



Titulación: Grado en Ingeniería Civil
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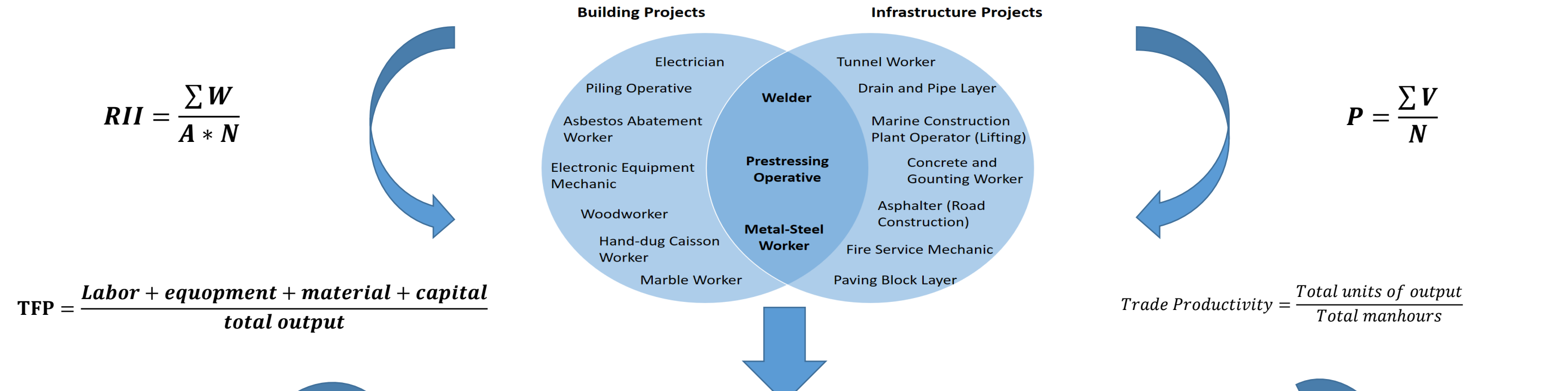
TRABAJO FINAL DE GRADO

Autor: Zaballos Palop, Ignacio
 Tutor: Yepes Piqueras, Víctor
 Cotutor: Zhang, Xueqing

Benchmarking the Construction Trade Productivity (37 Trades) Identifying the Critical Construction Trades for Infrastructure and Building Projects

Trade	Building				Infrastructure			
	Labor Cost	Construction Time	Labor Shortage	Automation Level	Labor Cost	Construction Time	Labor Shortage	Automation Level
1 Woodworker	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2 Hand-dug Caisson Worker	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3 Leveller	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4 Piling Operative	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5 Waterproofing Worker	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6 Drain and Pipe Layer	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
7 Paving Block Layer	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
8 Cement Sand Mortar Worker	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Criticality Rank	Trade	Labor Shortage Internal Rank	Labor Shortage Overall Rank	Automation Internal Rank	Automation Overall Rank
1	Welder	3	5	3	6
2	Electrician	7	12	4	13
3	Prestressing Operative	1	1	1	1
4	Asbestos Abatement Worker	5	9	8	24
5	Piling Operative	4	6	2	3
6	Hand-dug Caisson Worker	9	16	9	32
7	Woodworker	2	3	6	20
8	Metal-steel Worker	8	14	5	15
9	Marble Worker	6	11	10	36
10	Electronic Equipment Mechanic	10	19	7	22



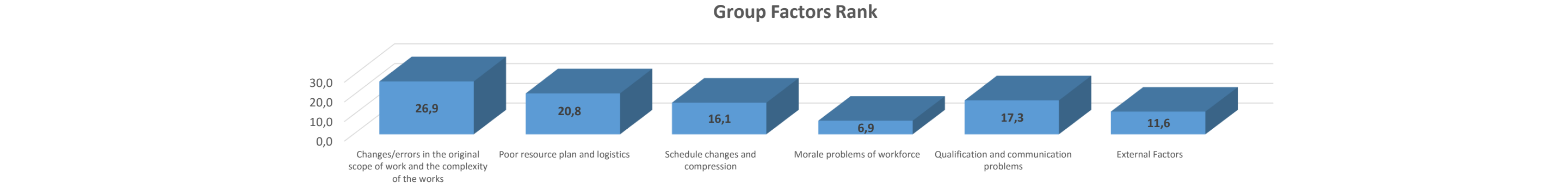
Questionnaire – Key Factors Affecting the Productivity of the Critical Construction Trades Identifying the Critical Group Factors and Factors (Under a total of 40)

Section C – Weightings of the Six Groups of Factors

Considering the relative importance of the six groups of factors affecting construction productivity, please assign a percentage weighting (%) to each of the six groups such that the sum of the weightings of the six groups is 100%.

No.	Factor Group	Weightings
1	Changes/errors in the original scope of work and the complexity of the work	
2	Poor resource plan and logistics	
3	Schedule changes and compression	
4	Morale problems of workforce	
5	Qualification and communication problems	
6	External factors	
Total		100%

No.	Factor	Rating
I. Changes/errors in the original scope of work and the complexity of the work		
1	Errors/omissions in specifications and quality requirements	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
2	Unclear technical specifications	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
3	Design changes, errors and omissions	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
4	Design complexity	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
5	Additions to the original scope of work	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
6	Inappropriate construction method	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
7	Complexity of construction method	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
II. Poor resource plan and logistics		
8	Material delivery problems	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
9	Unavailability of tools and equipment	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5



AIM AND OBJECTIVE OF THE RESEARCH PROJECT

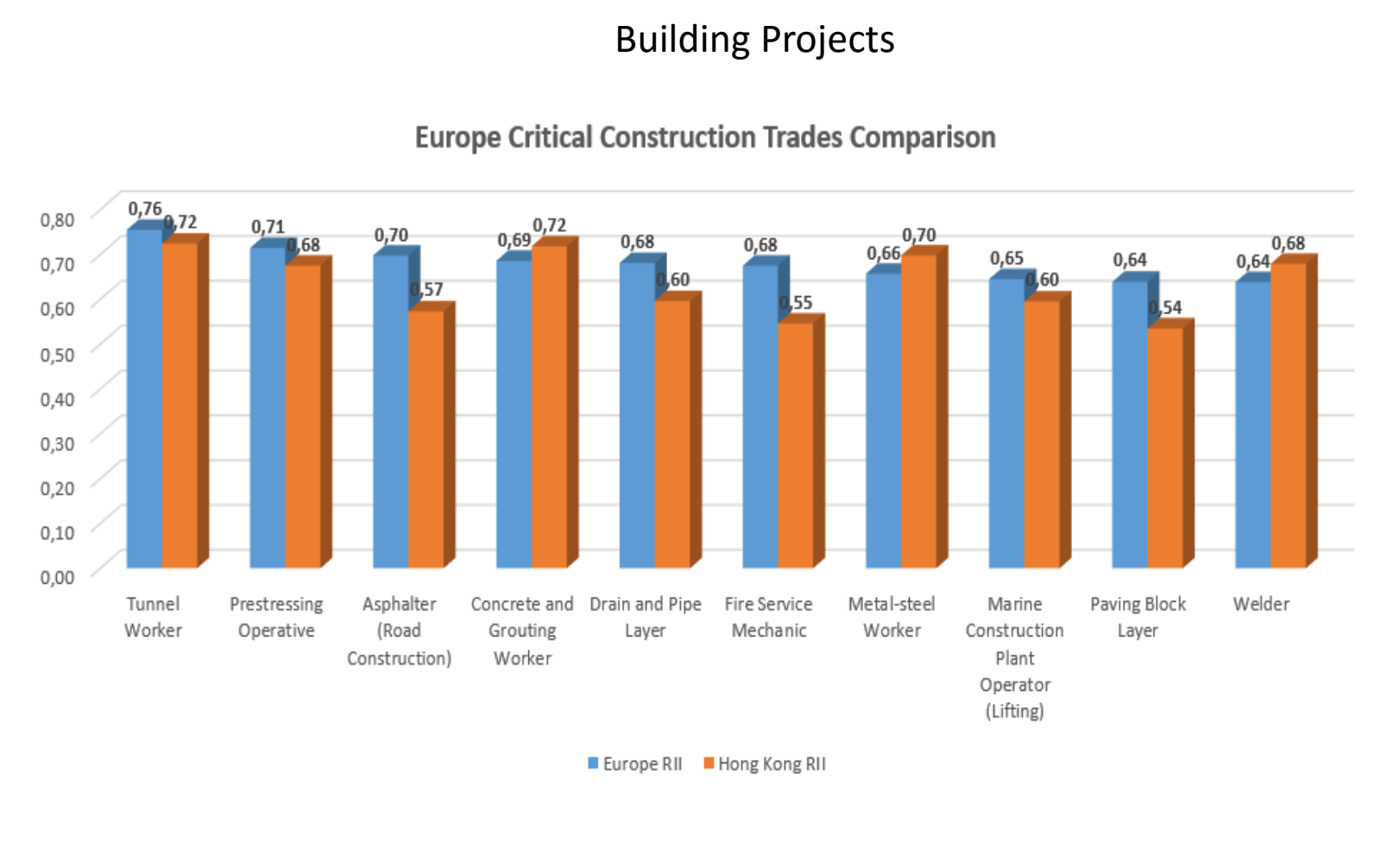
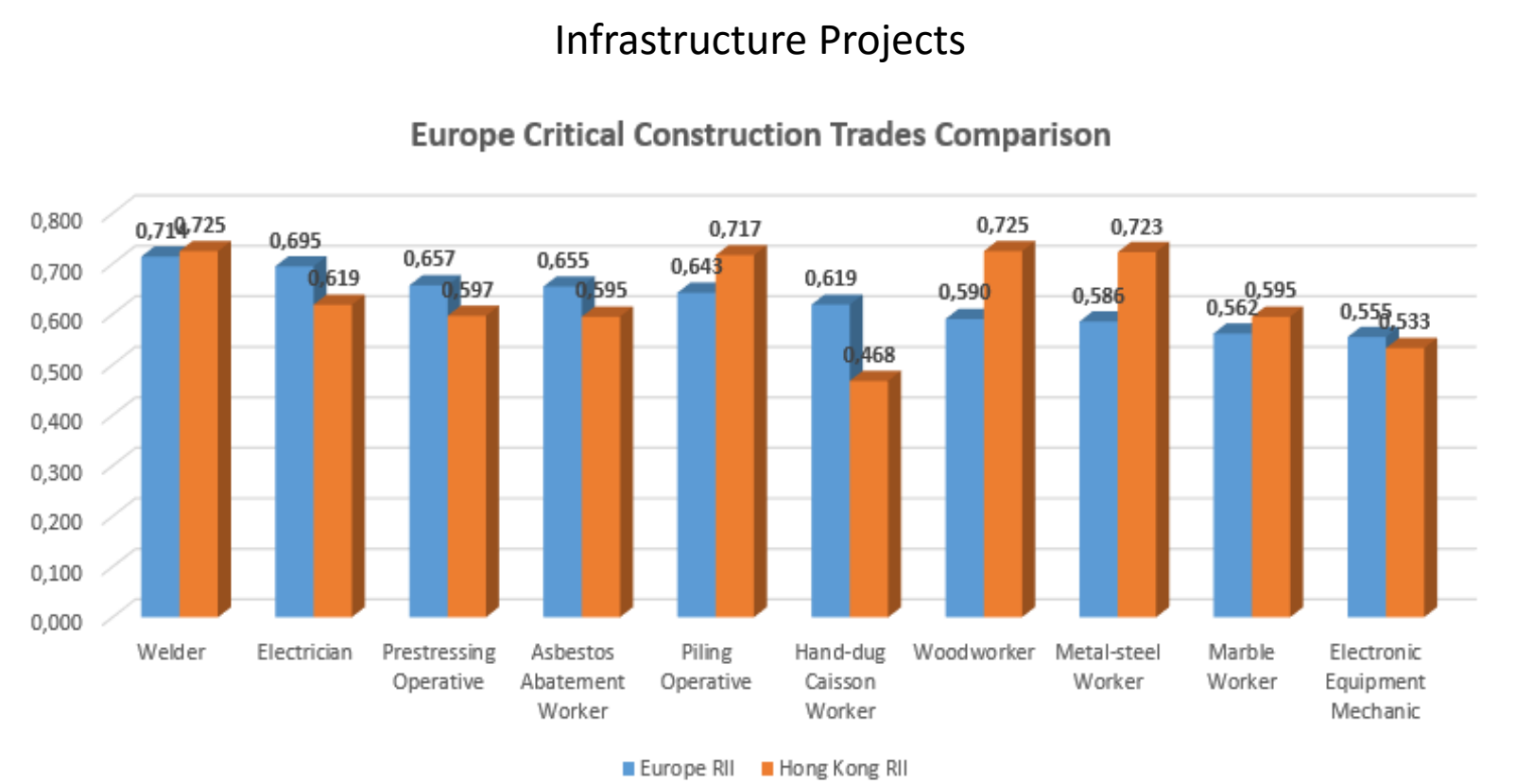
- To determine ten most critical construction trades affecting the productivity of typical types of building and infrastructure projects in Europe;
- To develop methodology for measuring the productivity of the trades selected in (i) above;
- Based on the productivity performance of the selected trades, to establish benchmark indicators of the trades in terms of productivity;
- Views from the construction industry about various affecting labor productivity to the selected trades;
- To compare and evaluate the productivity performance of the selected trades with that of other developed countries, in our case study it will be Hong Kong; and
- To make recommendations to improve labor productivity in construction.

Overall Rank	Factors	RII	Average	Group Factor
1	Design changes, errors and omissions	0.800	4.00	I
2	Communication problems between management and workers	0.763	3.81	V
3	Poor qualification/experienced of management at different levels	0.744	3.72	V
4	Shortage of skilled/experienced workers	0.744	3.72	V
5	Improper coordination between different construction trades	0.738	3.69	III
6	Design complexity	0.706	3.53	I
7	Unclear technical specifications	0.694	3.47	I
8	Unfavourable economic and financial conditions	0.688	3.44	VI
9	Inappropriate construction method	0.688	3.44	I
10	Lack of training/orientation program for workers	0.681	3.41	V

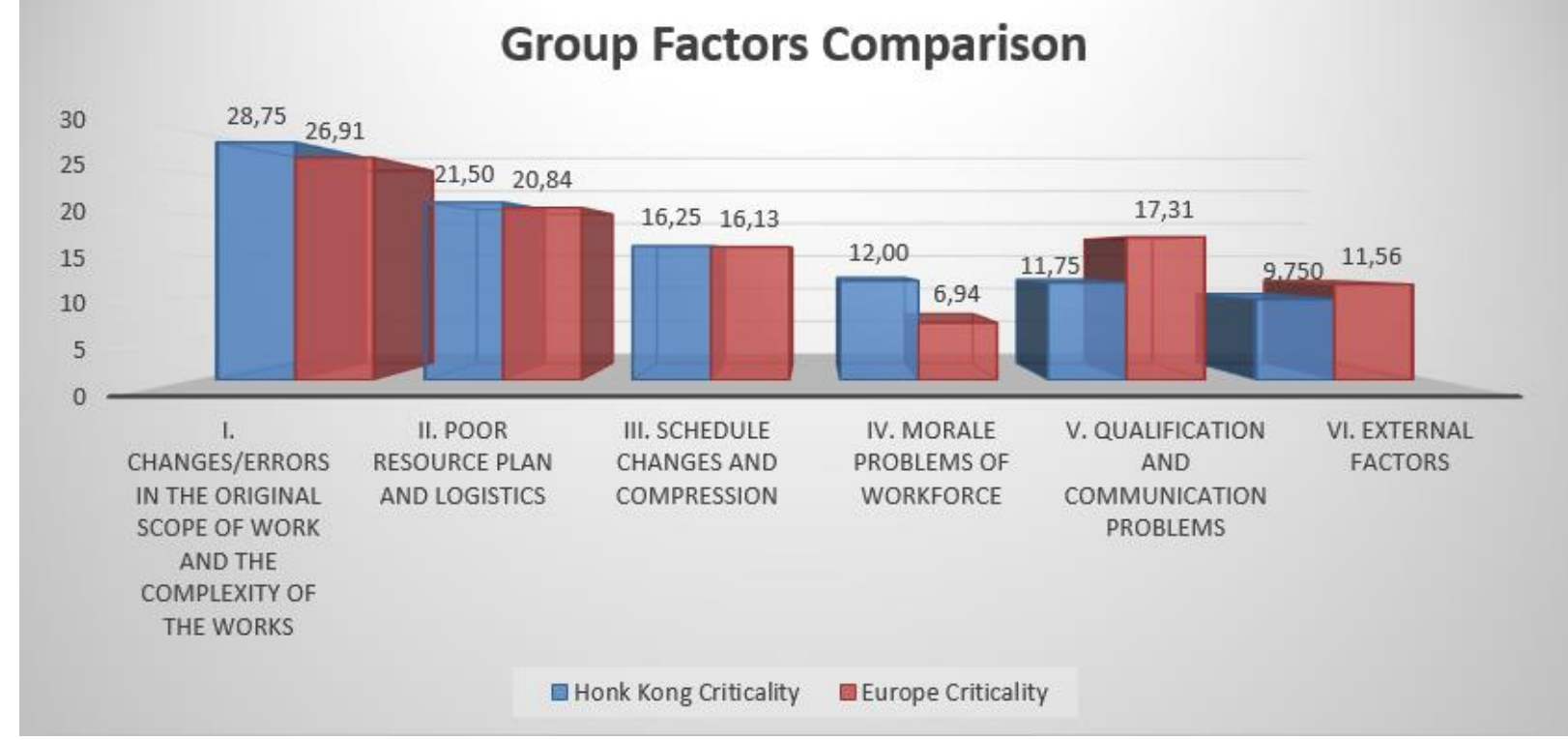
Questionnaire – Productivity Data of the Critical Construction Trades for both Infrastructure and Building Projects

Construction Trade	Measurement Unit
Bar Bender and Fixer	kg/manhour
Steel fixer	kg/manhour
To grout the floor	m³/manhour
To grout the beam	m³/manhour
To grout the column	m³/manhour
Rigger/Metal Formwork Erector	kg/manhour
Woodworker	m²/manhour
Welder	m/manhour
Metal-steel Worker	kg/manhour
Scaffolder	m²/manhour
Piling Operative	m/manhour
Piling (master)	m/manhour
Excavator	m³/manhour
Tower crane	m²/manhour
Curtain wall installer	m²/manhour
Glazier	m²/manhour
Electrician	m/manhour
Prestressing Operative	kg/manhour

Study Comparison between Europe and Hong Kong



Factors Comparison



Europe Critical Factors Comparison

