‘Comparing
EU Construction Industries - Lessons and Issues ’

Presentation by

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to

Revaluing Construction 2007

In

Copenhagen

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- The ECDG research project, 2005/2006
- The findings - comparative efficiency
- Benchmarking – definition
- Benchmarking – application to the project
- The research methodology
- The findings – efficiency drivers

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ECDG research project : Terms of reference – overview

‘investigate the factors which influence the relative resource usage and competitiveness in EU construction industries (with particular reference to national framework conditions)’

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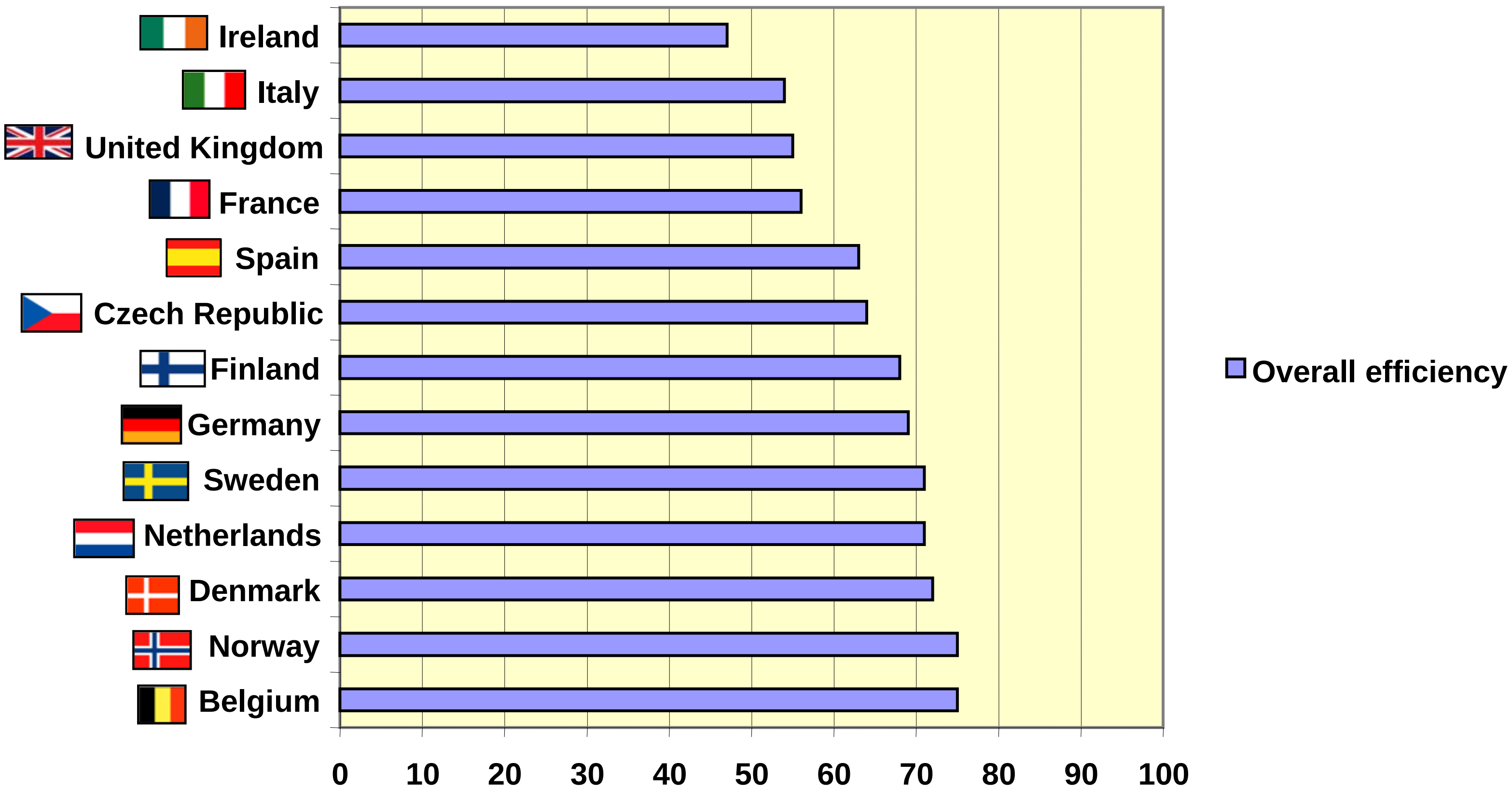
Results : The resource-use benchmarking index



Benchmarking – definition

‘The process of comparing a product, service, process – indeed any activity or object – with other samples from a peer group, with a view to identifying ‘best buy’ or ‘best practice’ and targeting oneself to emulate / improve upon it’.

Bernard Williams:

‘Facilities Economics in the EU’ (International Facilities and Property Information Ltd 2001)

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The ultimate objectives

- **Establish feasibility of benchmarking across EU countries**
- **If so – develop a benchmarking model**
- **Countries to see their position in the EU peer group**
- **Countries to know where to find ‘best performance’**
- **Improve overall EU efficiency**
- **Potential 2% increase in EU Gross Domestic Product (GDP).**

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Alternative methods of comparison

- **Macro-economic output per construction industry employee:**
  - **- Added Value**
  - **- Construction Gross Domestic Product**

Micro-economic – project performance

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Construction GDP per employee – some problems

- **Actual numbers of workers**
- **On-site workforce *only* included**
- **Variable mix of building types**
- **Resource wastage part of 'output' – i.e. *cost* not *value* added**

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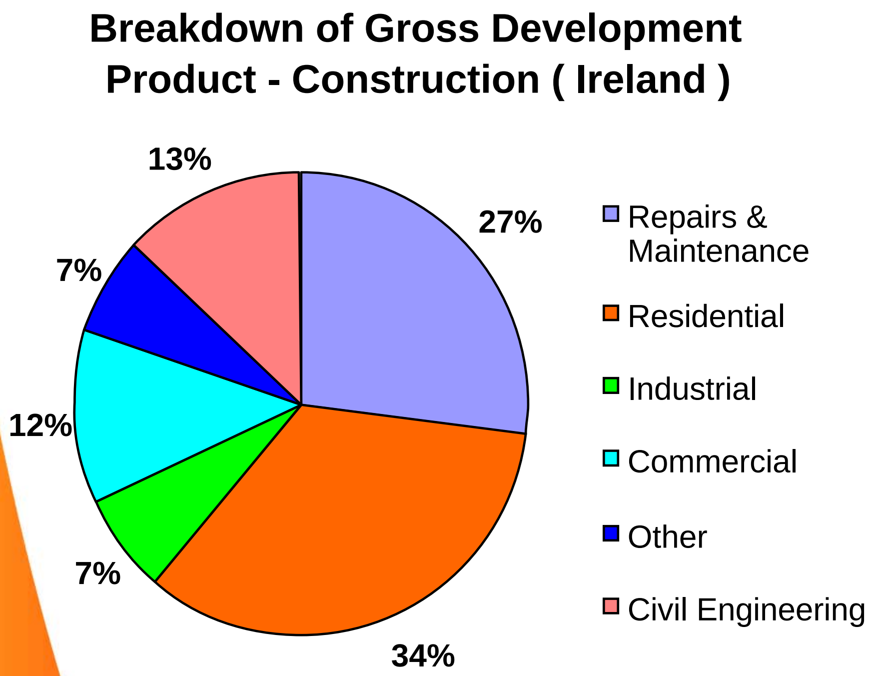
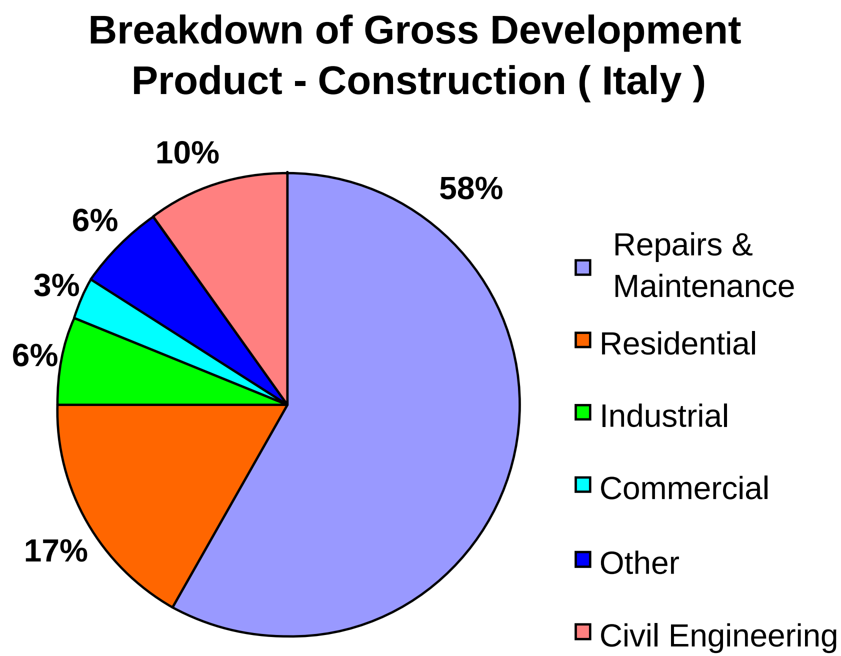
Construction GDP – analysis of 2 countries: n.b. different mix





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The macro-economic approach – micro-economic example

- **4 workers do a job for € 20,000 (net cost) =**

  € 5,000 output per capita

- **4 workers do the same job next door for € 24,000 (net cost) =**

  € 6,000 output per capita

Which team is more efficient?
Surely not the more expensive one?!

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The research stages

1. Desk research
2. Resource-use analysis – theoretical
3. Resource-use analysis – project-cost-based
4. Create a benchmarking model – merging both indexes
5. Conclusions and recommendations

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Stage 1 'Desk Research'

- Literature review
- Key informant interviews
- Questionnaire survey

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Stage 2: Resource use efficiency - theoretical assessment

- Identify construction process ‘resource drivers’
- ‘Weight’ their importance
- Assess the peer group’s efficiency in each case
- Create a (theoretical) resource-use efficiency index

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Resource drivers identified

Resource Drivers	
Controllable	**Uncontrollable**
1 Buildability 2 Communications 3 Change 4 Labour – skills & incentive 5 Management skills & incentives 6 Repetition of processes 7 Selection of components 8 Materials handling 9 Site security	1 H&SaW legislation 2 EU Competition legislation 3 Building regulations 4 Hazardous substances regulation 5 Minimum wage regulations 6 Maximum working week regulations 7 Weather - adverse 8 Non-availability of labour 9 Non-availability of materials 10 Non-availability of plant 11 Adverse site conditions 12 Adverse site access 13 Poor innate calibre 14 Poor quality of indigenous materials 15 Poor quality of indigenous plant

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The questionnaire survey form

On-Line : Click on term for HELP or print Help File page

	Factor	**Weight of Importance - in principle**	**Actual level of achievement in the country and building type specified**
1	' Buildability '		
2	Communications		
3	Change		
4	Labour - skills		
5	Management - skills		
6	Labour - incentives		
7	Management - incentives		
8	Repetition of processes		
9	Selection of components		
10	Materials handling		
11	Site security		
12	Other (please state)*		
13	Other (please state)*		
14	Other (please state)*		

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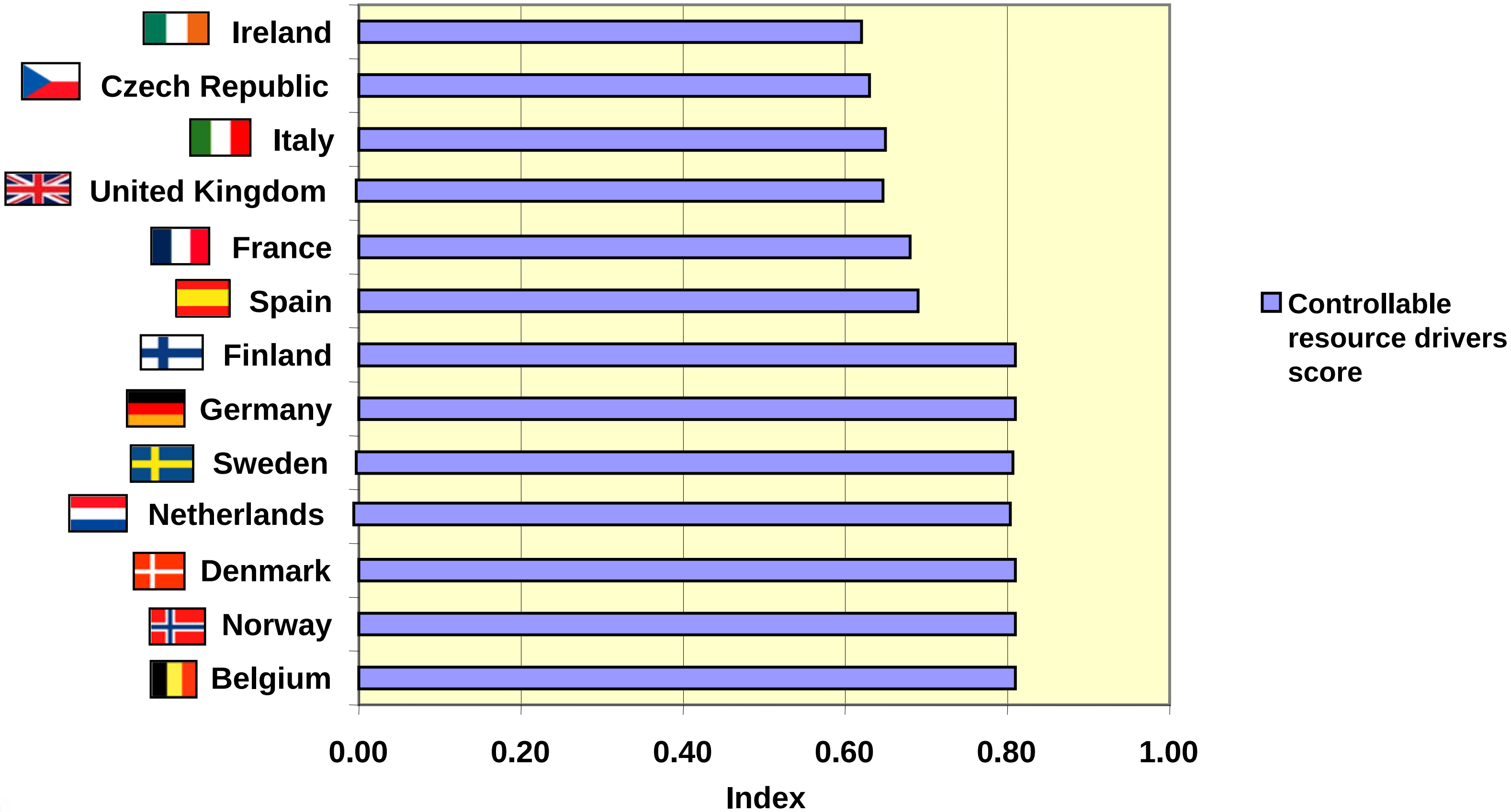
Resource-use efficiency index – from 'desk research'



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Stage 3 – Project cost analysis

- Comparison of costs/m2 GIA
- Establish rates of pay and on-costs
- Calculate project output in sq.m per site labour hour
- Create a labour output efficiency index – based on sq.m. per site hour

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Project cost – data sources

- **Published international cost comparisons by internationally respected firms of Chartered Quantity Surveyors –**

  - Gardiner & Theobald ('Building')

  - Davis Langdon ('European construction costs handbook')

- **Researchers' own data-base**

Extract from ‘Building’ 2005 Survey – G & T

International costs

Gardiner & Theobald's 13th annual survey looks at how much it'll cost you to build various buildings around the world, along with labour and inflation rates – plus why China is still the main cost driver

China and steel: The global effects of an unprecedented boom

AFTER YEARS OF HYPE, THE REALITY OF THE huge Chinese economy started to have a global effect in 2004; China became the main driver of international construction costs – a role previously played by the US and Western Europe. China's economic engine helped reverse years of deflation for construction costs in neighbouring Asian markets and its huge appetite for raw materials sparked worldwide inflation for a broad range of construction materials. The US market, where construction costs rose at a double-digit pace, was the hardest hit but inflation also posted large gains in many other countries, according to a survey by London-based international project and cost management firm Gardiner & Theobald, Levett & Bailey and Rider Hunt.

In its 13th annual survey of international construction costs conducted, G&T reports that construction inflation increased on average 5.2% in 23 nations in Europe, Asia and the Middle East. This is up from a 3% rate reported for the same group of countries in 2003 and 2.3% in 2002. In the US, the survey shows construction costs in New York climbing from 2.4% in 2004 to 12% this year. In Western Europe, construction inflation rose from 2.5 to 3.7% during the same period.

Contractors in Australia and New Zealand also struggled with rising material costs in 2004. The report notes that construction costs in New Zealand jumped 14% this year, after averaging annual increases of less that 2% for the previous seven years. In Australia, construction inflation rose from 4% in 2003 to 7% this year, according to the survey.

Some of the largest cost increases surveyed were in Eastern Europe, where construction inflation nearly doubled to 6% in 2004. This excludes Romania, which is coming back into line with inflation rates in other European countries after suffering cost increases of 34% in 2002 and 40% in 2001. G&T estimates that construction inflation in Romania will drop to 9% this year.

"Bucharest is booming," says Doug Nobel in the local G&T office. Prices are edging up but remain as much as 40% lower than in Western Europe, he says. But the gap is narrowing – "only in the sense that international companies are becoming more competitive," Nobel adds.

In South America, Argentina is back in the grips of double-digit inflation after minimal cost increases in 1997-2001. This year G&T expects costs in Argentina to increase 25%, following annual gains of 20% in 2003 and 68% in 2002.

Overall, G&T expects the international inflation rate for construction to begin to ease next year. The 17 countries providing forecasts for 2005 predict building costs will increase 5% next year. The same group of countries reported a 7% increase in 2004.

Struggling with steel

Higher steel prices had less of an impact on contractors in Europe than in the US because concrete is the material choice for much of Europe, and the share of steelwork in a project's cost is still small, according to a number of sources. But firms in Europe still had to cope with the global phenomenon of higher prices.

In Poland, rebar also went up 40-50%, says Jan Holyst of G&T's Warsaw office. Some construction companies on fixed prices were "caught in the cold" as owners were held rigidly to contract, he adds.

Construction in Poland – Eastern Europe's largest market – is "not as competitive as it was," says Holyst. As construction demand picks up after a long depression, "this year there has been a noticeable increase in prices," he adds.

In Slovakia, Bratislava is also booming and helping to push up bid prices about 10% this year, says Levente Varga, of G&T's Bratislava office. The most dramatic single event was this year's hike of VAT from 10 to 19%, "For contractors, it was a huge, huge increase," he says. With end users unable to recover the tax, the residential market felt it most, he adds.

In the UK, where the use of structural steel is more widespread, the popularity of the material for building frames has not abated, says Paul Ridout, a London partner of G&T. Though the price hike was large, steel costs account for only a few percent of total investment, he says.

The UK "is benefiting from a return in business confidence with early signs of revival of the commercial building market," says Ridout. Public sector spending in the UK is also due to remain strong. As a result, "tender prices are just slightly on the up," he adds. The firm calculates that this year's national average rise in bid tender prices has been 4.5% and is forecasting 4% in 2005.

In Spain, construction prices are not creating "any surprises," says Cecilia Espinosa de los Monteros, managing director of Madrid-based cost consultant CEM Management S.A. While the retail and residential sectors are still active, commercial construction is now quiet. But since the Socialist Party won this year's government elections, investment in public works has slowed.

Costs in France have risen fractionally over last year to about 4% overall, says Peter Lewis, in G&T's Paris office. Demand for construction is hottest in the Paris region. Construction costs can be between 5 to 10% lower in areas outside of the capital, he says.

Extract from European Construction Costs Handbook (Davis Langdon)

Approximate estimating

The building costs per unit area given overleaf are averages incurred by building clients for typical buildings in the Stuttgart (Baden-Württemberg) area as at the first quarter 1999. They are based upon the total floor area of all storeys, measured between external walls and without deduction for internal walls.

Approximate estimating costs generally include mechanical and electrical installations but exclude furniture, loose or special equipment, and external works; they also exclude fees for professional services. The costs shown are for specifications and standards appropriate to Germany and this should be borne in mind when attempting comparisons with similarly described building types in other countries. A discussion of this issue is included in section 2. Comparative data for countries covered in this publication, including construction cost data, are presented in Part Three.

Approximate estimating costs must be treated with caution; they cannot provide more than a rough guide to the probable cost of building. All the rates in this section exclude VAT which is at 15%.

Germany

	Cost DM per m²	Cost DM per ft²
Industrial buildings		
Factories for letting (include lighting, power and heating)	1,180	110
Factories for owner occupation (light industrial use)	1,180	110
Factories for owner occupation (heavy industrial use)	1,520	141
Factory/office (high-tech) for letting (shell and core only)	1,360	126
Factory/office (high-tech) for letting (ground floor shell, first floor office)	1,580	147
Factory/office (high-tech) for owner occupation (controlled environment, fully furnished)	1,670	155
Warehouses, low bay (6 to 8m high) for letting (no heating)	1,140	106
Warehouses, low bay for owner occupation (including heating)	1,230	114
Warehouses, high bay for owner occupation (including heating)	1,230	114
Cold stores/refrigerated stores	1,310	122
Administrative and commercial buildings		
Civic offices, non air conditioned	2,410	224
Civic offices, fully air conditioned	2,770	257
Offices for letting, 5 to 10 storeys, non air conditioned	2,410	224
Offices for letting, 5 to 10 storeys, air conditioned	2,770	257
Offices for letting, high rise, air conditioned	2,770	257
Offices for owner occupation, 5 to 10 storeys, non air conditioned	2,410	224
Offices for owner occupation, 5 to 10 storeys, air conditioned	2,770	257
Offices for owner occupation, high rise, air conditioned	3,070	285
Prestige/headquarters office, 5 to 10 storeys, air conditioned	3,950	367
Prestige/headquarters office, high rise, air conditioned	4,830	449

for £ ÷ 64 (1.96)

	Cost DM per m²	Cost DM per ft²
Health and education buildings		
General hospitals	2,640	245
Teaching hospitals	2,510	233
Private hospitals	2,930	272
Health centres	2,190	203
Nursery schools	1,930	179
Primary/junior schools	1,930	179
Secondary/middle schools	2,260	210
University (arts) buildings	2,640	245
University (science) buildings	2,640	245
Management training centres	2,190	203
Recreation and arts buildings		
Theatres (over 500 seats) including seating and stage equipment	2,640	245
Theatres (less than 500 seats) including seating and stage equipment	2,860	266
Concert halls including seating and stage equipment	2,640	244
Sports halls including changing and social facilities	2,320	216
Swimming pools (international standard) including changing facilities	3,280	305
Swimming pools (schools standard) including changing facilities	3,280	305
National museums including full air conditioning and standby generator	2.640	245
Local museums including air conditioning	1,930	179
City centre/central libraries	2,350	218
Branch/local libraries	2,280	212
Residential buildings		
Social/economic single family housing (multiple units)	1,180	110
Private/mass market single family housing 2 storey detached/semidetached (multiple units)	1,230	114
Purpose designed single family housing 2 storey detached (single unit)	1,490	138
Social/economic apartment housing, low rise (no lifts)	1,310	122
Social/economic apartment housing, high rise (with lifts)	1,340	124
Private sector apartment building (standard specification)	1,290	120
Private sector apartment building (luxury)	1,820	169
Student/nurses halls of residence	1,410	131
Homes for the elderly (shared accommodation)	1,620	151
Homes for the elderly (self contained with shared communal facilities)	1,620	151
Hotel, 5 star, city centre	2,990	278
Hotel, 3 star, city/provincial	2,480	230
Motel	1,310	122

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Building categories in Davis Langdon EU handbook

- **Industrial**
- **Administrative and commercial**
- **Health**
- **Education**
- **Recreation**
- **Arts**
- **Residential**

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Design and specification variables in the Davis Langdon data

- For rent / owner occupation
- Intensity of use
- Storey heights
- No’s of storeys
- Air-conditioned / heating only
- Standard / prestige
- Special requirements
- Etc.

BWA
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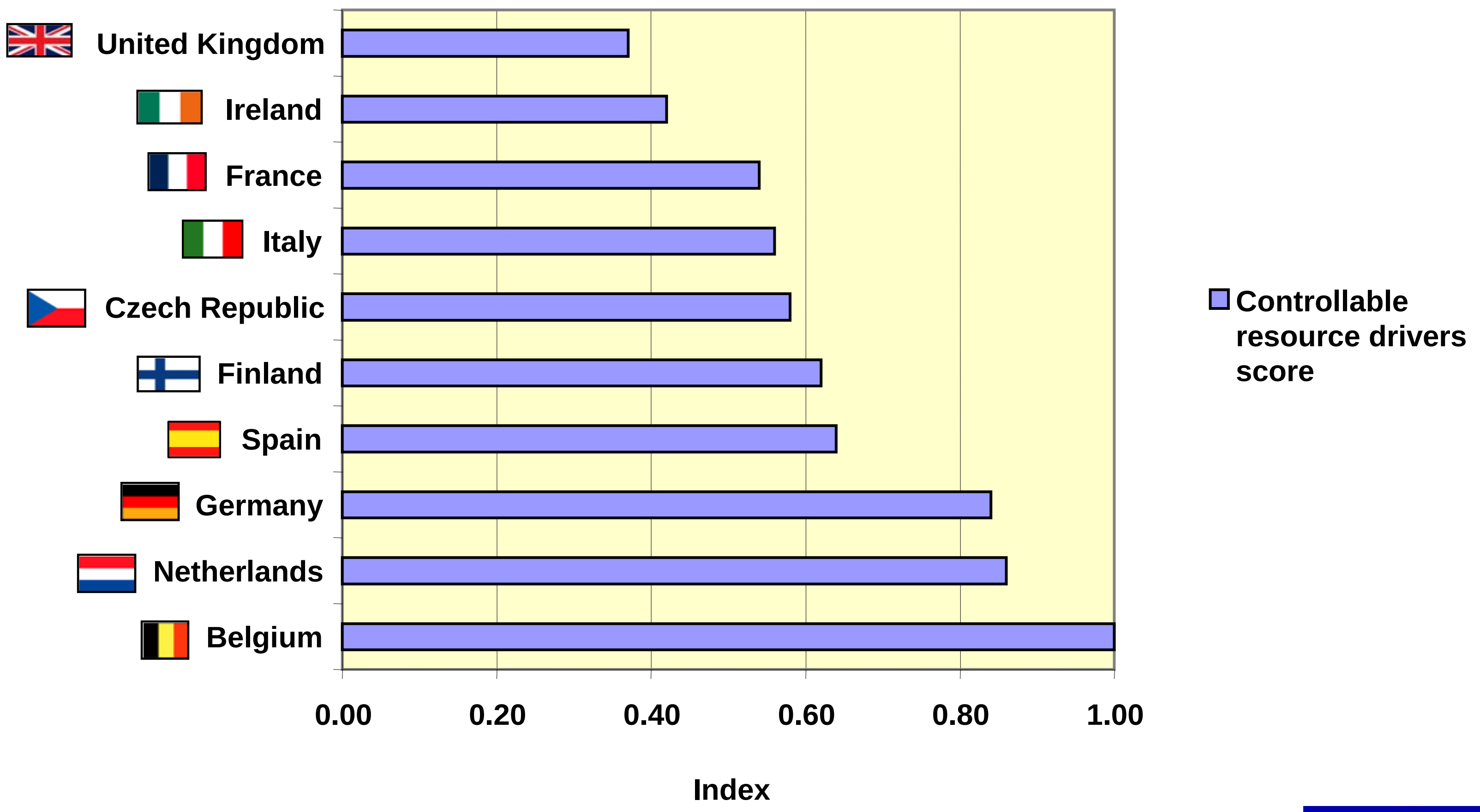
Project analysis index – m2/site hour *normalised across all building types*



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On-site /Off-site Syndrome

- **N.b. different proportions of site labour/ component costs depending on construction regime**

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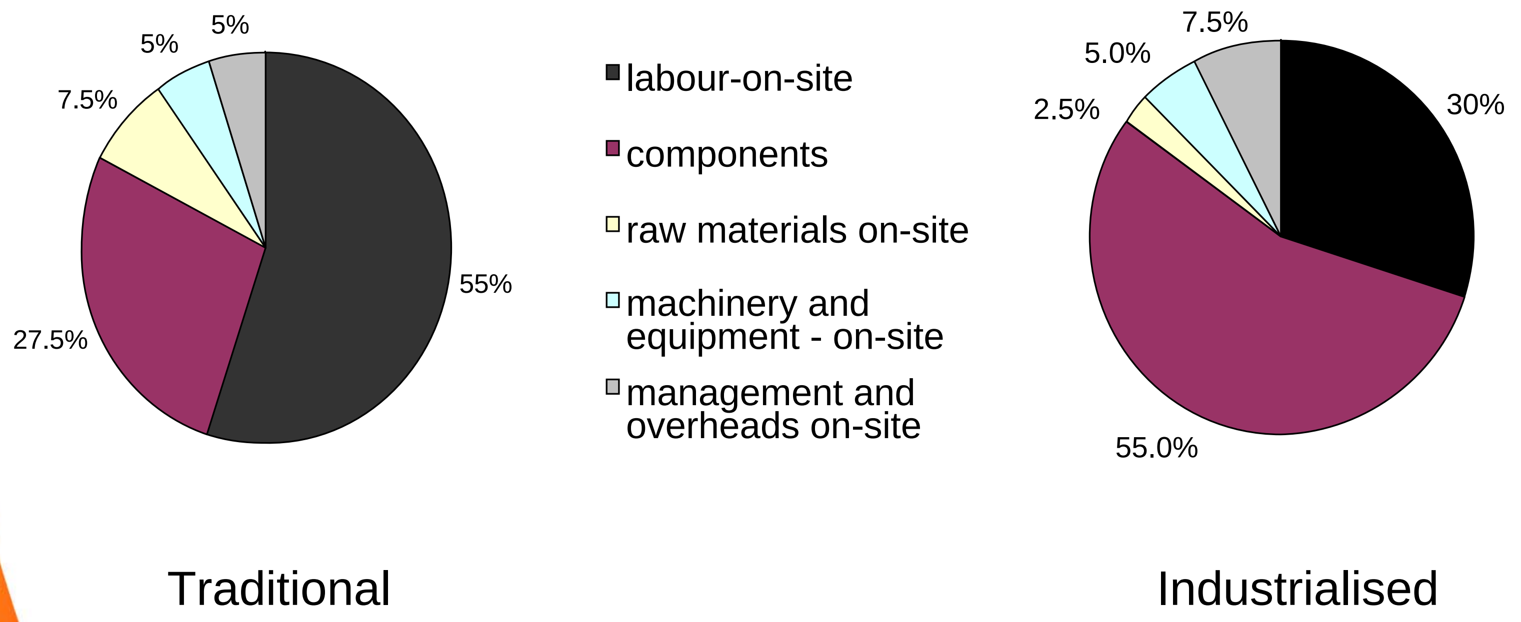
Distribution of construction resources

– traditional v industrialised process: on-site costs v component costs



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On-site/off-site labour costs

Average all-in cost in € per hour		
	Construction	Manufacturing
Country	Spons 1999	Cologne Institute 1999*
Belgium		
Average	27.71	21.84
Netherlands		
average	25.18	20.36
Germany		
average	27.61	20.45
Spain		
average	12.02	13.77
Finland		
average	15.11	21.72
Italy		
average	18.30	15.39
France		
average	17.81	18.50
Ireland		
average	15.57	14.27
United Kingdom		
average	16.57	18.62
Denmark		
average	27.81	23.75
Norway		
average	26.75	26.35
Sweden		
average	23.28	20.65
Czech Republic		
average	2.21	3.26

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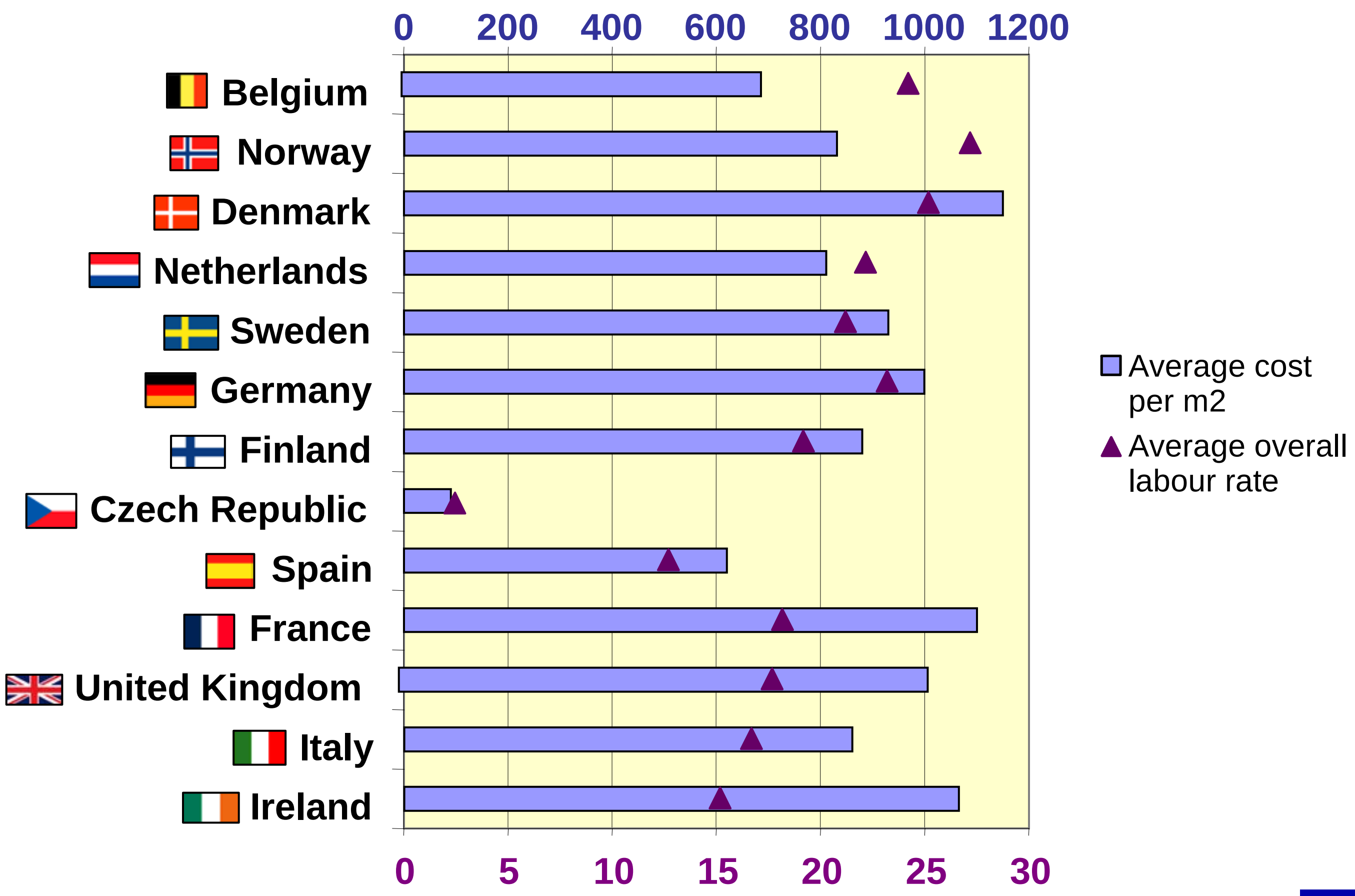
Project costs/m2 and hourly – (on/off-site mix) cost of labour



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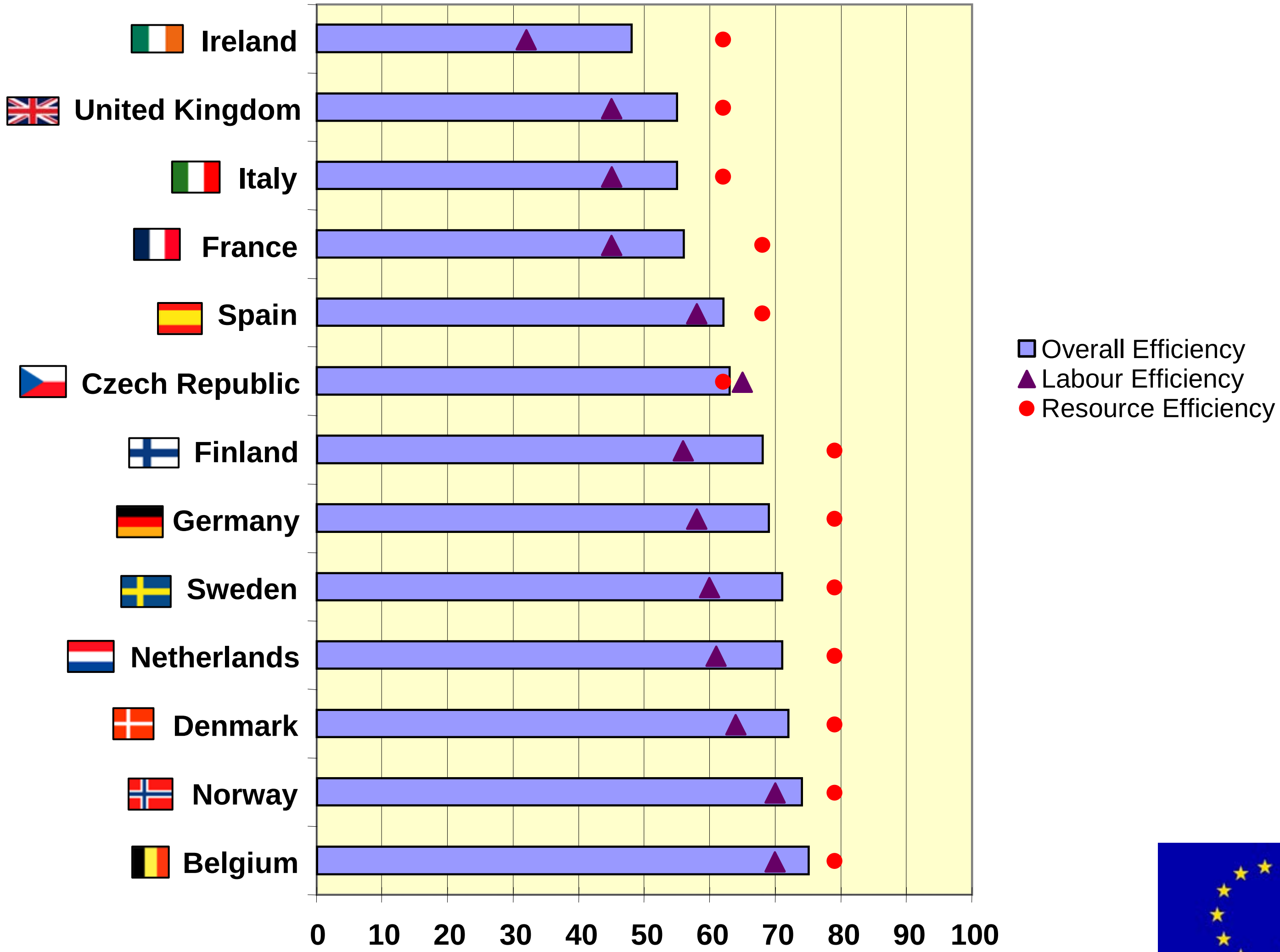
Stage 4: merged indexes – desk research v project analyses



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Performance characteristics of apparent best-in-class - *materials*

- Substantial off-site pre-fabrication
- Highly mechanised site distribution
- 'Just-in-time' delivery of materials and components : on- and off- site
- Low levels of material wastage
- Investment in Research and Development

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Performance characteristics of apparent best-in-class - *workforce*

- **Well paid site workforce**
- **Well trained site workforce**

N.B. Skilled at managing the more complex interfaces in MMC

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Performance characteristics of apparent best-in-class – *procurement process*

- Good logistics
- Flexible relationships between designers/clients and constructors
- Single-point responsibility
- N.B. Decennial project insurance model – Belgium

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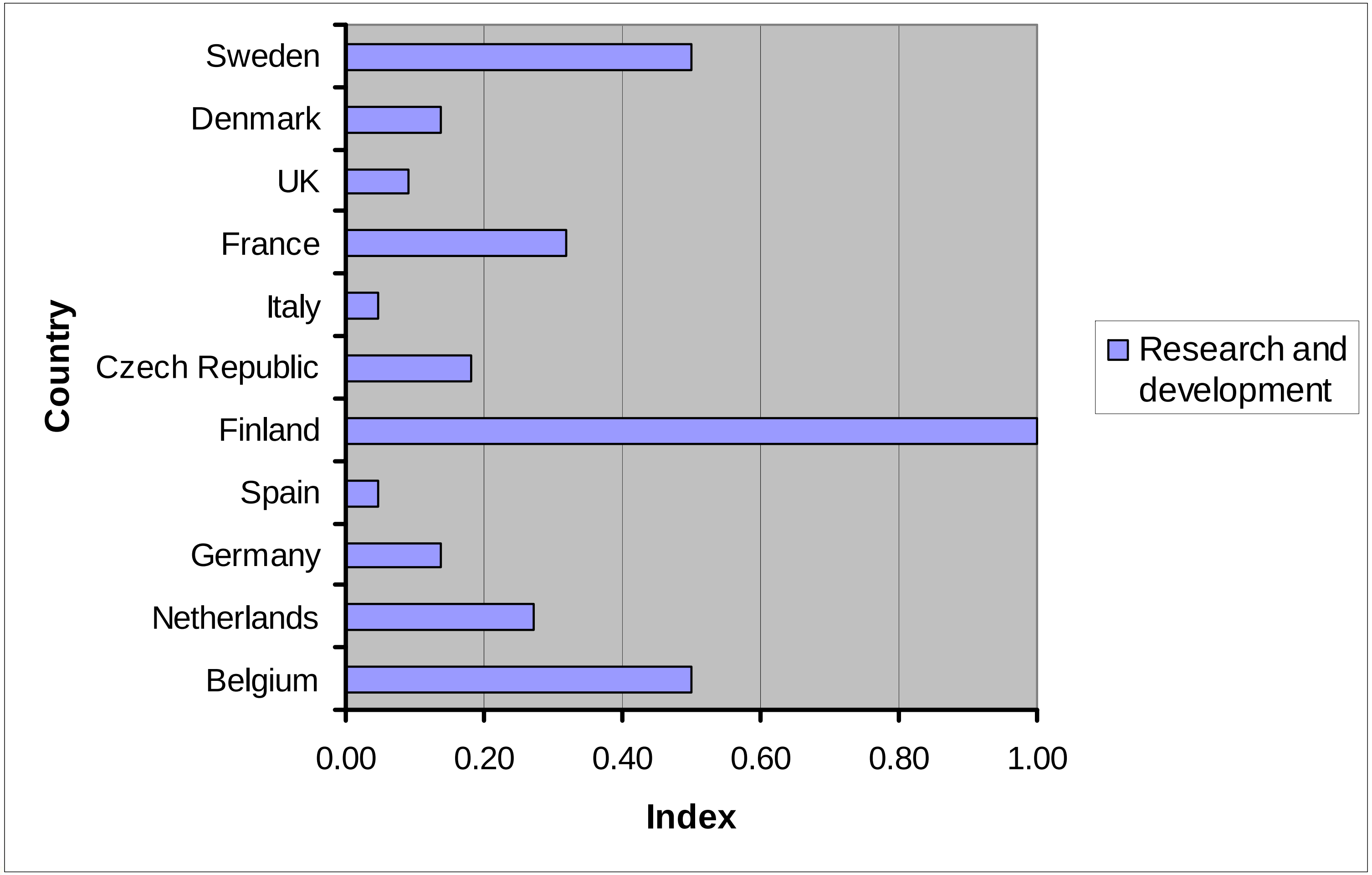
R & D investment



What the papers (and interviewees) said

- There follow a few pertinent extracts from the literature review and interviews with industry experts.
- The country rankings in the peer group efficiency table are in parenthesis.
- There was something to say about each country – but not enough time!

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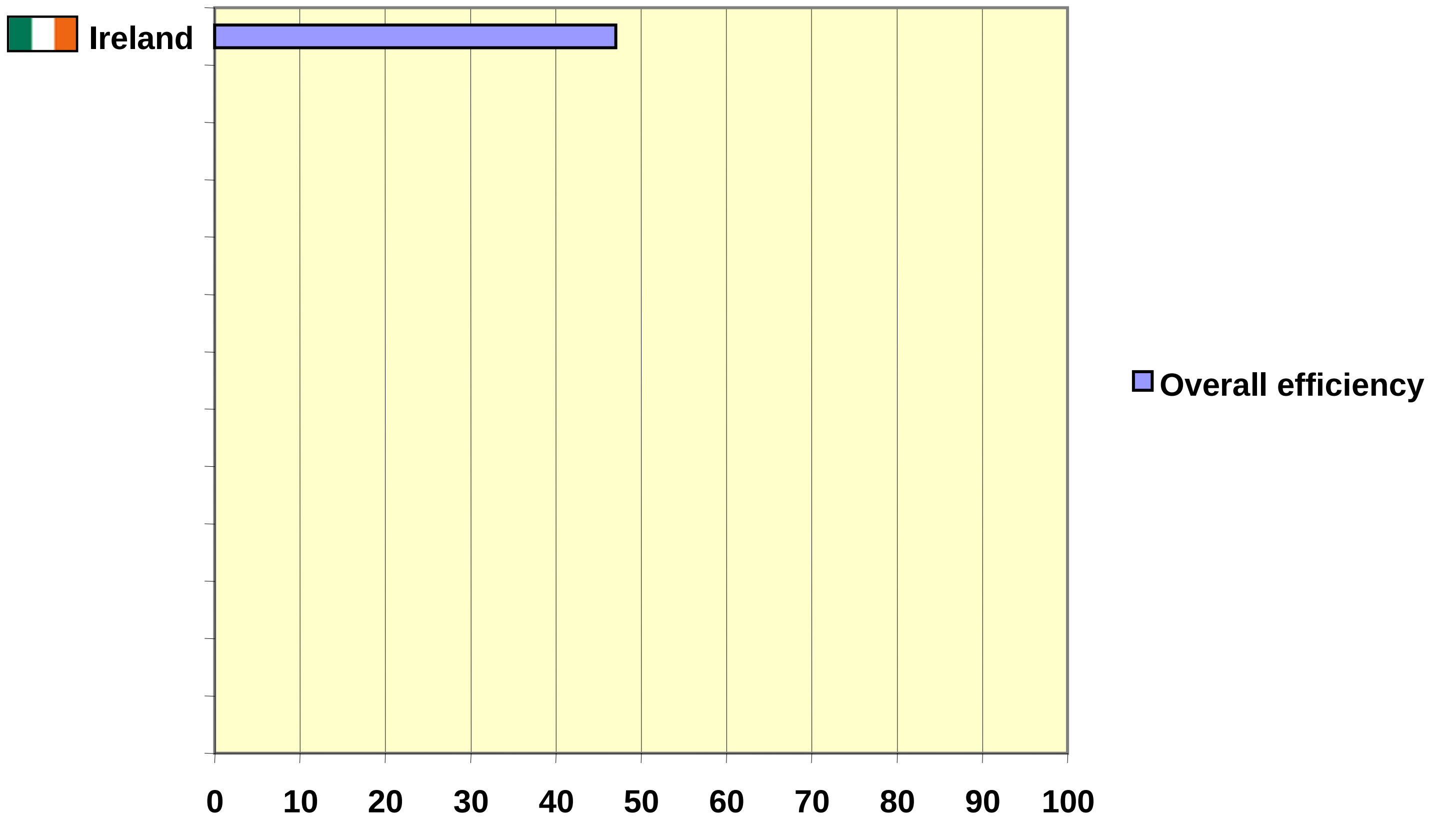
Results : The resource-use benchmarking index



Ireland – 48%

- ‘the architects read the UK journals’
- ‘Craft form of production is less productive and slower, needs control of output of labour and is relatively indifferent to quality and maintenance.’
- ‘Unpredictable level of skills’
- ‘Shortage of skilled manpower at all levels’

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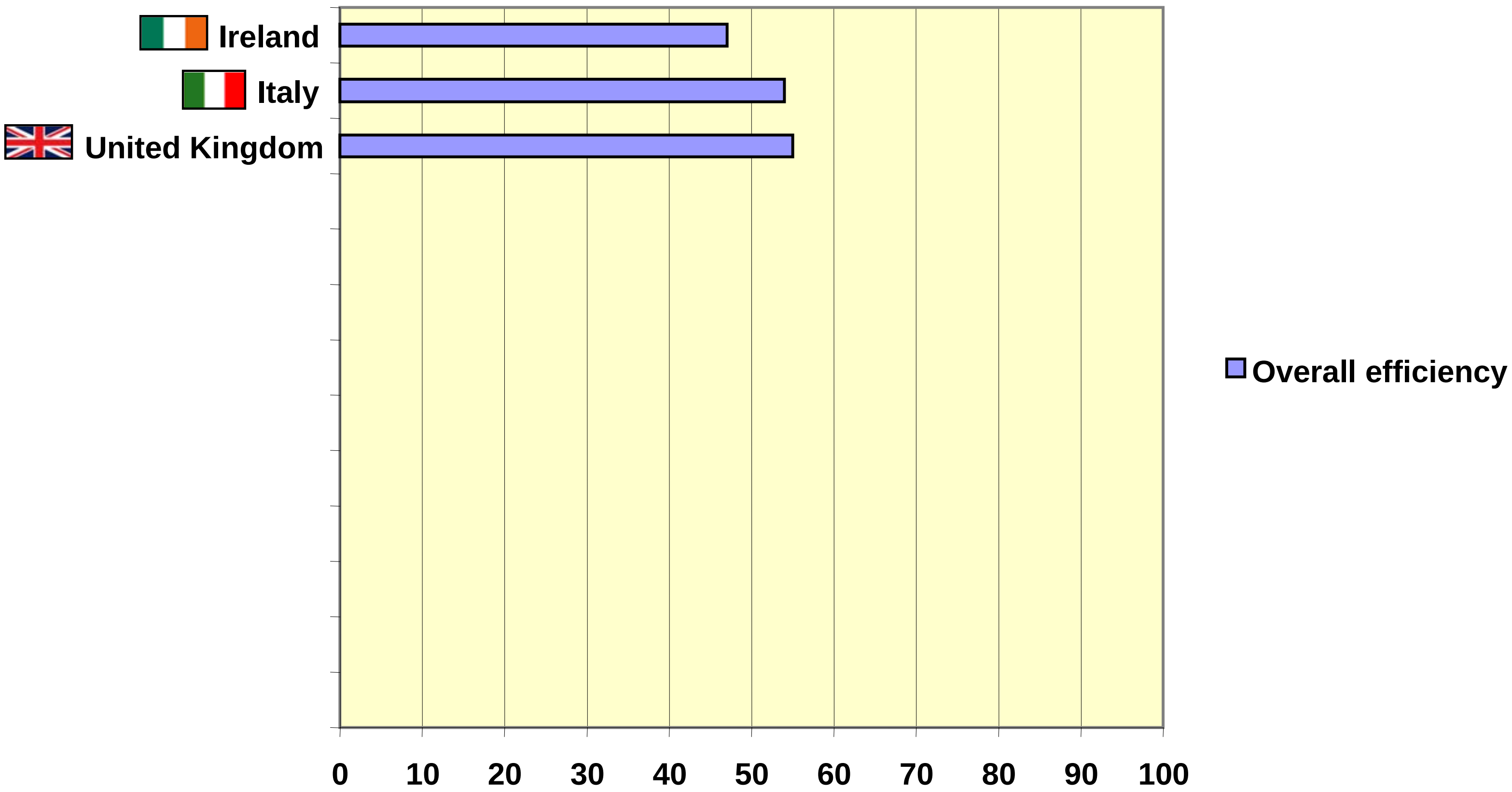

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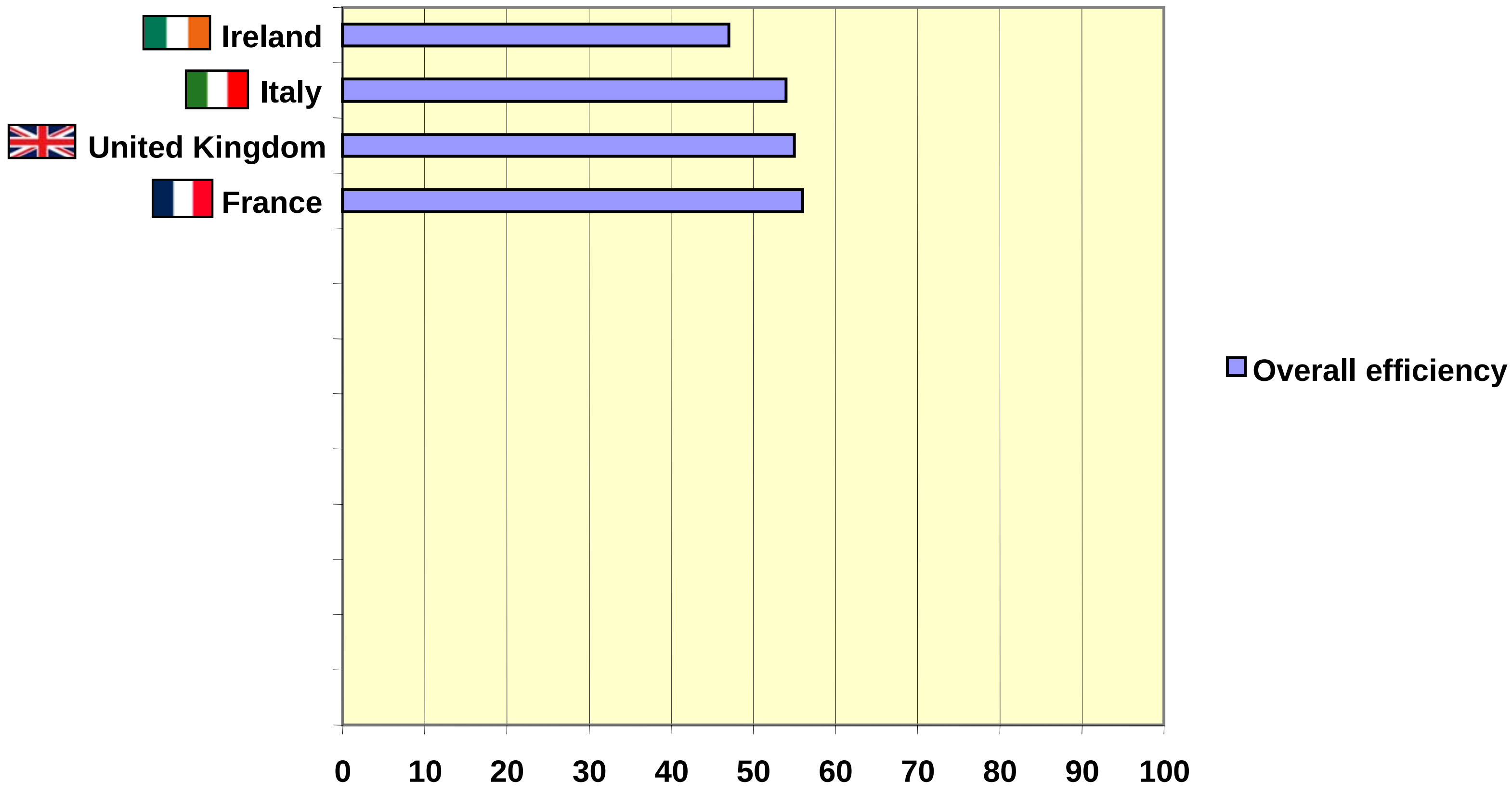
UK – 55%

- **‘One of the lowest investors in R&D and training – exacerbated by extensive sub-contracting’**
- **‘Compared with 12 major Far Eastern countries, including Australia and New Zealand, UK performance was the worst except for Vietnam’**
- **‘Low labour rates and efficiency do not go together’**
- **‘UK system kills innovation – Belgian system *fosters* innovation’**

Results : The resource-use benchmarking index



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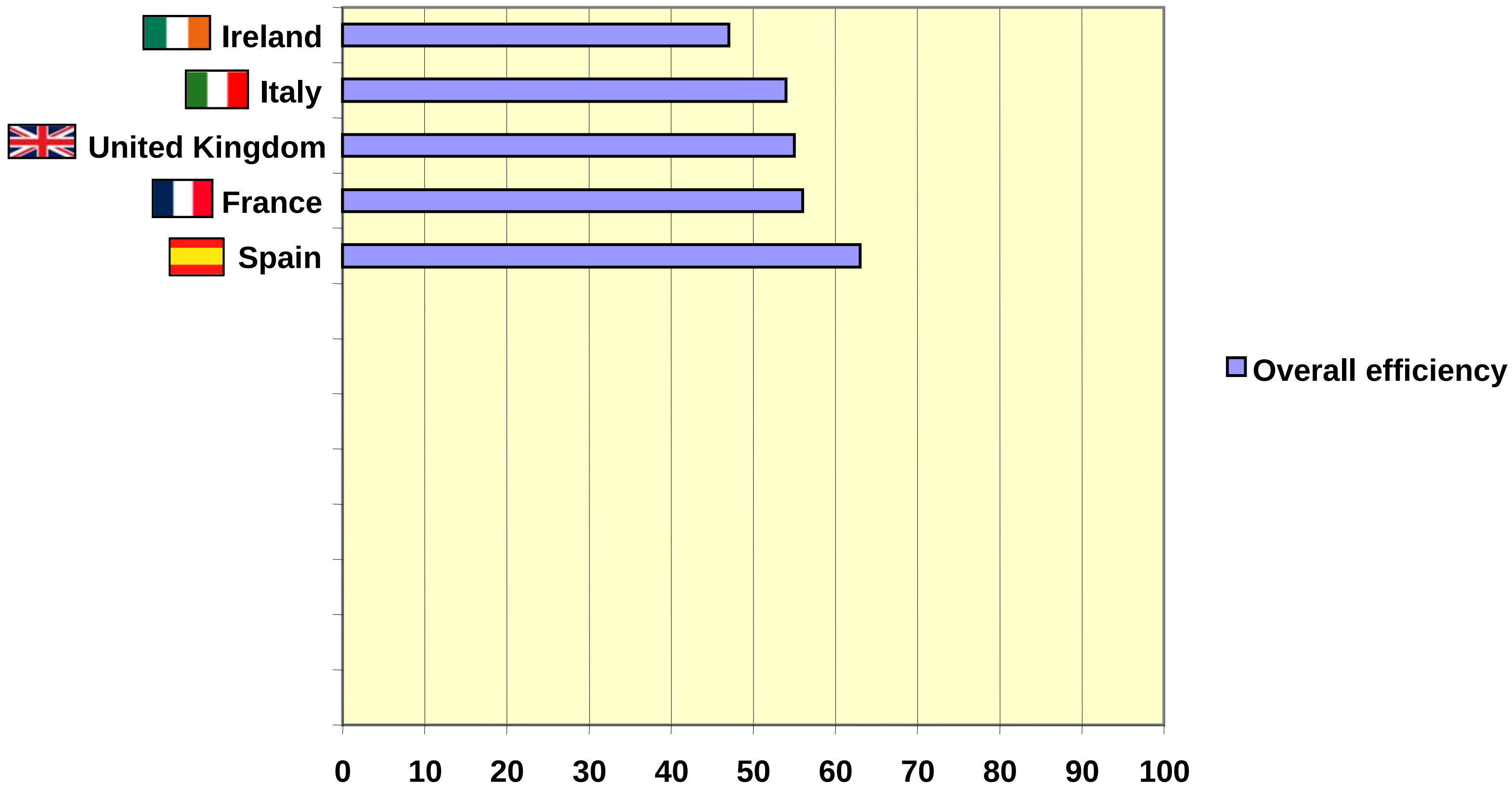

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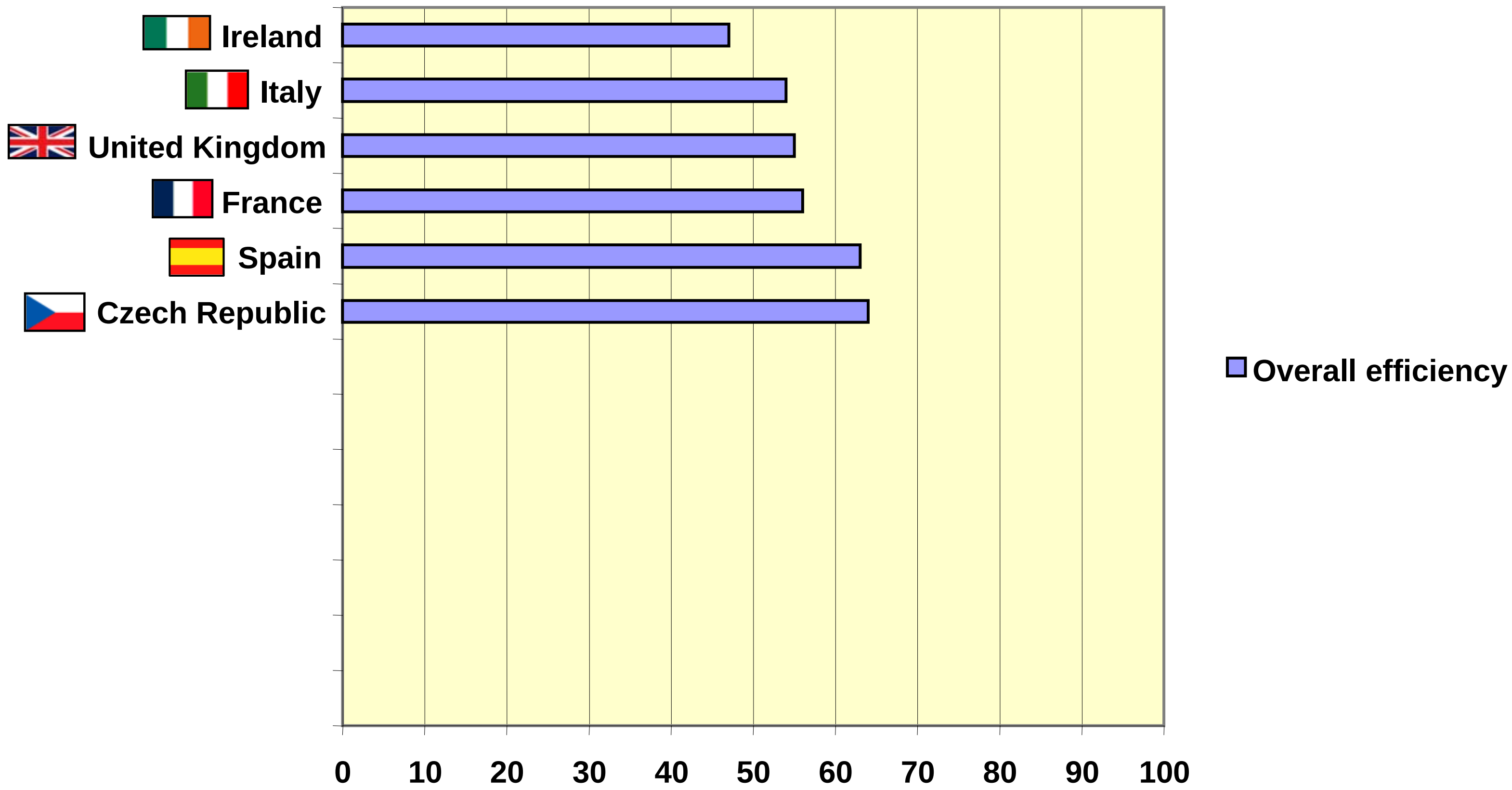

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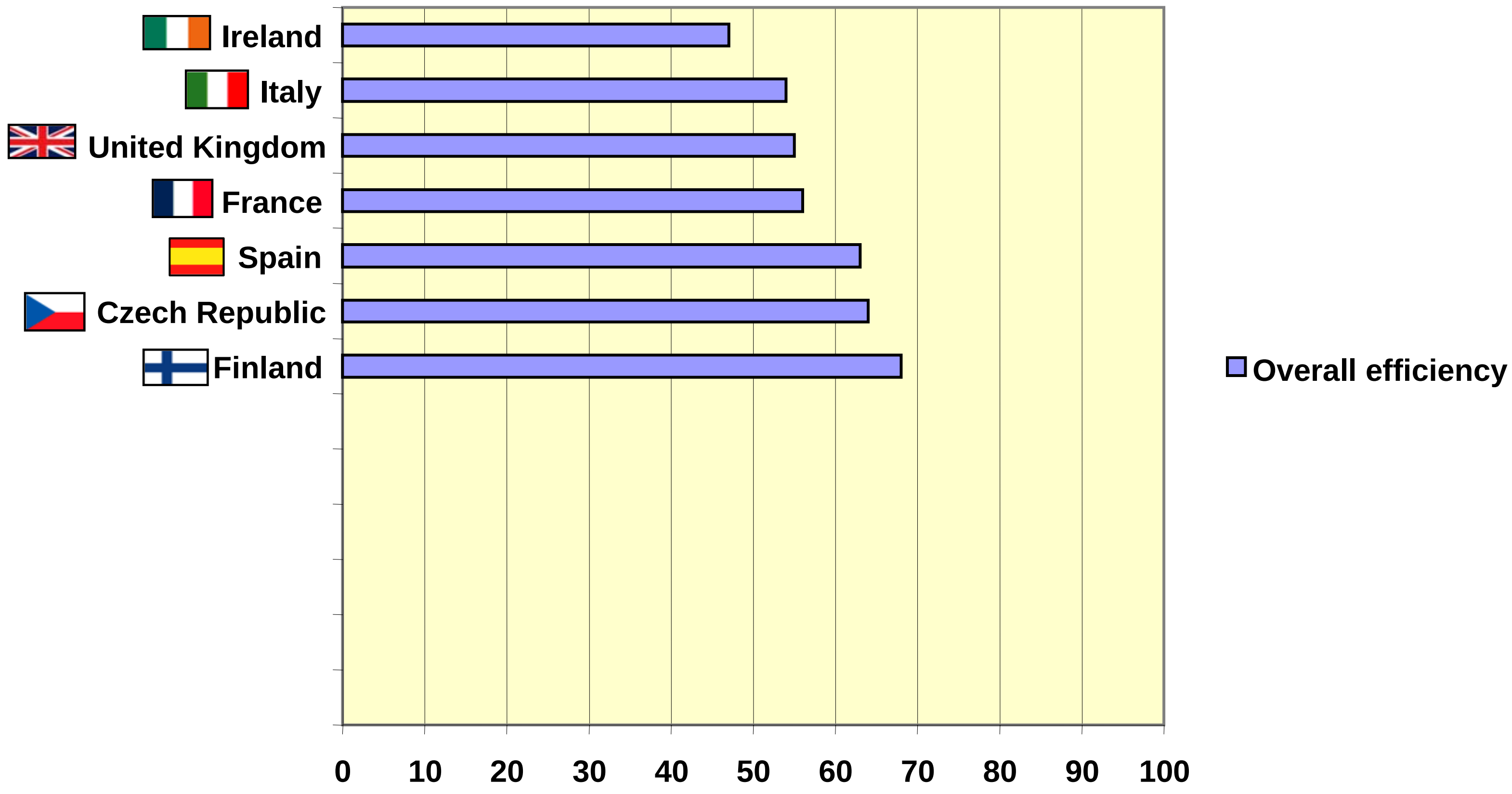

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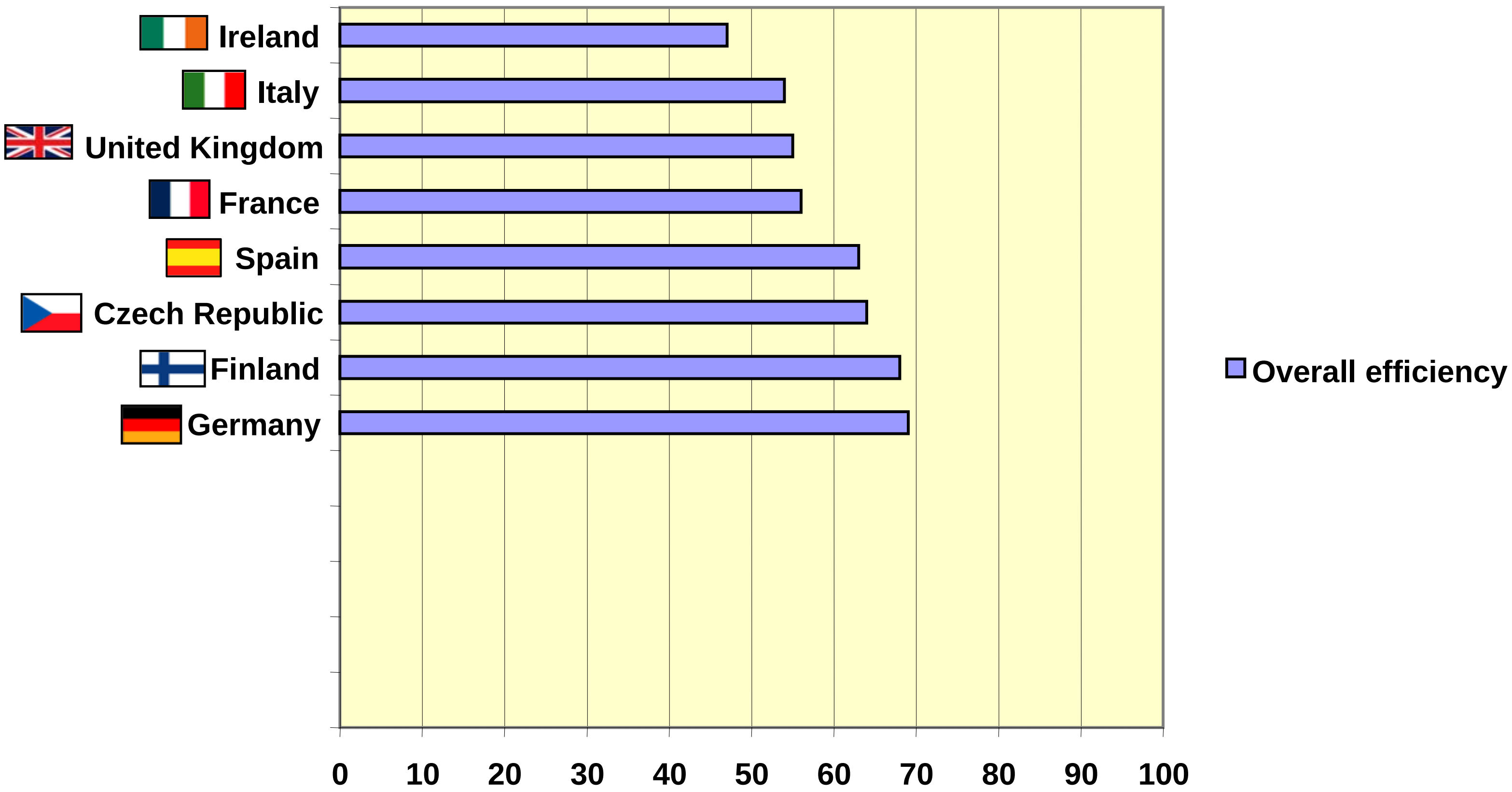

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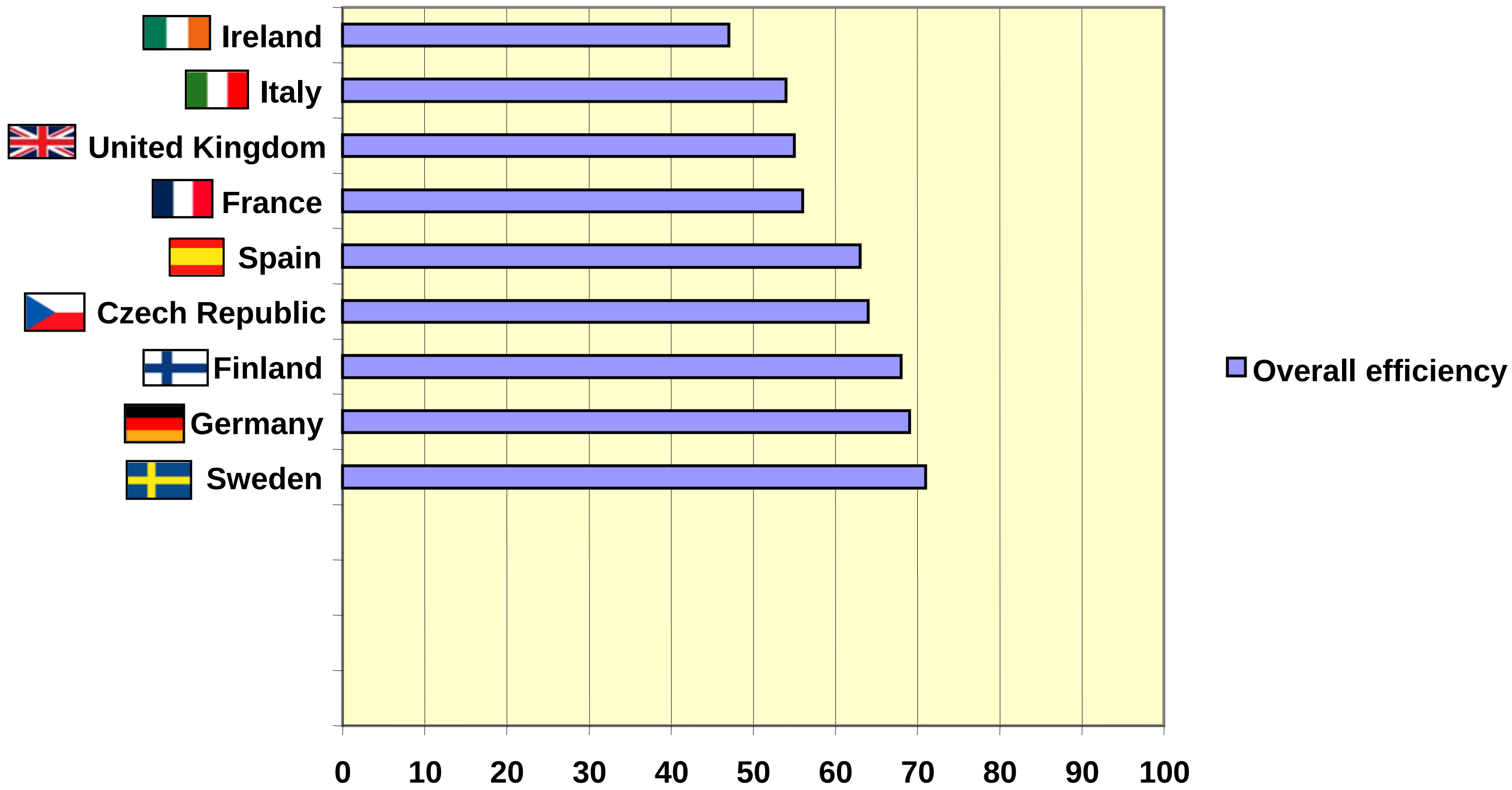

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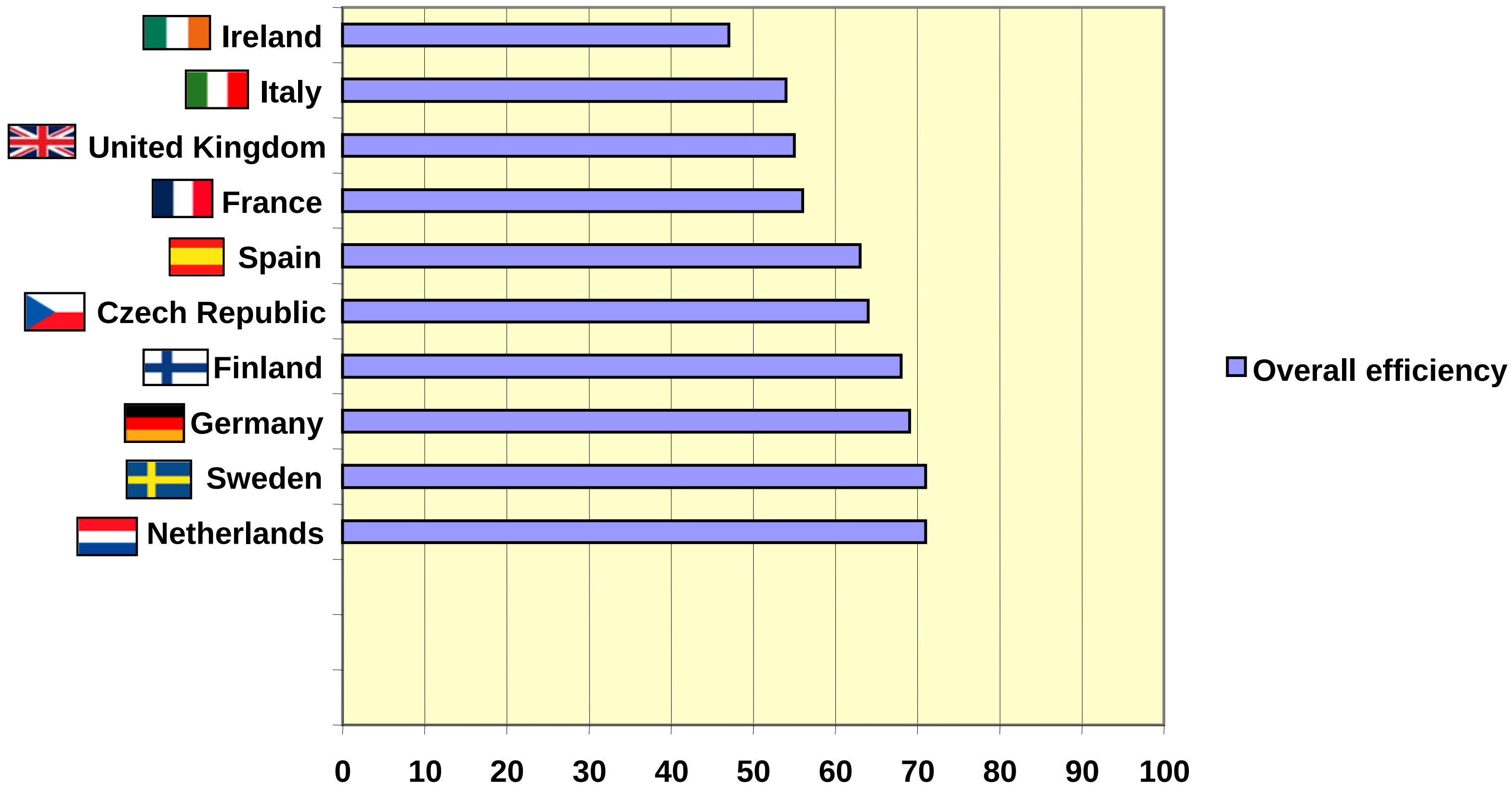

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The Netherlands - 71%

- ‘Highly industrialised with a lean management system’
- ‘The bricklayer’s hod is now a museum piece’
- ‘Health and safety regulations are strictly applied’
- ‘Their project was completed in 66 weeks- the UK equivalent took 102 weeks and cost 30% more’
- ‘The ultimate in rationalisation – very much quicker and cheaper to build’
- ‘High level of training - well paid and good conditions’
- ‘Ordered and rigid’

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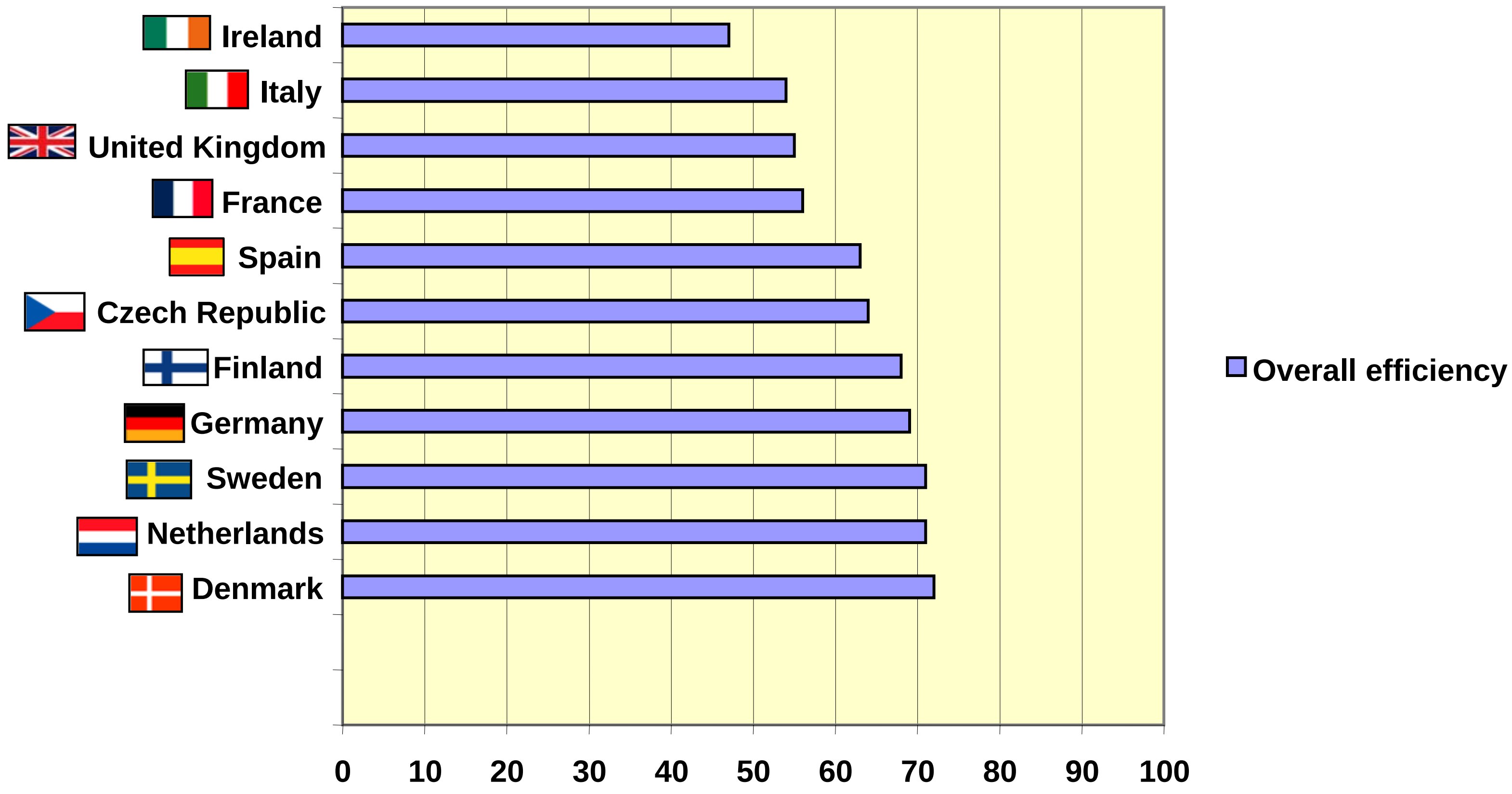

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Denmark - 72%

- ‘There was an abrupt end to the project- all final trades finished together’
- ‘The Danes have a lean, efficient industrialised construction industry.….significantly more demanding in terms of skill and training but a more productive and speedier process’
- ‘Materials costs are very high’
- ‘Small firms invest as much in training as the large ones’

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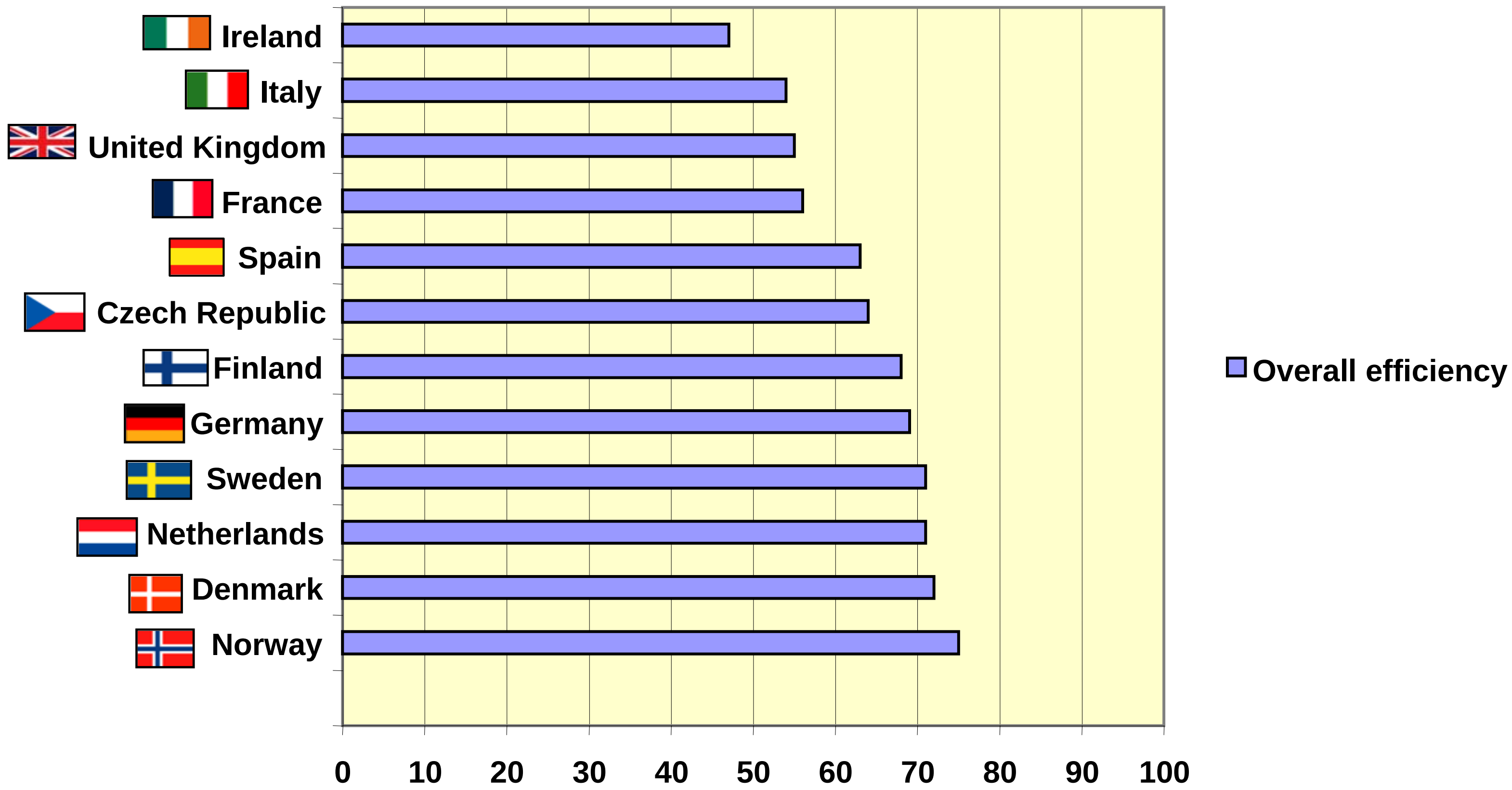

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Norway - 75%

- **‘Norwegian companies struggle to get the labour they need in boom periods; they make extensive use of migrant labour’ (*but then, so does nearly everyone else!* BW)**
- **‘The most efficient companies pay high wages and their workers work long hours’**
- **‘They are highly industrialised and do not sub-contract extensively’**
- **‘Norway (and The Netherlands, Sweden and Denmark) have the largest number of workers in continuing training schemes – 60% - 90% of all workers are considered to be skilled workers’**

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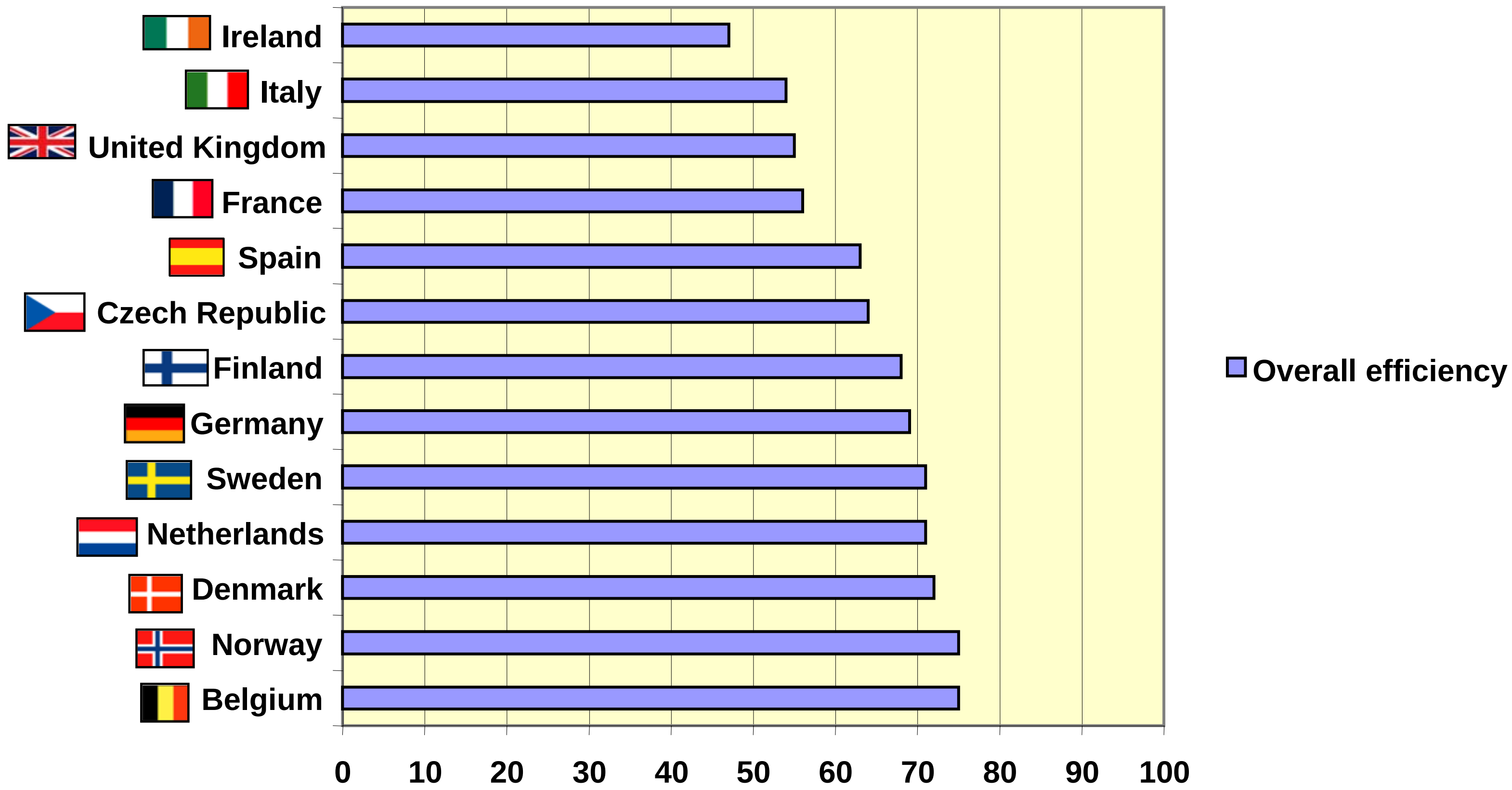
Results : The resource-use benchmarking index



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Belgium - 75%

- ‘They have an incredibly industrious, well-trained, well-paid workforce that is predominantly skilled; they look after themselves on site and don’t need labourers to fetch and carry for them.’

- ‘1500 m2 every 4 days with just 5 men on the site – staggering!’

- ‘Chaotic and flexible’

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Conclusions – technological issues 1.

- **Procurement and indemnity processes which facilitate off-site fabrication / site mechanisation (MMC) afford the best opportunity to optimise efficiency of resource usage.**

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Conclusions – technological issues 2.

MMC

- accelerates the learning curve
- optimises on-site labour efficiency
- involves constructor in design process
- reduces risks to health and safety on site
- reduces on-site man-management time
- reduces waste/breakage/theft of materials
- reduces proliferation of materials (catalogues)
- reduces proliferation of unnecessary details
- better quality assurance (factory control)
- more efficient use of transport (n.b. sustainability

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