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Quick planning using "S" curves and cost based durations

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Objective

Fully automated model for quick planning based on the project cost estimate

- Total duration
- Allocation of cost over time
- Defining and sequencing activities
- Activities duration
- Number of crews

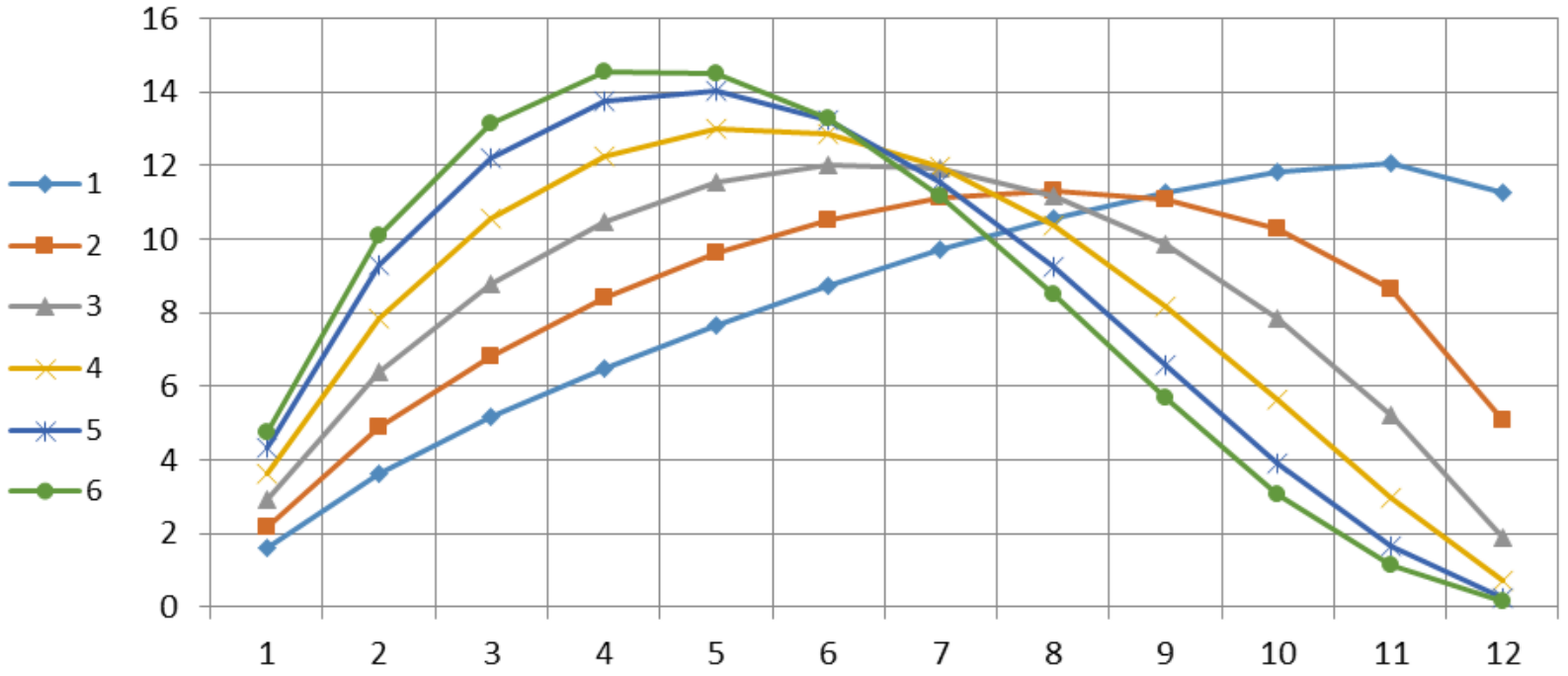
Estimating total duration

Relationship between cost and time (BCIS, 2009)

Use	Duration (weeks)
General	22.4 x LOG (€) - 91
Collective housing	33 x LOG (€) - 146
Single family	31 x LOG (€) - 131

Allocation of cost over time

Expenses by periods (Lara and Dinsmore)



Defining and sequencing activities

		NatC	Code	Description	QtyTgt	Unit	1: Plan 31-Jul-12	2: Plan 31-Aug-12	3: Plan 30-Sep-12	4: Plan 31-Oct-12	5: Plan 30-Nov-12	6: Plan 31-Dec-12	7: Plan 31-Jan-13	8: Plan 28-Feb-13	9: Plan 31-Mar-13	10: Plan 30-Apr-13
1/0	−		***0***	***Housing project***	*1*		***81.819,57***	***94.631,40***	***107.592,89***	***120.252,72***	***132.122,19***	***142.700,30***	***151.509,33***	***158.132,48***	***162.244,74***	***163.639,07***
2/1	+ 1		**E01**	**Preliminaries**	1		**3.981,85**									
3/1	+ 2		**E02**	**Earthwork**	1		**48.877,31**									
4/1	+ 3		**E03**	**Sewage**	1		**10.072,11**									
5/1	− 4		**E04**	**Foundations**	1		**18.888,30**	**46.181,73**								
6/2	+ 4.1		E04CM040	HM-20/P/20/I concrete cleaning	34,59	m3	2.119,68									
7/2	+ 4.2		E04CE020	Wood formwork footings, trenches, beams p	48,68	m2	778,39									
8/2	+ 4.3		E04CA060	HA-25/P/40/IIa concrete, footings	220,88	m3	15.990,23	10.714,16								
9/2	+ 4.4		E04SA020	HA-25 concrete slab reinforced, e = 15 cm	659,35	m2		9.059,47								
10/2	+ 4.5		E04SE020	Limestone 40/80, e = 20 cm	659,35	m2		4.437,43								
11/2	+ 4.6		E04MA010	HA-25/P/20/I in concrete wall 25 cm, 1-sided	88,57	m3		21.970,67								
12/1	− 5		**E05**	**Structures**	1			**48.449,67**	**107.592,89**	**120.252,72**	**132.122,19**	**41.794,27**				
13/2	+ 5.1		E05HFA020	Salb self-supporting beam 20 +5 cm, 60 cm bas	6.277,72	m2		48.449,67	107.592,89	114.778,28						
14/2	+ 5.2		E05AG010	Lintel galvanized steel, 250x4 mm	365,45	m				5.474,44	986,72					
15/2	+ 5.3		E05AW040	Angle of 60 mm	108,00	m					2.066,04					
16/2	5.4		E05HFS400_01	Formation of hollow slab	181,37	m2					8.705,76					
17/2	+ 5.5		E05HLA030	HA-25/P/20 concrete, formwork slabs5 kg/m3	11,66	m3					2.775,08					
18/2	+ 5.6		E05HSA010	HA-25/P/20/I concrete, pillars, metal formwork,	205,16	m3					47.619,69					
19/2	+ 5.7		E05HVA030	Concrete girders with wood framing HA-25/P/2	230,18	m3					69.968,90	1.888,69				
20/2	+ 5.8		E05HVA075	HA-25/P/20/I concrete with flat bands	107,85	m3						39.905,58				
21/1	+ 6		**E07**	**Walls and divisions**	1							**100.906,03**	**151.509,33**	**77.457,39**		
22/1	+ 7		**E08**	**Cladding and suspended ceilings**	1									**80.675,09**	**89.886,69**	
23/1	+ 8		**E09**	**Covers**	1										**40.090,04**	
24/1	+ 9		**E10**	**Insulation and waterproofing**	1										**32.268,01**	**59.251,19**

Activities sequencing and cost allocation based on “S” curve (Presto)

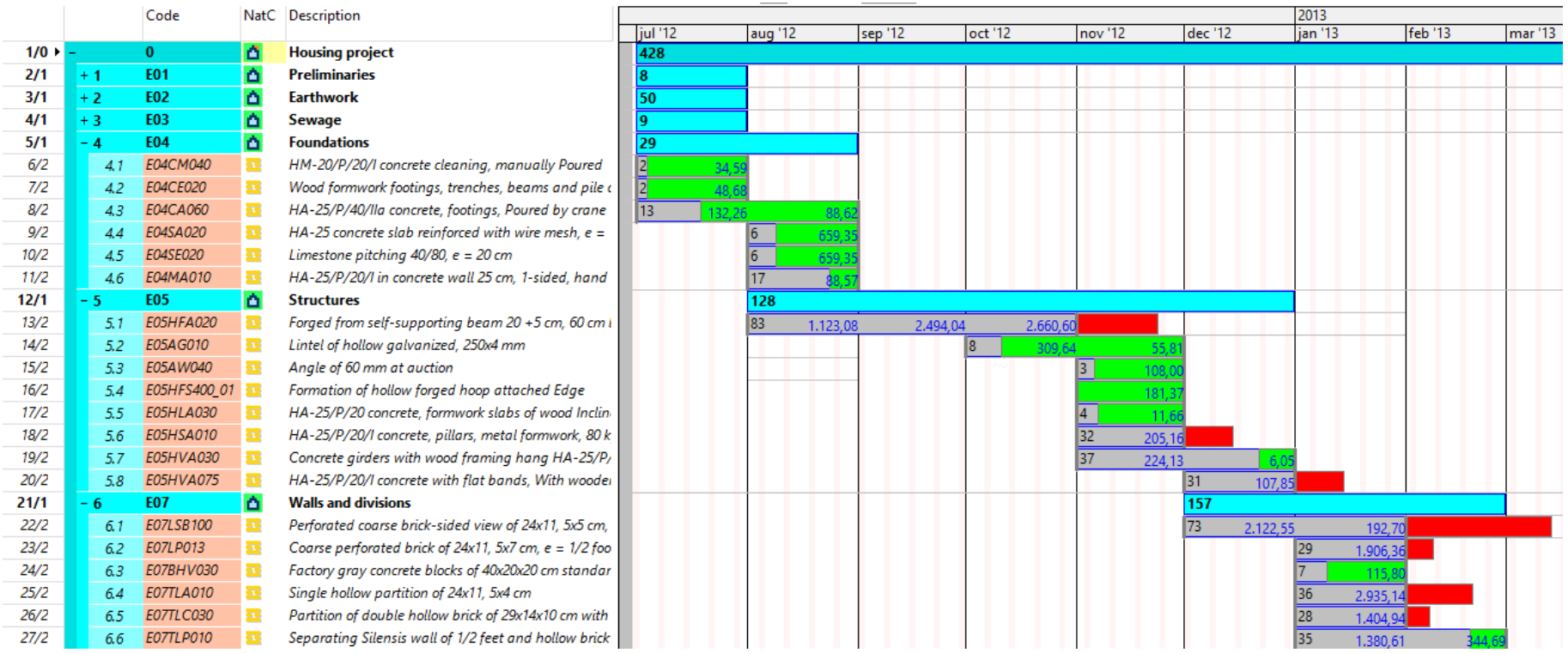
Activities duration

Based on

- Proportionality between activity (resources) cost and duration and total (resources) cost and duration
- Estimation of the number of simultaneous activities
- Correction for activity size
- A simultaneity coefficient V (0 = serial, 1 = parallel) is inserted to adapt to different situations

Activity duration =
(Activity cost / Total cost) ^ (1 - V) x Total duration

Final result

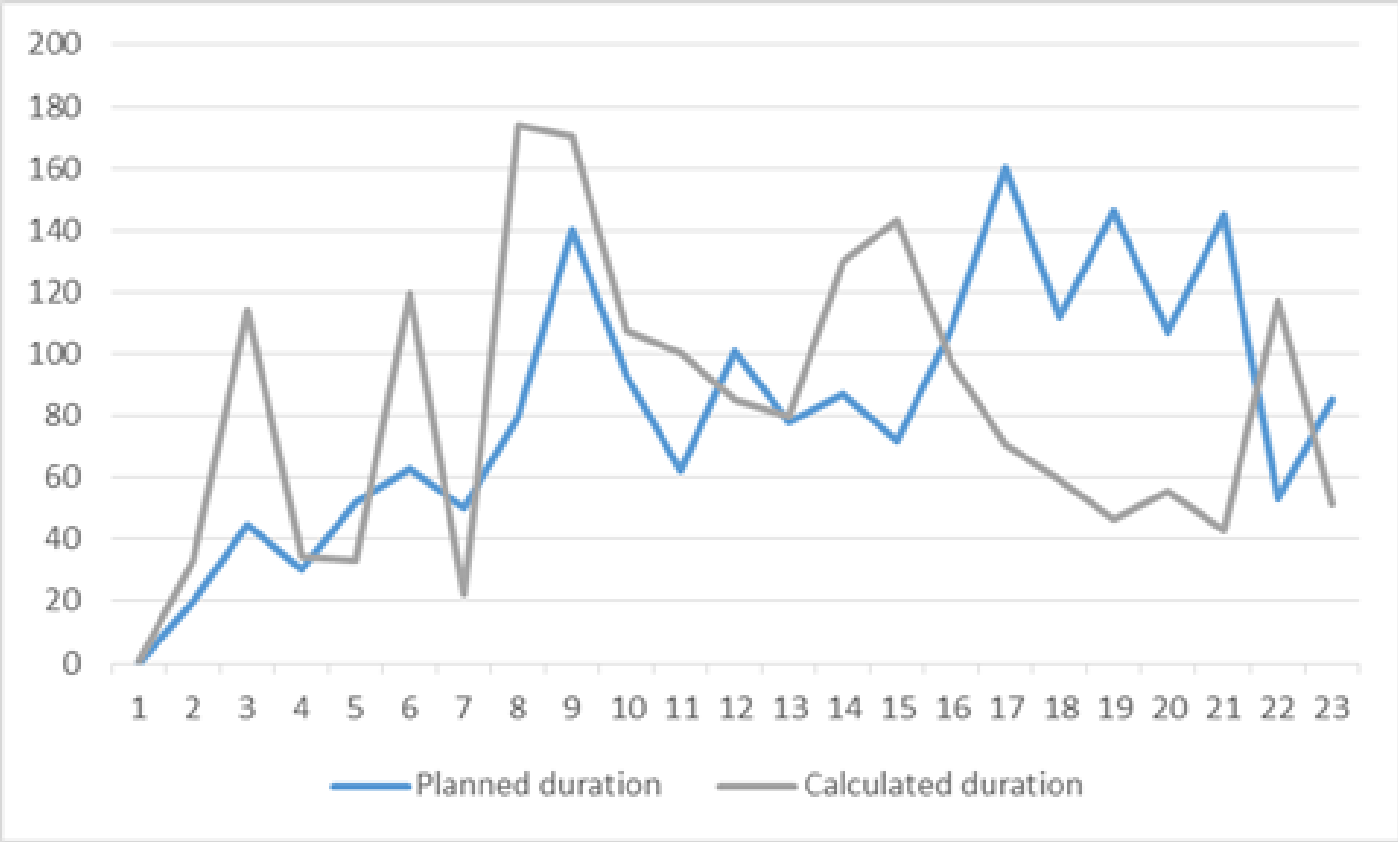


		Code	NatC	Description
1/0	–	0		**Housing project**
2/1	+ 1	E01		**Preliminaries**
3/1	+ 2	E02		**Earthwork**
4/1	+ 3	E03		**Sewage**
5/1	– 4	E04		**Foundations**
6/2	4.1	E04CM040		*HM-20/P/20/I concrete cleaning, manually Poured*
7/2	4.2	E04CE020		*Wood formwork footings, trenches, beams and pile c*
8/2	4.3	E04CA060		*HA-25/P/40/IIa concrete, footings, Poured by crane*
9/2	4.4	E04SA020		*HA-25 concrete slab reinforced with wire mesh, e =*
10/2	4.5	E04SE020		*Limestone pitching 40/80, e = 20 cm*
11/2	4.6	E04MA010		*HA-25/P/20/I in concrete wall 25 cm, 1-sided, hand*
12/1	– 5	E05		**Structures**
13/2	5.1	E05HFA020		*Forged from self-supporting beam 20 +5 cm, 60 cm i*
14/2	5.2	E05AG010		*Lintel of hollow galvanized, 250x4 mm*
15/2	5.3	E05AW040		*Angle of 60 mm at auction*
16/2	5.4	E05HFS400_01		*Formation of hollow forged hoop attached Edge*
17/2	5.5	E05HLA030		*HA-25/P/20 concrete, formwork slabs of wood Inclin*
18/2	5.6	E05HSA010		*HA-25/P/20/I concrete, pillars, metal formwork, 80 k*
19/2	5.7	E05HVA030		*Concrete girders with wood framing hang HA-25/P/*
20/2	5.8	E05HVA075		*HA-25/P/20/I concrete with flat bands, With wooden*
21/1	– 6	E07		**Walls and divisions**
22/2	6.1	E07LSB100		*Perforated coarse brick-sided view of 24x11, 5x5 cm,*
23/2	6.2	E07LP013		*Coarse perforated brick of 24x11, 5x7 cm, e = 1/2 foo*
24/2	6.3	E07BHV030		*Factory gray concrete blocks of 40x20x20 cm standar*
25/2	6.4	E07TLA010		*Single hollow partition of 24x11, 5x4 cm*
26/2	6.5	E07TLC030		*Partition of double hollow brick of 29x14x10 cm with*
27/2	6.6	E07TLP010		*Separating Silensis wall of 1/2 feet and hollow brick*

Presto

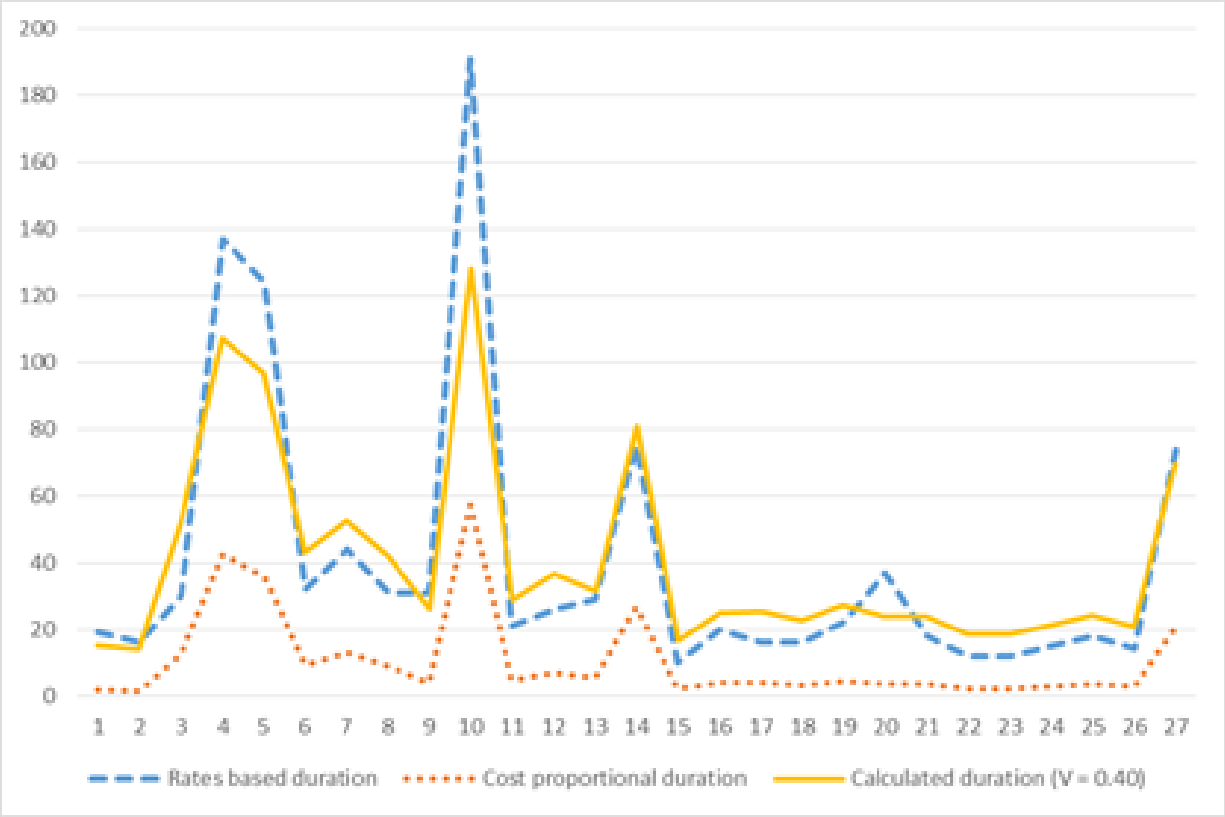
No. of crews = Time based duration / Cost based duration

Planned vs. calculated durations



Commercial center
Activities at division level, V = 0,6

Planned vs. calculated durations



Residential building
Activities at work unit level, V = 0,4

Future work

- Refine and validate the model for different project types and sizes

Conclusions

Starting from an estimate, the methodology is completely automatic, with the following decision points:

- *Applying the BCIS expression*
- *Checking the sequential order*
- *Selecting the right "S" curve for the project*
- *Deciding the simultaneity coefficient*

Thank you

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