S.A.-S.D.</u>	3 weeks
⑧A — ⑨A	discuss received tenders - <u>comm.unit</u>	1 week
⑨A — ⑩	issue purchase orders - <u>comm.unit</u>	2 weeks

Fig. 2 Legend for Equipping Bar Chart

The preparation of operational policies also involves meetings and consultations to secure agreement by all concerned personnel to the policies proposed. These stages can be identified and can, therefore, be charted.

Four charts were needed for this section. One chart detailed the progress of "Departmental Policies" e.g. Standard Ward Units, Department of Radiodiagnosis, Department of Physical Medicine, etc. The second chart dealt with "Service Policies" such as Catering Services, Porter Services, Security of Buildings etc. Two charts were required to deal with "Other Policies" which included Control of Infection, Reception and Discharge of Patients, Major Accident Procedure, Staff Identification Badges and Custody of Patients Property and many other subjects.

The charts required for the Planned Preventative Maintenance Programme will depend upon the system adopted by the Senior Engineer. These charts will be prepared in consultation with this officer and in accordance with his requirements. Usually two or three charts will accommodate all the information required.

6. EXPERIENCE IN USE

The N.A.U. have now been operating the system described for a number of years and have used it as a commissioning aid during that period. One of the interesting outcomes of using the system is that problems tend to be identified much earlier than would otherwise be the case. Because of the earlier identification it was possible to devote more time to finding a good solution rather than accepting any proposed solution as a matter of expediency. A good example of this arose on the staffing side.

When a new large hospital opens there are usually two or three small hospitals in surrounding areas which are closed down. Health Boards have a policy of having no redundancy wherever possible, so staff in closing hospitals would be offered comparable posts in the new hospital. However, (a) for personal or family reasons a number of people would not wish to transfer to the new hospital and (b) as the new hospital is providing improved health services the number of staff required will be much greater than the number employed in the closing hospitals. The Board's personnel division stated that, as a matter of policy, all existing employees of the Board (some 7,000 persons) should have the first opportunity of filling posts at the new hospital before outside appointments were made. How could it be ascertained how many wished to transfer and, consequently, how many posts would have to be advertised and filled from outside?

The N.A.U. devised a form which went out with the pay slips to every employee of the Board. The form explained the alternatives available and the recipient had merely to tick to indicate preferences. The form was a "turn-round" document which could be fed straight into the computer on completion. The Computer Section of the Board wrote a programme which would accept the input information and could retrieve it in all the sorts required by the client e.g. how many domestics will be transferring to the new hospital; how many staff nurses with paediatric qualifications would have to be recruited?

When this form was circulated, returned and processed, the output enabled, amongst other things, the staff appointments timetable to be prepared. When this was done a further problem was identified. New entrants to the Health Service have to be medically examined and x-rayed by the hospital's Community Health Specialist. The charts revealed that in one week two hundred people would appear for medical examination. This figure was far greater than could be dealt with by the Community Health Specialist, so after consultation the phasing of many



appointments was altered and thus was the problem overcome.

Another interesting development, which was undertaken on request, was the preparation of a series of Commissioning Check Lists. Most hospital people are only involved in one major commissioning exercise in their lives and could not be expected to think of everything which had to be done to bring a department into operational use. A commissioning check list was prepared for each department or service and this list detailed all the work which had to be done to make the department operational. Some months before the due date for commissioning a department the Commissioning Officer would have a meeting with senior officers of that department and go through the check list with them, item by item, to see what work was completed, in hand, or still to be started. This proved most helpful to all concerned.

The phased bar charts proved to be the most important commissioning control documents. So many people are involved in the commissioning programme that it would have been difficult for the commissioning unit both to spread the work load and plan the involvement of the many participants without such an aid. The charts also identified to the participants their part in commissioning and what was required of them and when. A further advantage was that the charts imposed a discipline on the protagonists, as any delay caused by them would be shown up immediately. This was particularly useful when dealing with people to whom direct instructions could not be given, but whose co-operation had to be sought. The number and range of the charts ensured that all major work areas were well defined and documented.

Finally, when should the commissioning exercise be started? Experience has shown that the commissioning unit for a four hundred bed hospital should be set up some eighteen to twentyone months before the due handover date, whereas the commissioning process for a larger unit - say a seven hundred and fifty bed hospital should be started twentyfour to twentyseven months before the contract completion date. The effects of a late start can, in part only, be alleviated by increasing the number of people employed in the commissioning unit, but it is much more satisfactory to take a longer period and use fewer staff.

7. CONCLUSION

By comparing the results achieved when commissioning hospitals by using the system which has been described, with other hospitals which had been commissioned in a different manner, there is abundant evidence that this method does save time and does save money.

By comparing like with like, we are taking six months to commission a hospital where others are taking nine months, and we are taking nine months where they are taking twelve to thirteen months. Furthermore we have identified the critical activity in the commissioning process, which is equipping the hospital. We are, among other investigations, checking the number of vehicle movements which are required to transport 800 beds, overbed tables, bedside cabinets from the Central Stores to a hospital and vehicle turn round time. By identifying and investigating the prime time consuming area it should be possible to achieve an even greater reduction in the time from handover to operational use.

The final proof, if further proof is required, of the efficacy of the system, is the increasing demand from Health Boards for the assistance of the Network Analysis Unit in commissioning major hospitals. The Unit is currently working on six commissioning assignments and other requests are known to be imminent.