

The term procurement is used to describe all the activities undertaken by client for a project. Procurement is also referred to as a method, which weighs the positives and negatives and the financial constraints, which most likely will affect the project.

When choosing any type of procurement method the major concerns are to finish the project on time, the cost of the project and the quality of both the design and the build quality.

Traditional Procurement

The traditional procurement method has been used for a very long time. The major characteristics of this method are that the design process is separated from construction. A full documentation will have to be completed in order for the contractor to be invited to tender for the work. The process of this method has three main steps, which are to design, bid and build.

The positives to this method are that the contract is to the highest competitive level and the client chooses, which they prefer. The client can appoint a professional consultant to manage and take responsibility of the contract and to advise on the design, process and payment stage. The cost of the project will remain the same as it has already been confirmed and the tender has been awarded to the contractor, which states the price. If the prices have gone up then the contractor will be responsible for it.

The negatives to the traditional method are that the client has control over the design, which means there is no design responsibility on the contractor. The duration of the project tends to be longer as the design process and the construction process are separated and have a separate sequential process.

The traditional method is a very simple method to understand by all clients no matter how much experience they have. The issue with the traditional method is that the duration of the project is prolonged because the process of the designing is separated from the construction.

Design and build

In the design and build procurement method the contractor is responsibly for the design and construction. The contractor will be paid a lump sum. The appointed consultant client advisor will prepare an initial concept for the potential contractors to develop to a certain level, prepare a tender figure and to submit a proposal to then be evaluated to meet the client's satisfaction. A team of consultants will be needed to assess each contractor's proposal. Evaluation of tenders in this case is usually difficult because contractors are not working with one design. Tenderers should be informed of the criteria to be used and whether price is likely to be a prime factor.

The advantages of the design and build method are that the contractor is responsible for the design and construction. The client will hold no responsibility for the design and build. The major advantage in using this method is that the time could be dramatically reduced as the design and construction can be carried out in parallel so the design and construction can be done back to back. If there are delays the client can get compensated however the client may accept delays resulting from results stated in the contract.

The disadvantages to the design and build method is that the client can't make any design changes after the contract has been awarded to the contractor but if there are any changes this could result in the cost of the project to increase dramatically. The valuation and payment is in the hands of the contractor. The client could be paying more for the materials. The contractor could lie about the price of the valuation and it will result in the client paying more than what should have been paid.

The design and build approach makes it easier for the client to communicate as there is only one point of contact, the project manager. The risk and responsibility will be upon the contractor, but it is important to make sure that the insurance covers the risk that may occur. If the client wants to make changes after the contract has been

awarded to the contractor then it can get very expensive because it can affect the whole design and build contract. The duration of the project will be dramatically reduced but the process of choosing the right contractor can consume a large amount of time as you have to select the contractor and the contractor will have to work with all the tenderers working on different designs.

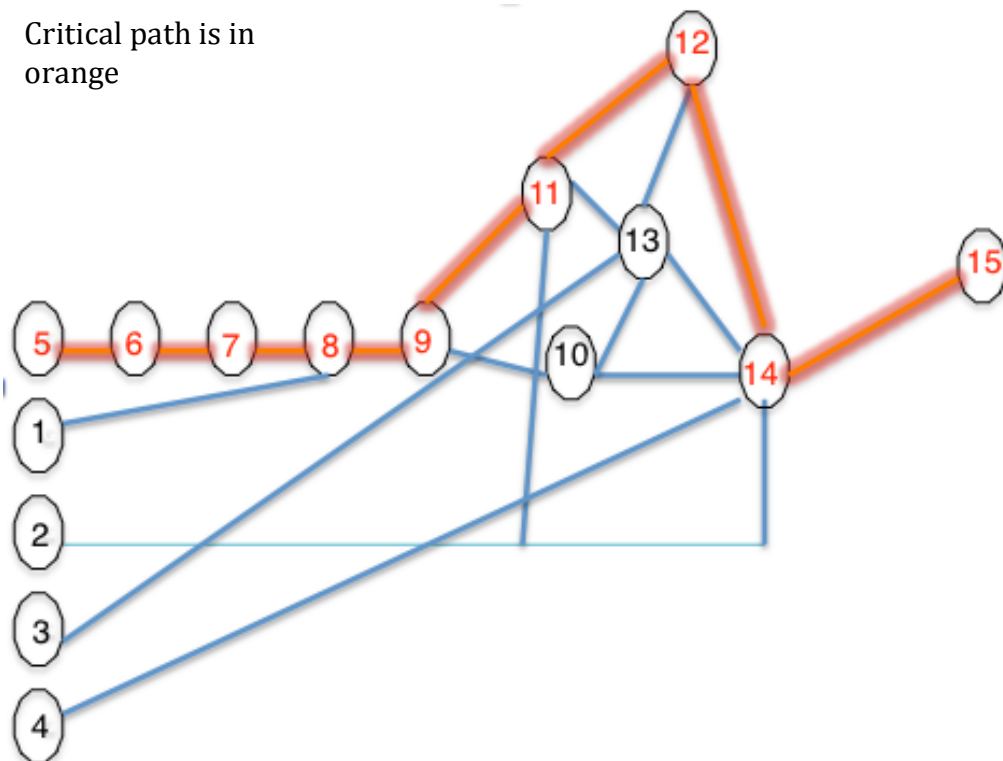
Management Procurement

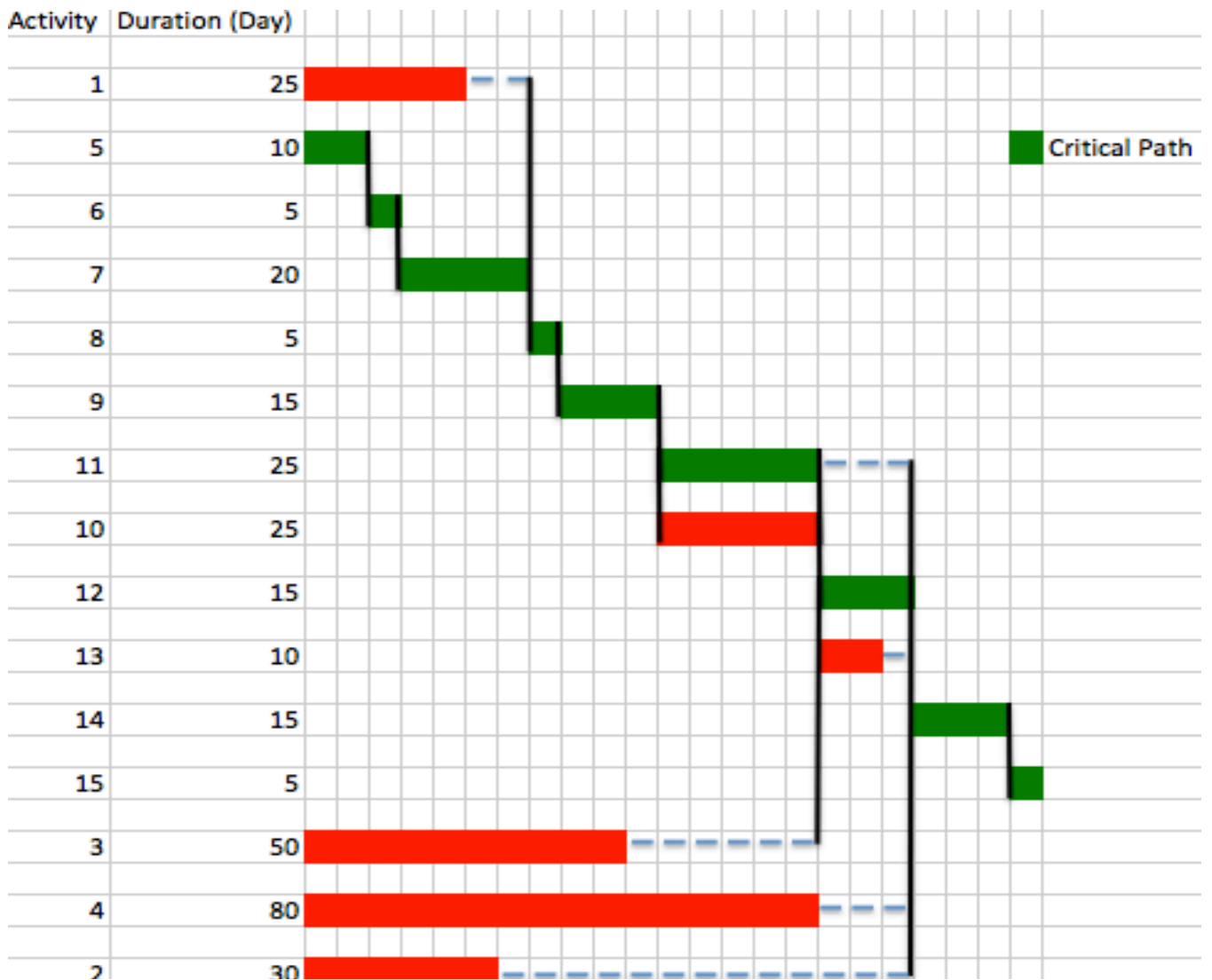
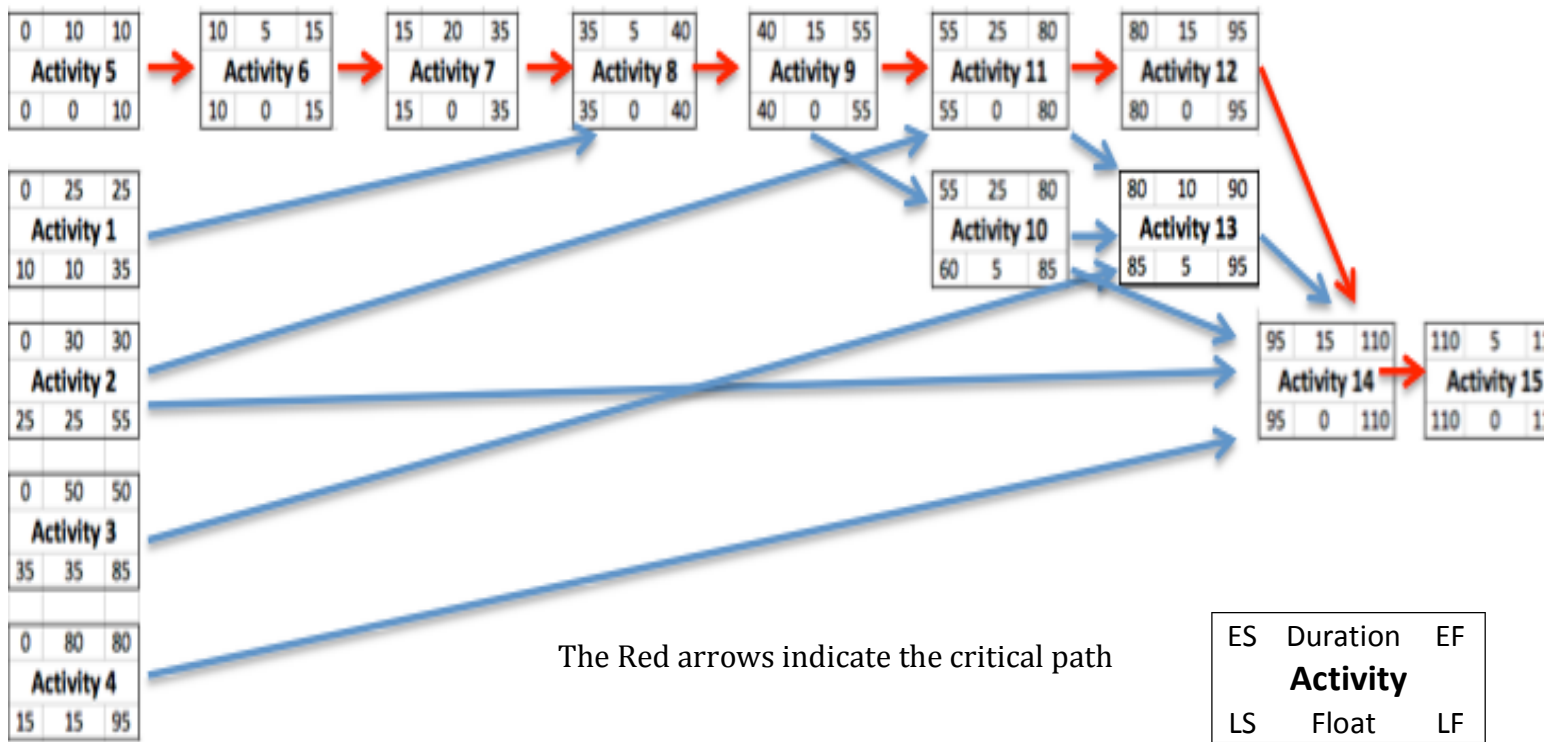
This method of procurement requires the client to hire a consultant to prepare the drawings and specifications. A process of tender and interviews will take place to hire the management contractor. The management contractor is independent and has a good relation with the client as they can communicate easily this is possible because the management contractor doesn't carry out construction work. The payment will be sent from the client to the management contractor for the cost of the work and additionally any extra costs agreed. There is a potential disadvantage as the price will be uncertain, as the construction will start while there are stages of the design incomplete. There will also be work packages that haven't been tendered for due to the fact that the design stages not being complete. To keep the project within budget there often will be adjustments to the design and specification of the work packages. The overall duration of the project is often shorter, when using this method of design and construction, than the traditional or build and design method.

2-a. Using the set of activities, their sequence and duration, shown below in table 1, build a network diagram [showing the critical path(s)], a precedence diagram [from your experience, showing the relationship between tasks], and a fenced-bar chart. Report on the normal duration for this project to be completed.

<i>ID</i>	<i>Activity</i>	<i>Following Activity</i>	<i>Duration (working days)</i>
1	Order and Deliver Rebar	8	25
2	Order and Deliver Structural Steel	11,14	30
3	Order and Deliver Windows	13	50
4	Order and Deliver Equipment	14	80
5	Deliver Site Trailer	6	10
6	Clear and Grade Site	7	5
7	Excavate Footings	8	20
8	Place Rebar in Footings	9	5
9	Place Concrete in Footings	10,11	15
10	Cast and Cure Slab on Grade	13,14	25
11	Erect Walls	12,13	25
12	Erect Walls	14	15
13	Install Windows	14	10
14	Install Equipment	15	15
15	Final Inspection	-	5

Critical path is in orange





2-b. Assume that you are building 3 warehouses. Show how would you schedule the project to minimise the duration that the project requires?

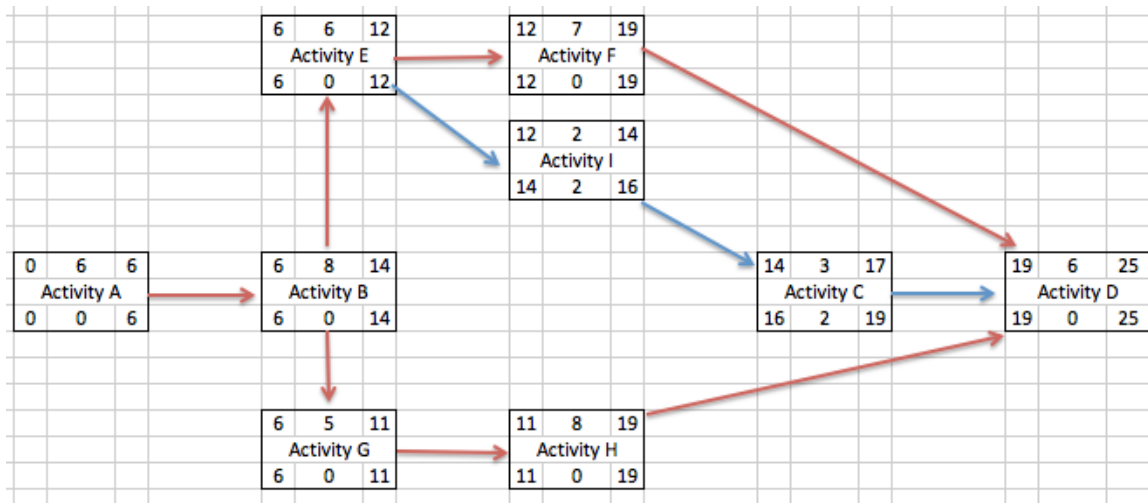
Building 1 warehouse takes 115 working days which means that building 3 warehouses would take 345 working days. If you schedule the project you can get the projects done in 115 days. There will have to be 3 times as much workers. All the activities must be carried out the same as the precedence diagram but scheduled so that 3 teams will follow the same diagram so that each team will finish in 115 days leaving 3 warehouses built. Another way of reducing the duration of the project will be more costly as you can work on Saturday and Sunday.

3. Figure (1) below shows a construction sequence involving activities A to I in arrow diagram format. The tabular data in Table 2 indicates the normal times, normal costs, crash times and crash costs. The indirect cost (or time related preliminaries) of the project is estimated £2000 per week.

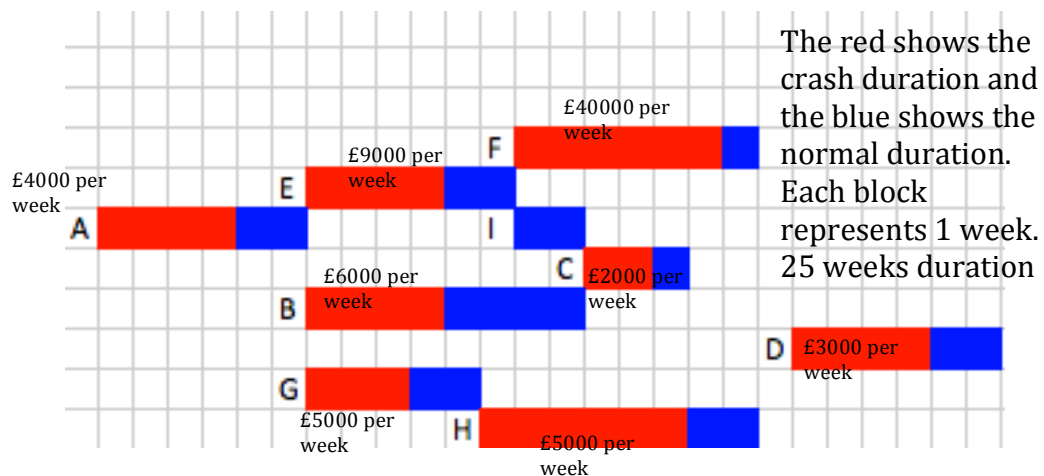
3-a. Analyse the network based on the normal durations for activities

Analysing the network based on the normal duration for the activities I found out that the duration of the project will be 25 weeks and there are 2 critical paths. All the activities are critical except from C as they can have a delay of 2 weeks and the project will still finish on time. From analysing the network diagram the activities F and G finish at week 19 while activity C finishes at week 17. Activity D can't start until activity F, C and H are complete.

3-b. An assessment of the optimum time and optimum cost solution(s) is required as completing the project in the most economic sequence is targeted. Also report on the 'least time' and 'least cost' solutions



The Precedence Diagram clearly shows the route to take to complete the project
The Red arrows indicate the critical path.

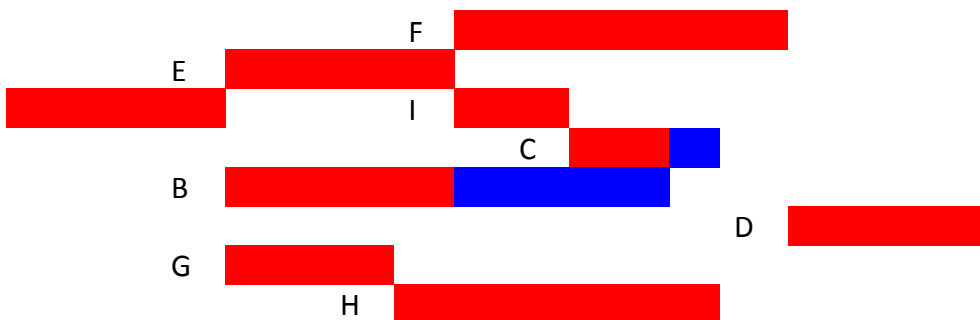


Activity	Duration (Weeks)	Direct Cost (£)
A	6	12,000
B	8	24,000
C	3	18,000
D	6	18,000
E	6	36,000
F	7	10,000
G	5	20,000
H	8	40,000
I	2	20,000
	25.weeks	198,000

Activity	Duration (Week)	Direct Cost (£)
A	6	12,000
B	8	24,000
C	3	18,000
D	4	24,000
E	6	36,000
F	7	10,000
G	5	20,000
H	8	40,000
I	2	20,000
	23.weeks	204,000

Activity	Duration	Direct Cost (£)
A	6	12,000
B	8	24,000
C	3	18,000
D	4	24,000
E	6	36,000
F	6	50,000
G	5	20,000
H	6	50,000
I	2	20,000
	22.weeks	254,000

Activity	Duration	Direct Cost (£)
A	4	20,000
B	8	24,000
C	3	18,000
D	4	24,000
E	4	54,000
F	6	50,000
G	3	30,000
H	6	50,000
I	2	20,000
	18.weeks	290,000



The fenced bar chart shows all of the activities being crashed which is 18 weeks of work. This is the quickest the project can be finished but it will come at a cost of £326,000

Project duration (Weeks)	Direct Cost	Indirect Cost	Total cost	Minimum
18	290,000	36000	326,000	
22	254,000	44000	298,000	
23	204,000	46000	250,000	
25	198,000	50000	248,000	<---

Without crashing any of the activities the project will be the lowest possible cost however, if you crash all the activities you will reach get the lowest possible duration of 18 weeks. The difference between the price of the project being 25 weeks and 18 weeks is £78,000, which will save 7 weeks. The optimum option to go for will be the project with the duration at 23 weeks as it reduces the time and has only a small increase in the price.