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EDUCATING UNIVERSITY STUDENTS FOR INNOVATIVE SOCIETIES

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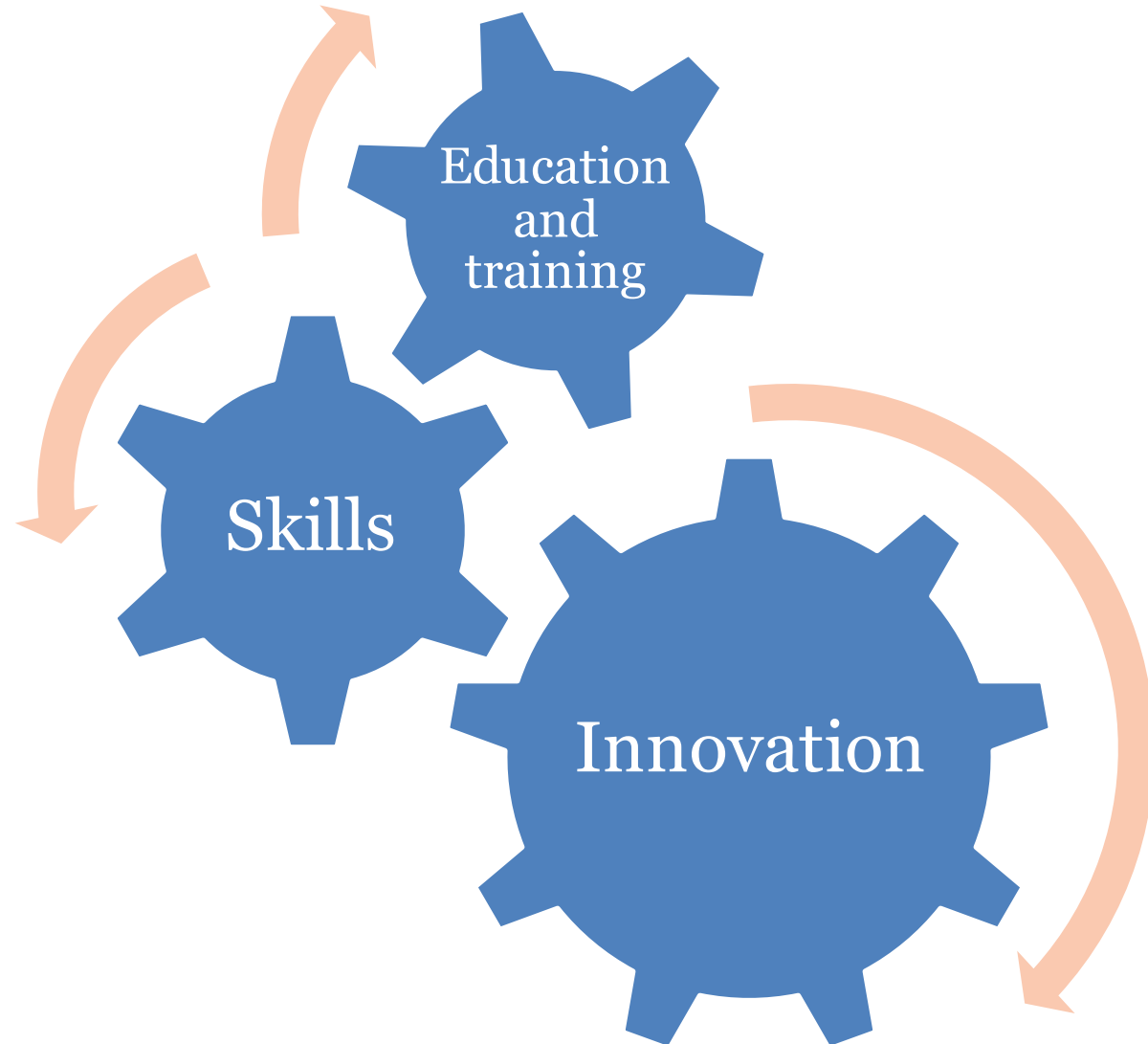
Organisation for Economic Co-operation and Development (OECD)

- 35 Members
- Coverage of most sectors of government
- What the OECD does in education (including HE):
 - International statistics
 - Policy advice
 - International peer learning
 - Soft standards



Skills and education for innovation

« 21st Century Skills »

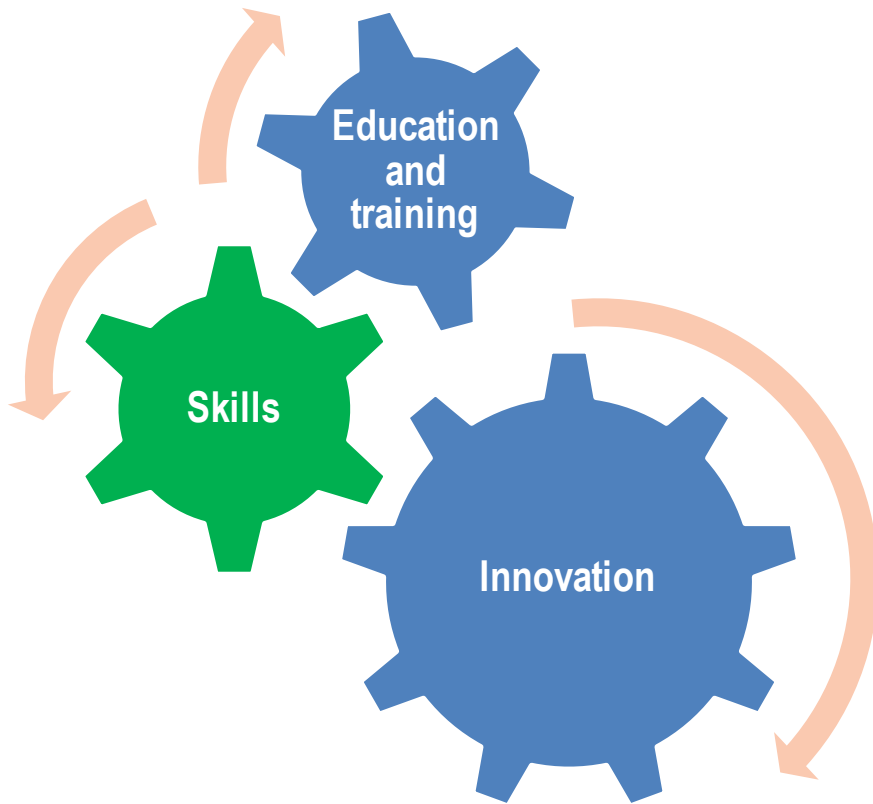




qualifications and degrees for innovation



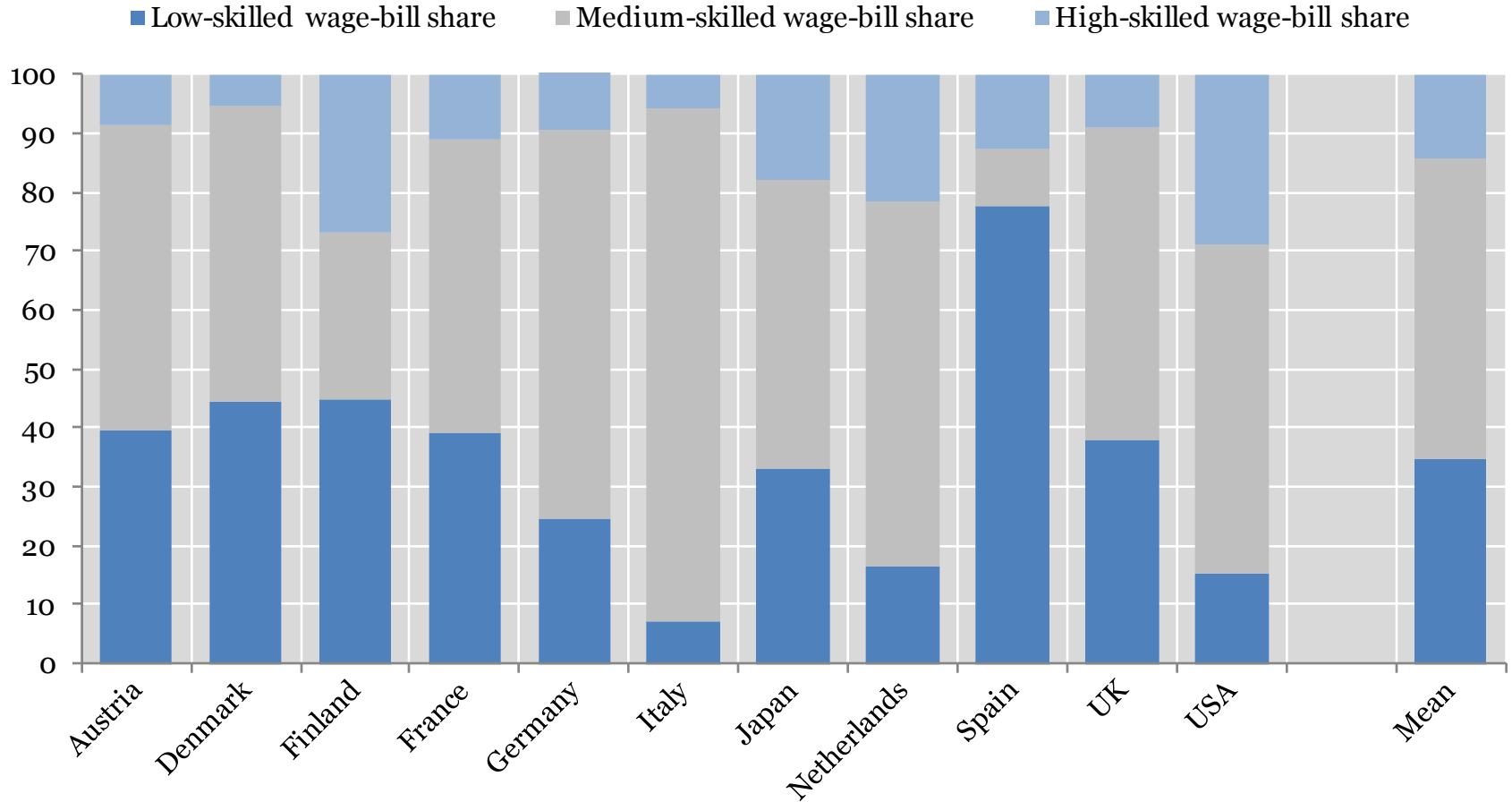
Qualifications and degrees for innovation



- What educational attainment?
- What qualifications/degrees are associated with innovation in the economy?
- Creative destruction and lifelong skill development?

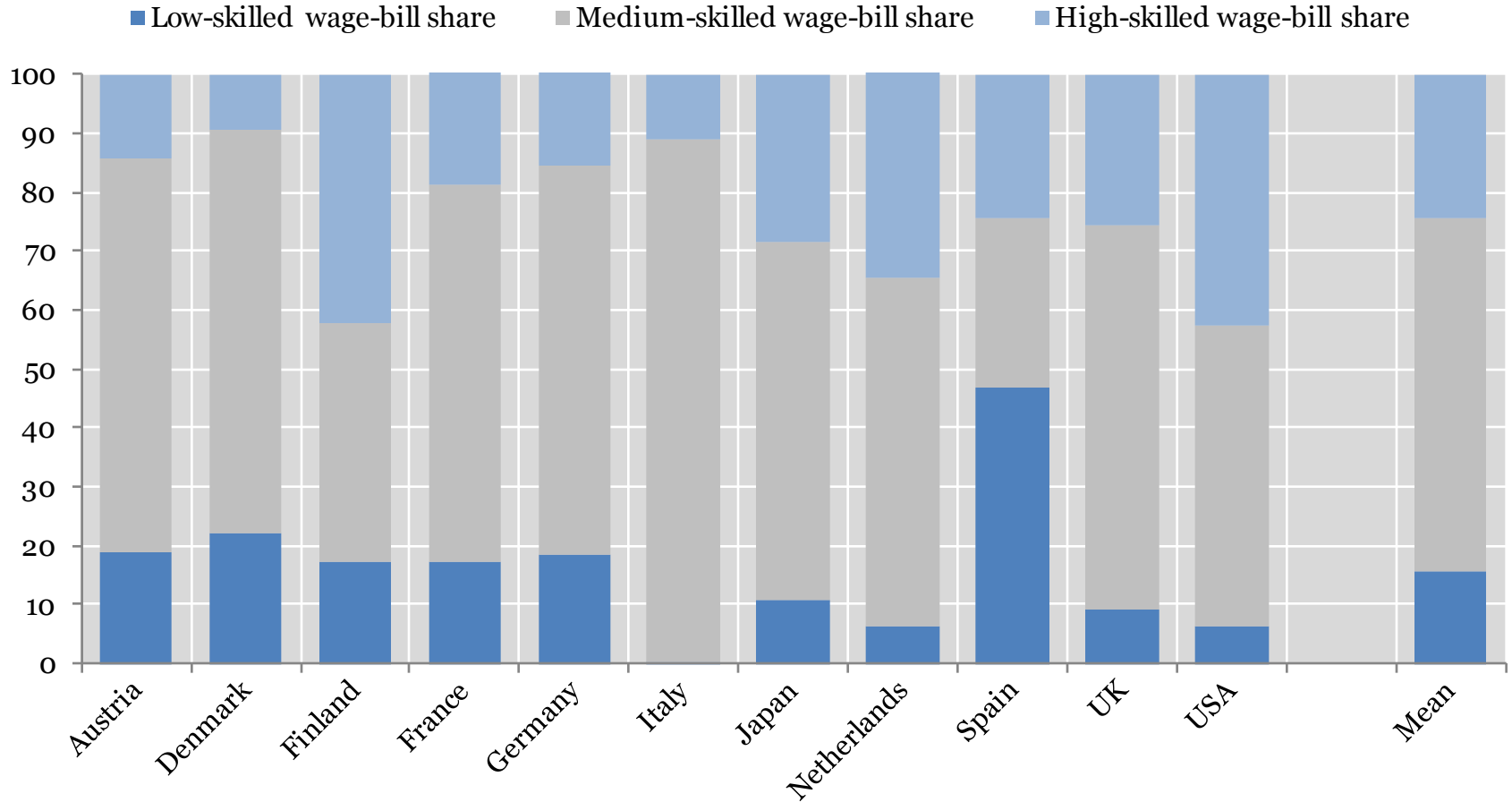


Employment structure in selected countries in 1980



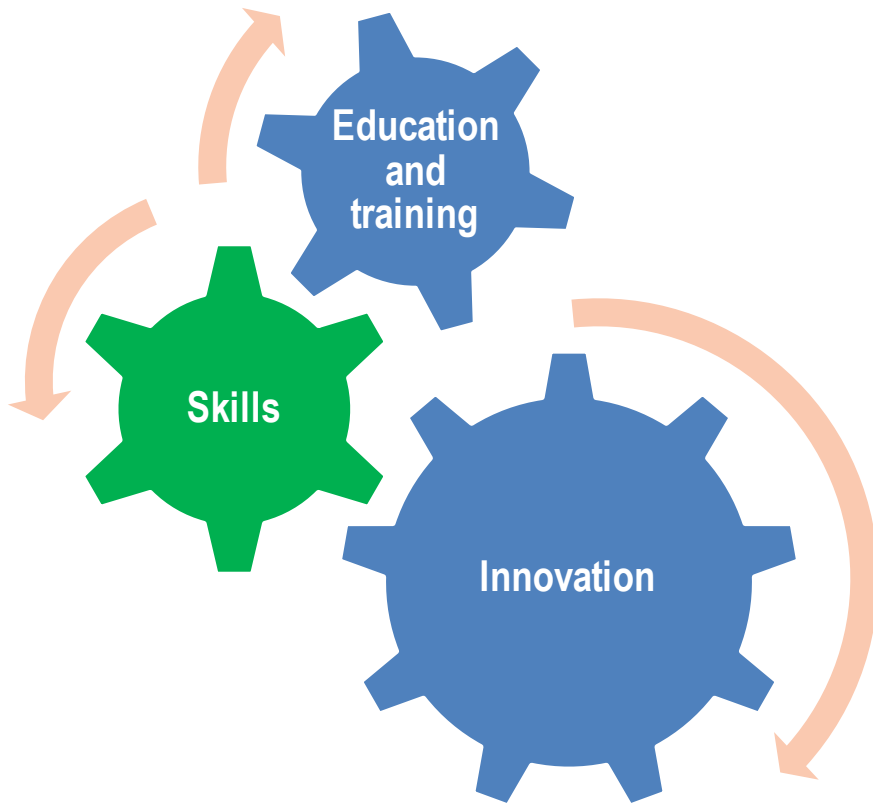


Employment structure in selected countries in 2004





Qualifications and degrees for innovation



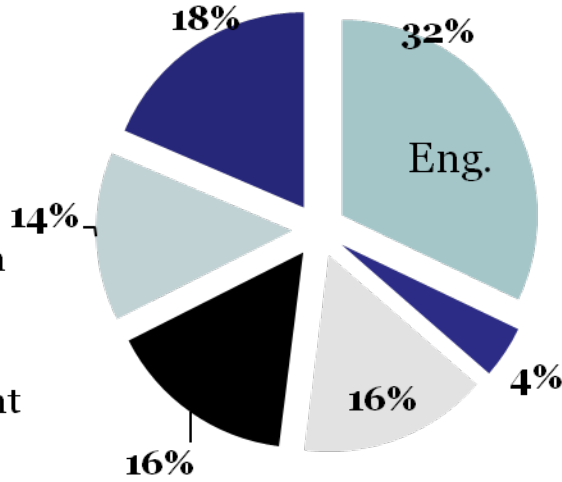
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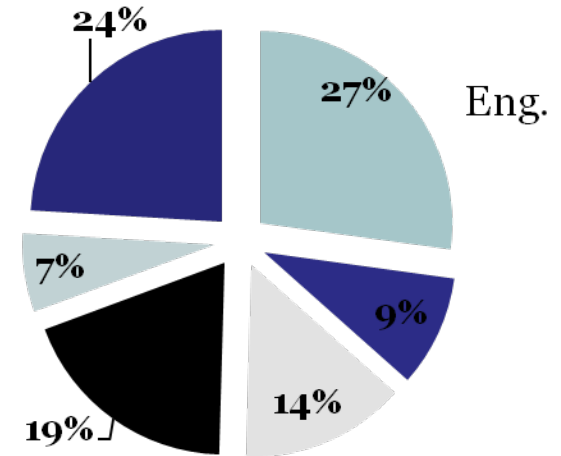
Diversity of qualifications for innovation across sectors

Mining

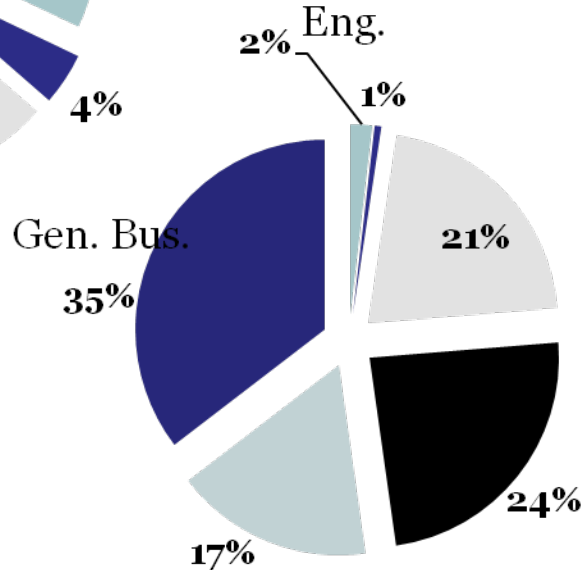
- Engineering
- Scientific
- Marketing
- Information technology
- Product management
- General business



Electricity, Water, Gas

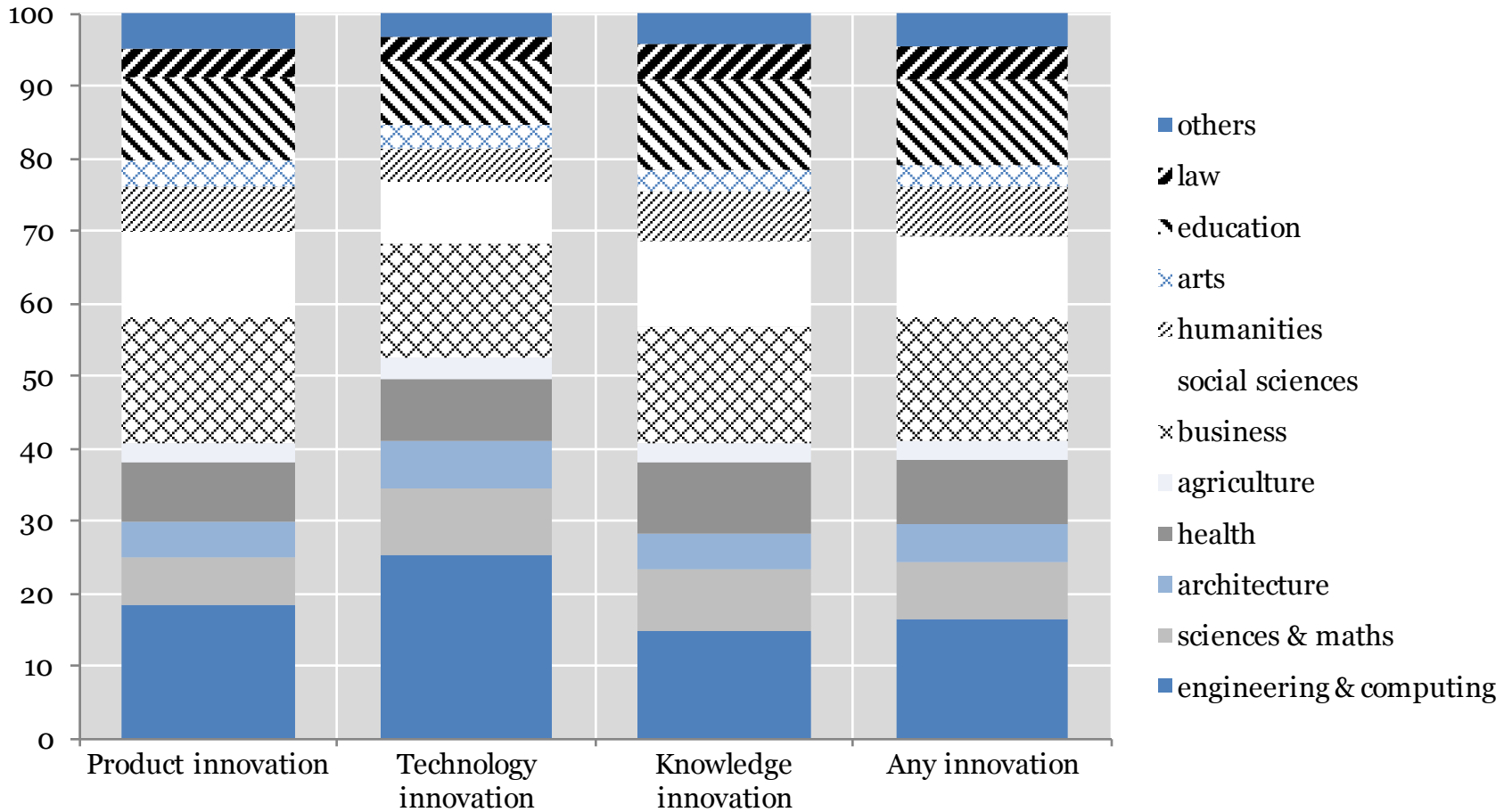


Finance and insurance



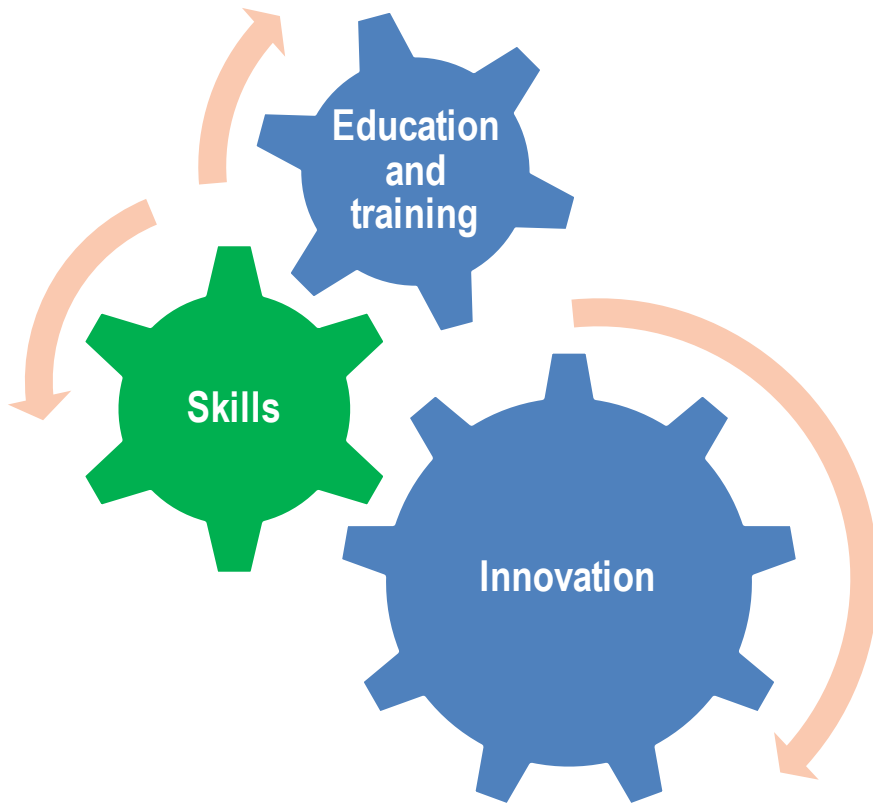


Fields of study of highly innovative professionals (%), by type of innovation





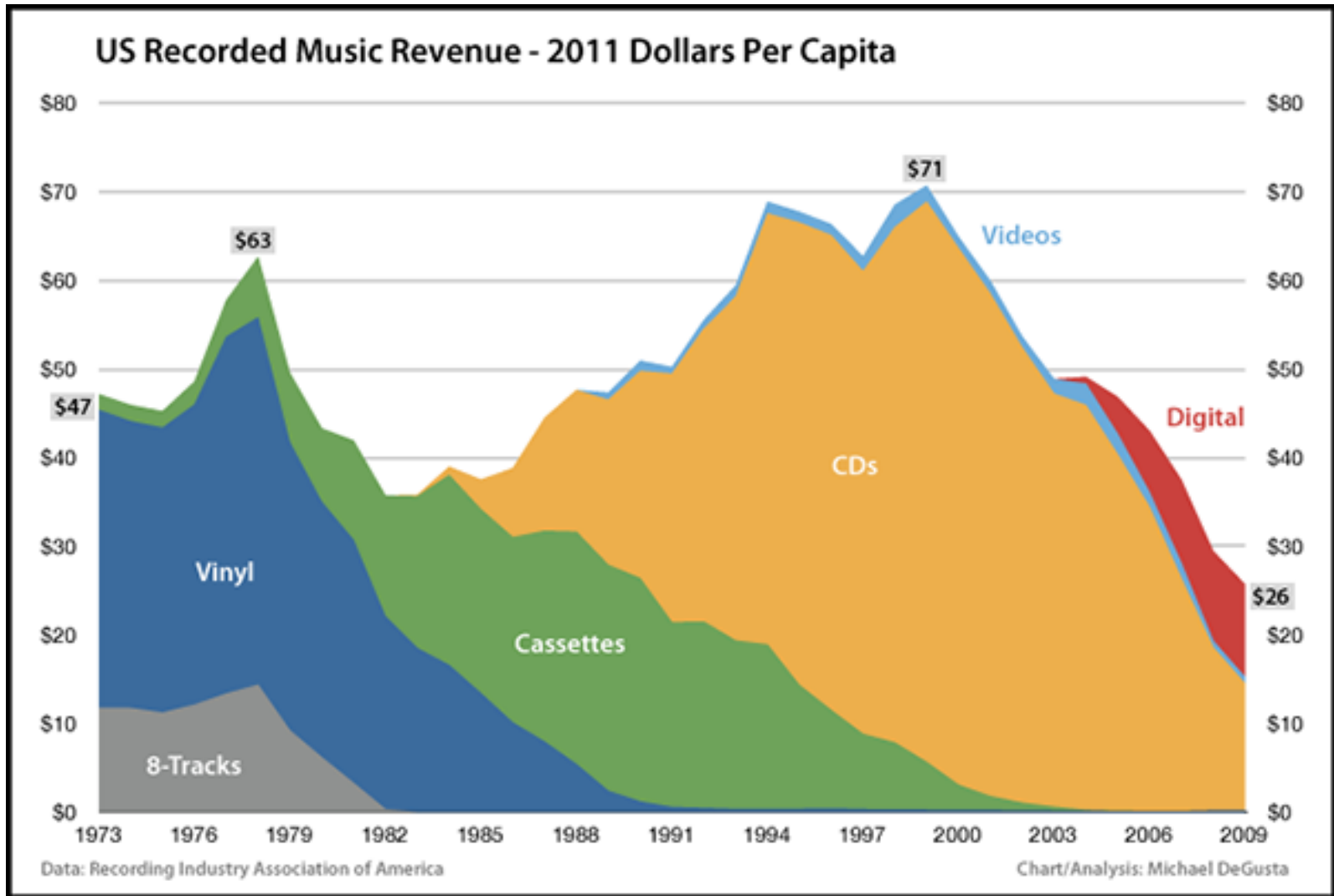
Qualifications and degrees for innovation



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Creative Destruction



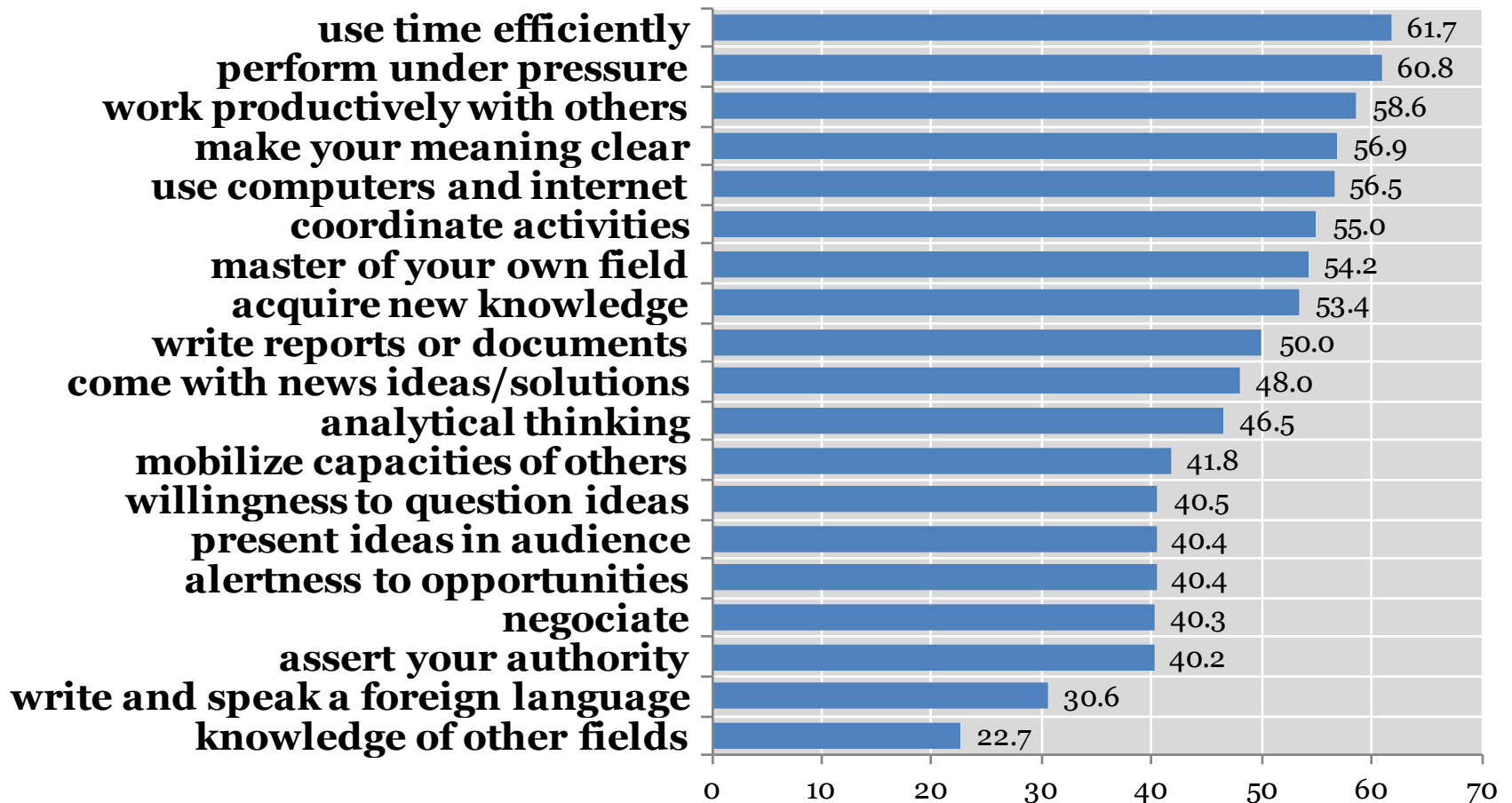


skills for innovation



Skills that tertiary-educated professionals report as very important in their job

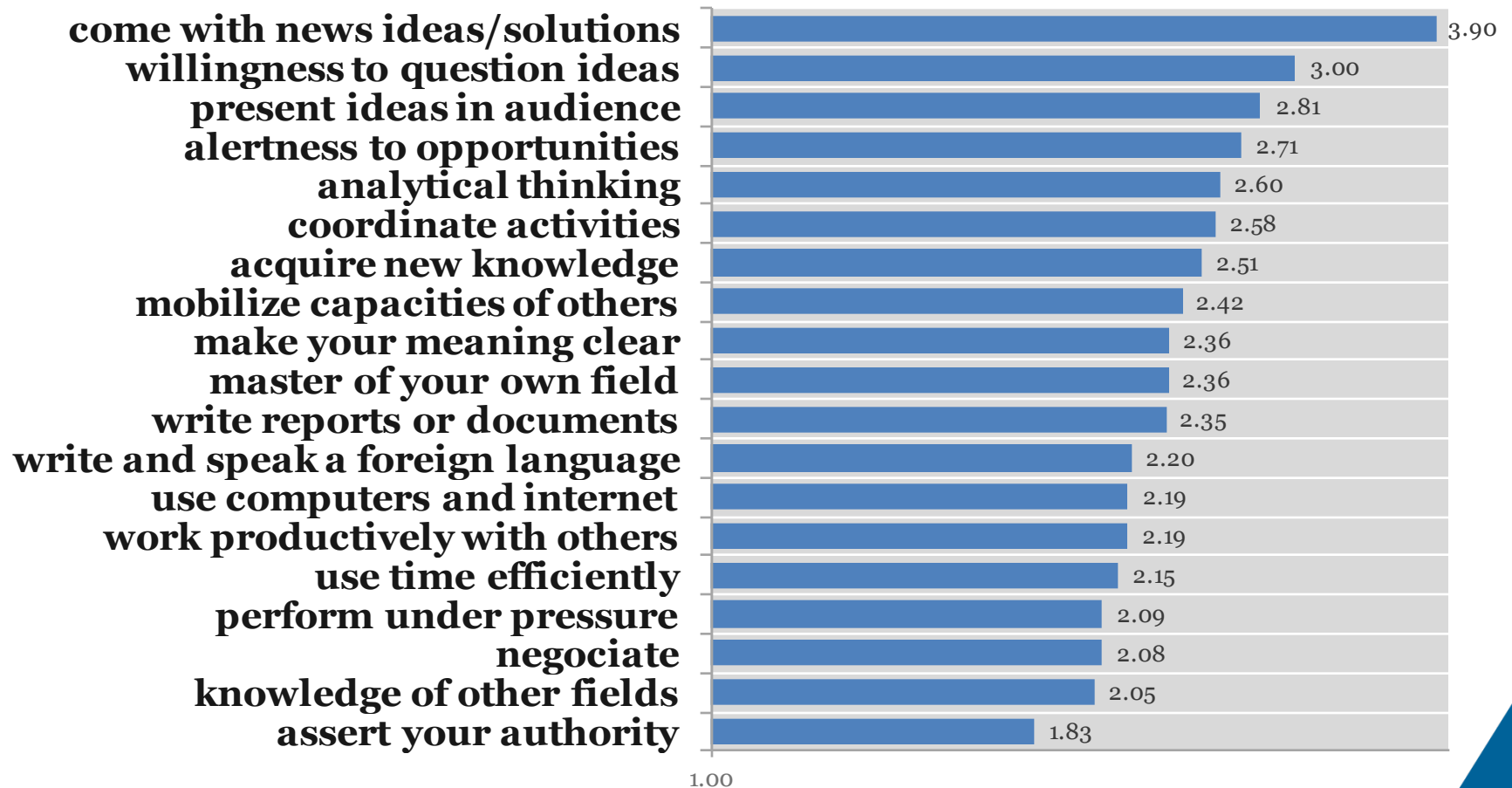
Percentage of employees reporting the following skills as very important in their job





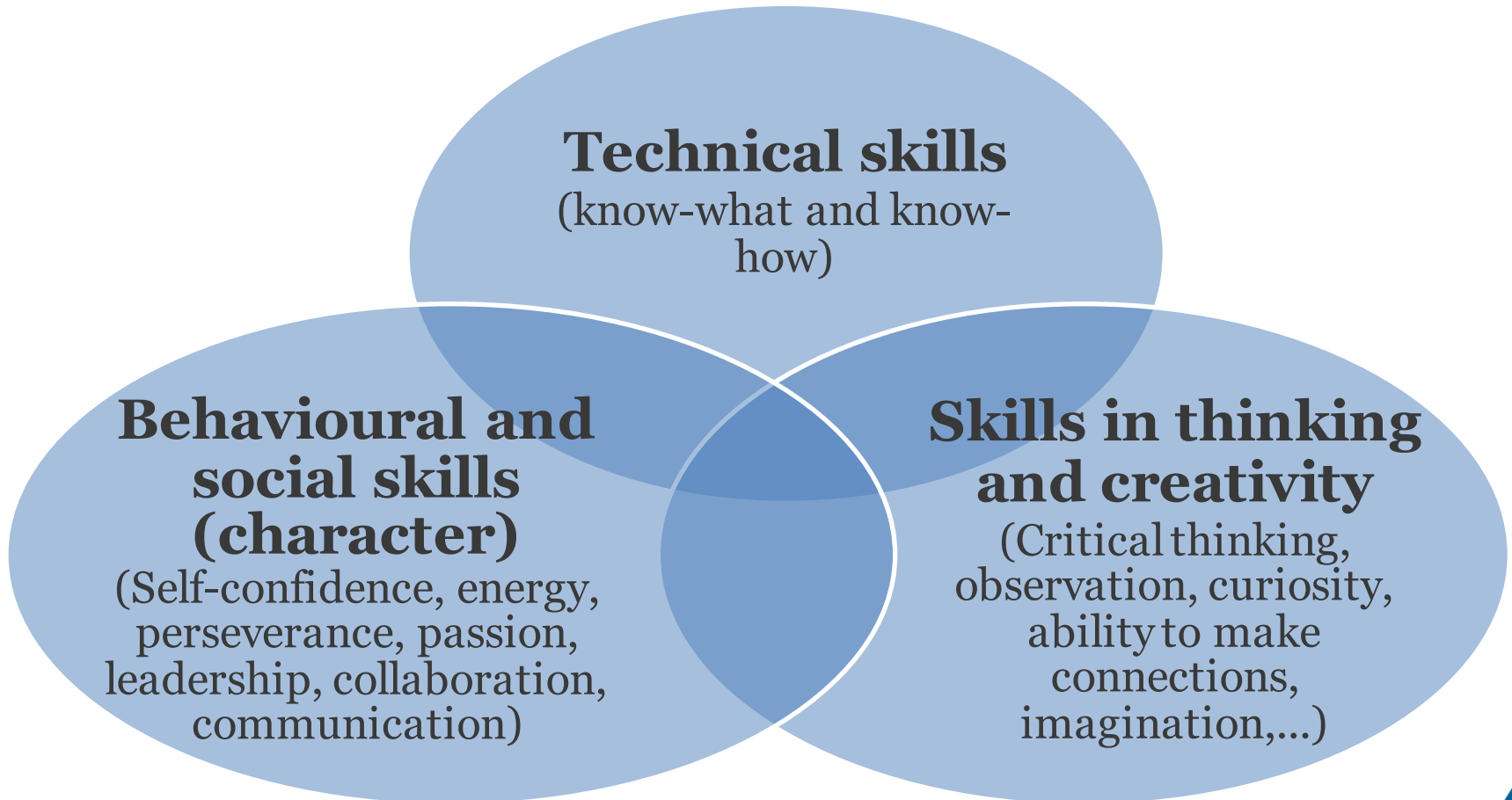
Critical skills for the most innovative jobs (according to tertiary-educated workers)

Likelihood (odds ratios) of reporting the following skills: people in the most innovative jobs vs. least innovative jobs



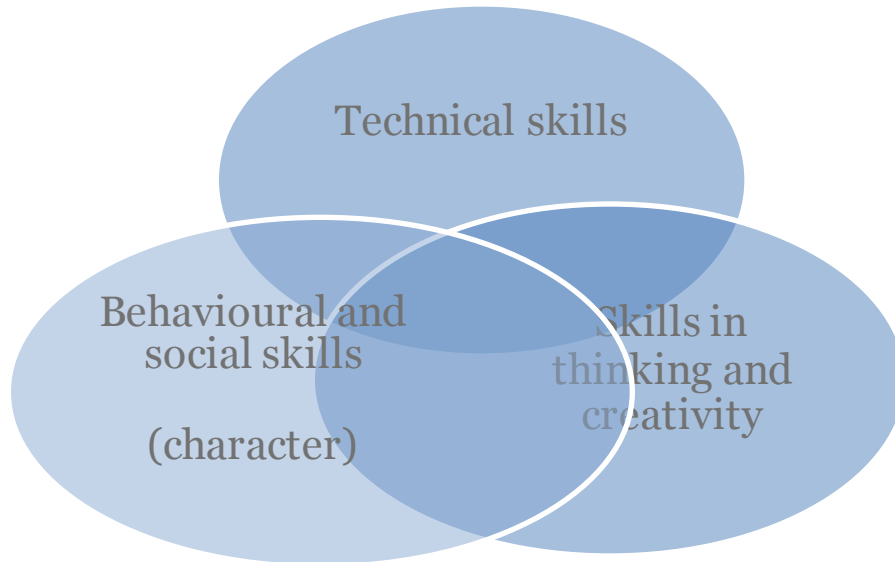


What individual skills should education systems foster?





Some comments on these skill categories



- They overlap and may reinforce each other

But

- They are different and cannot be reduced to a single skill (or measure)

- They are domain-specific
 - Skills are generally domain-specific: one is creative in a field, one knows how to behave/communicate in a specific context, one has problem-solving skills in a field, one has content knowledge in a field
- They can become « domain-generic »
 - A skills becomes « domain-generic » when one has gained it in a number of domains or settings, so that it becomes a « habit of mind » (a disposition or a stabilised skill) that one can apply to new fields

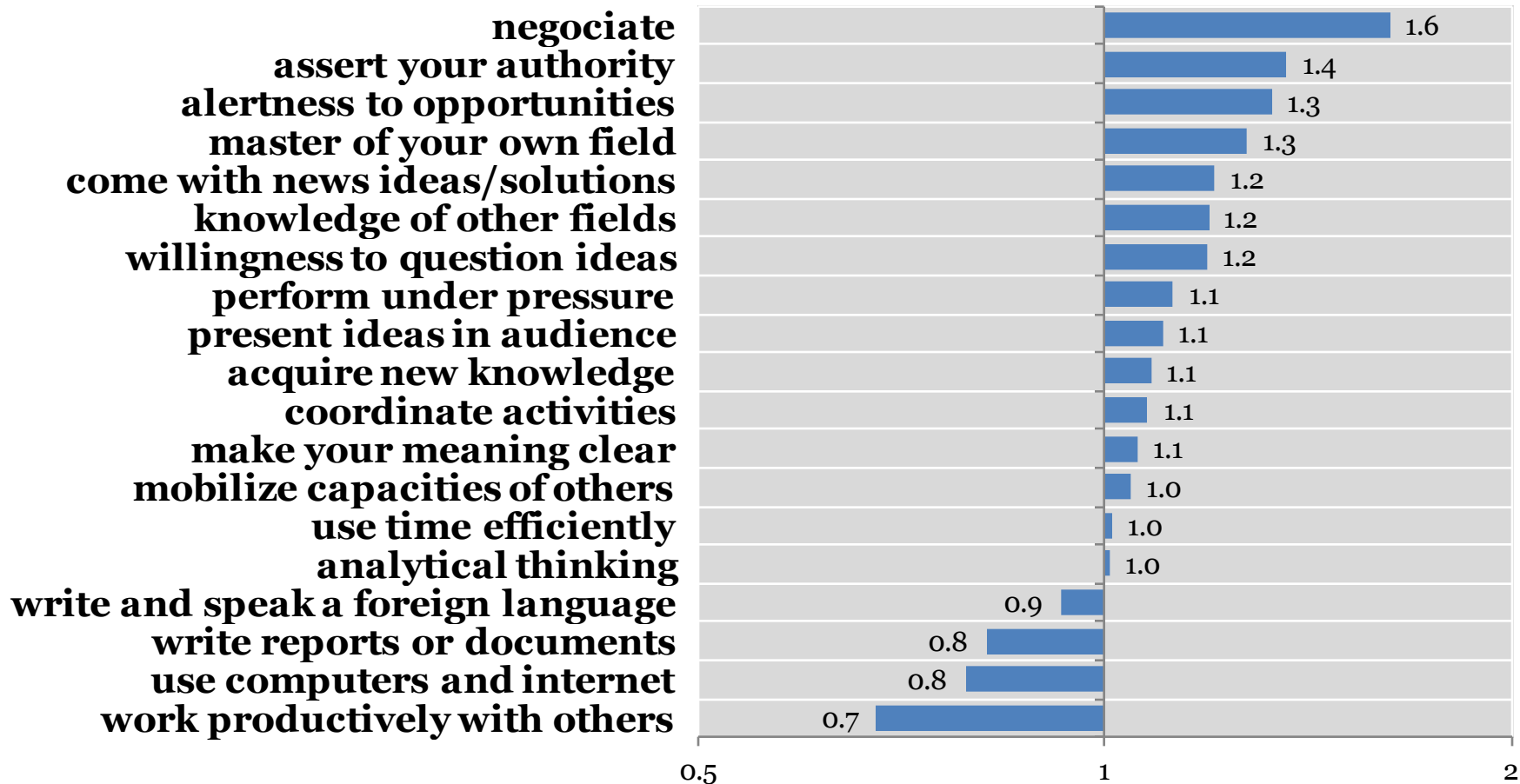


skills for (innovative) entrepreneurship



Critical skills for entrepreneurship (according to tertiary-educated workers)

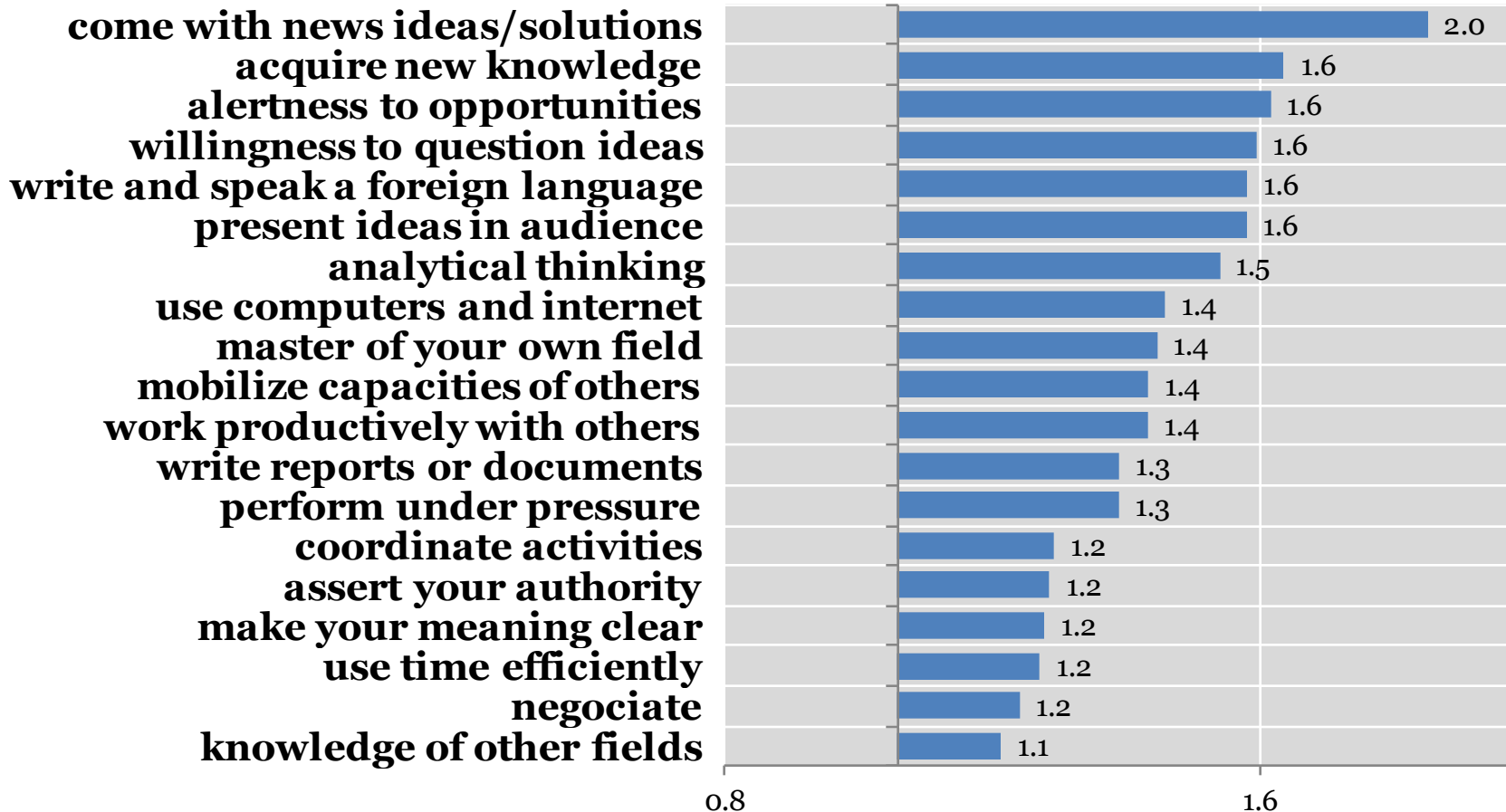
Likelihood (odds ratios) of reporting the following skills: people in self-employed vs. employees





Critical skills for innovative entrepreneurship (according to tertiary-educated workers)

Likelihood (odds ratios) of reporting the following skills: people in innovative entrepreneurs vs. entrepreneurs

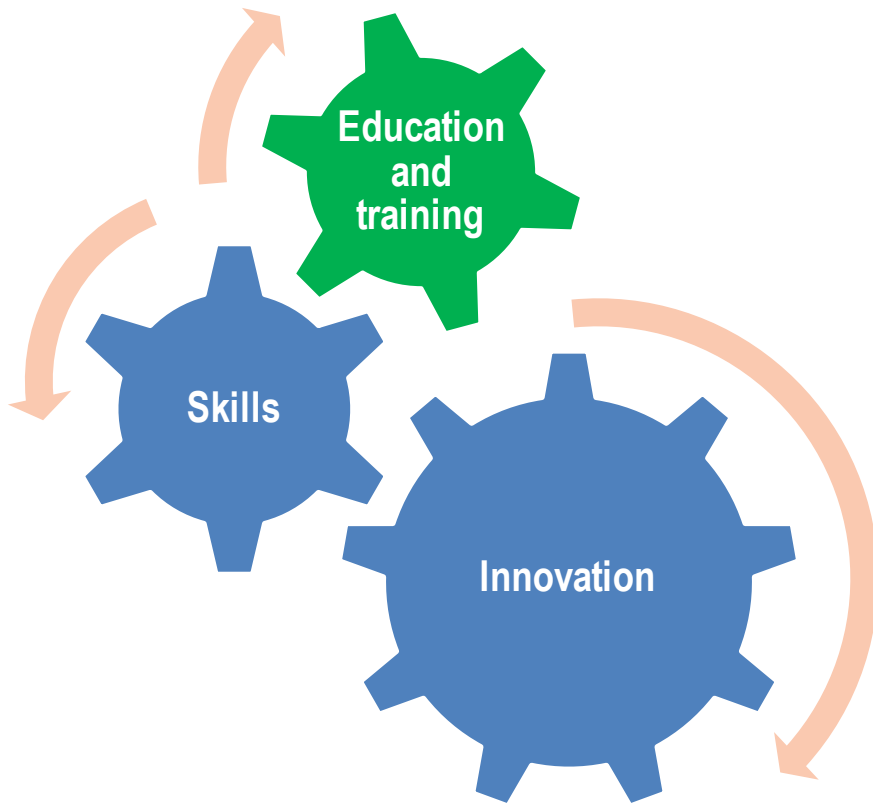




higher education for innovation



Higher education for innovation

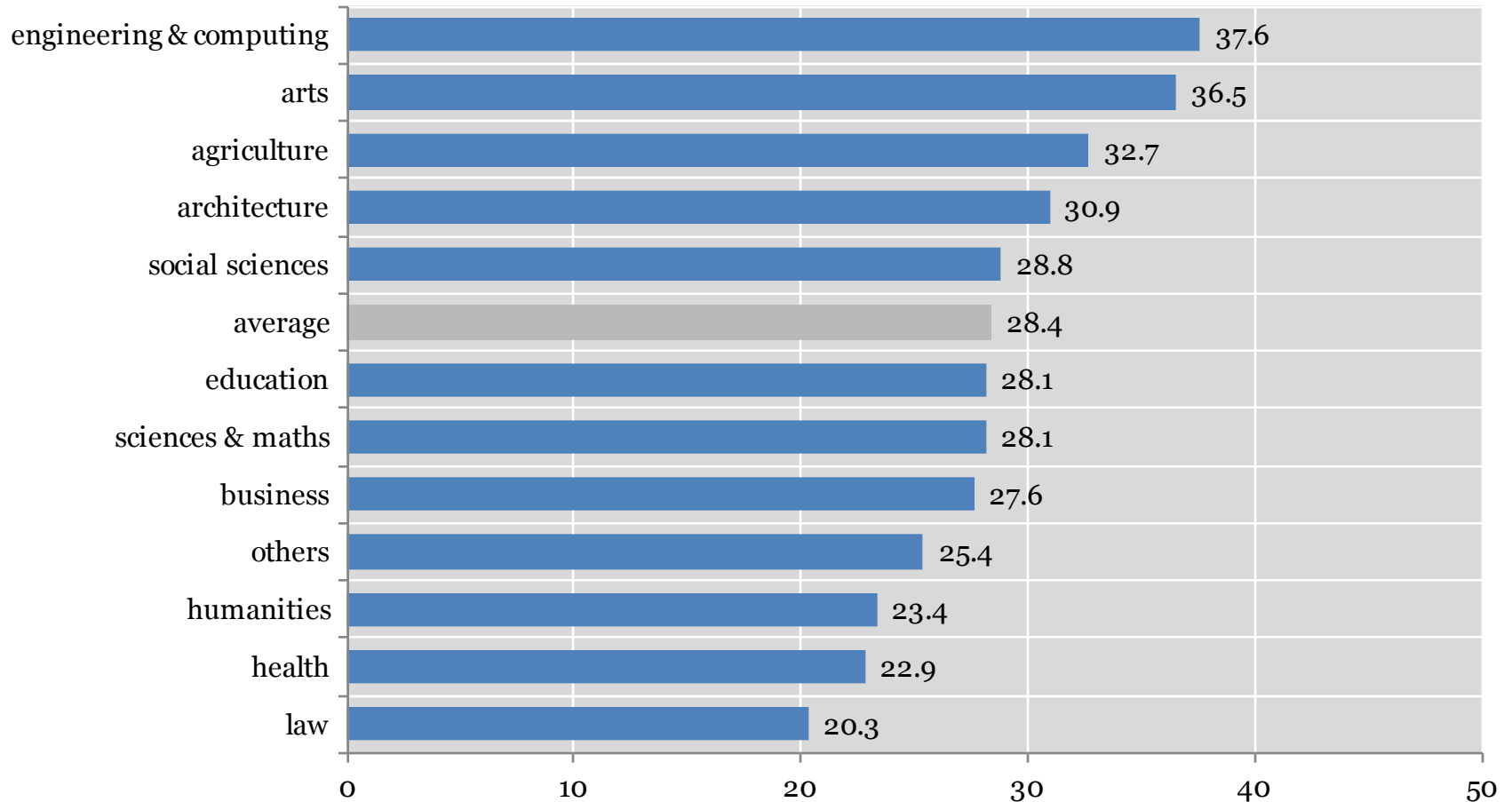


- Which graduates get highly innovative jobs?
- Do higher education systems foster skills for innovation?
- Which pedagogic practices are associated with highly innovative jobs?



What share of graduates of a given field have a highly innovative job?

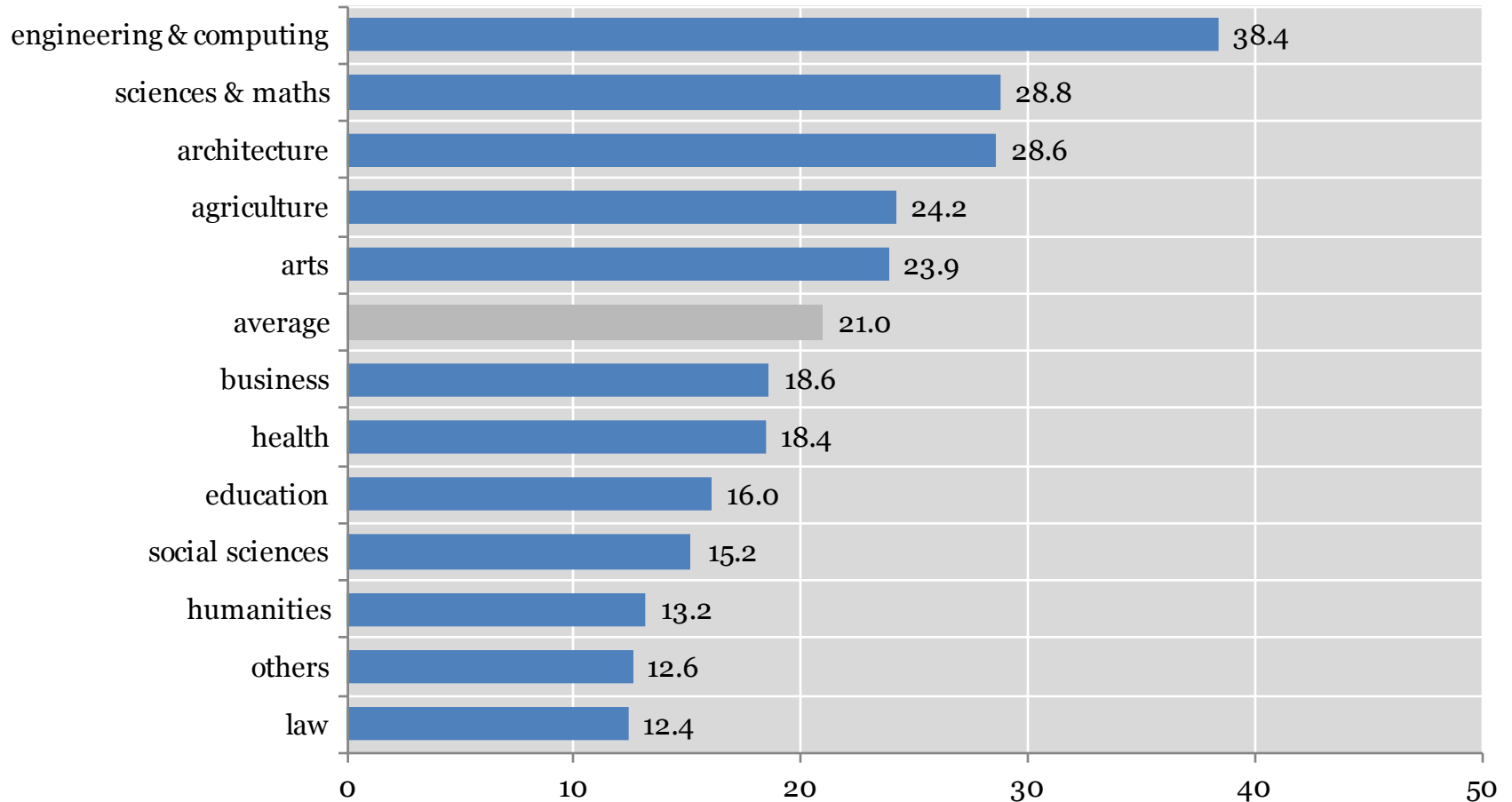
Product /service innovation





What share of graduates of a given field have a highly innovative job?

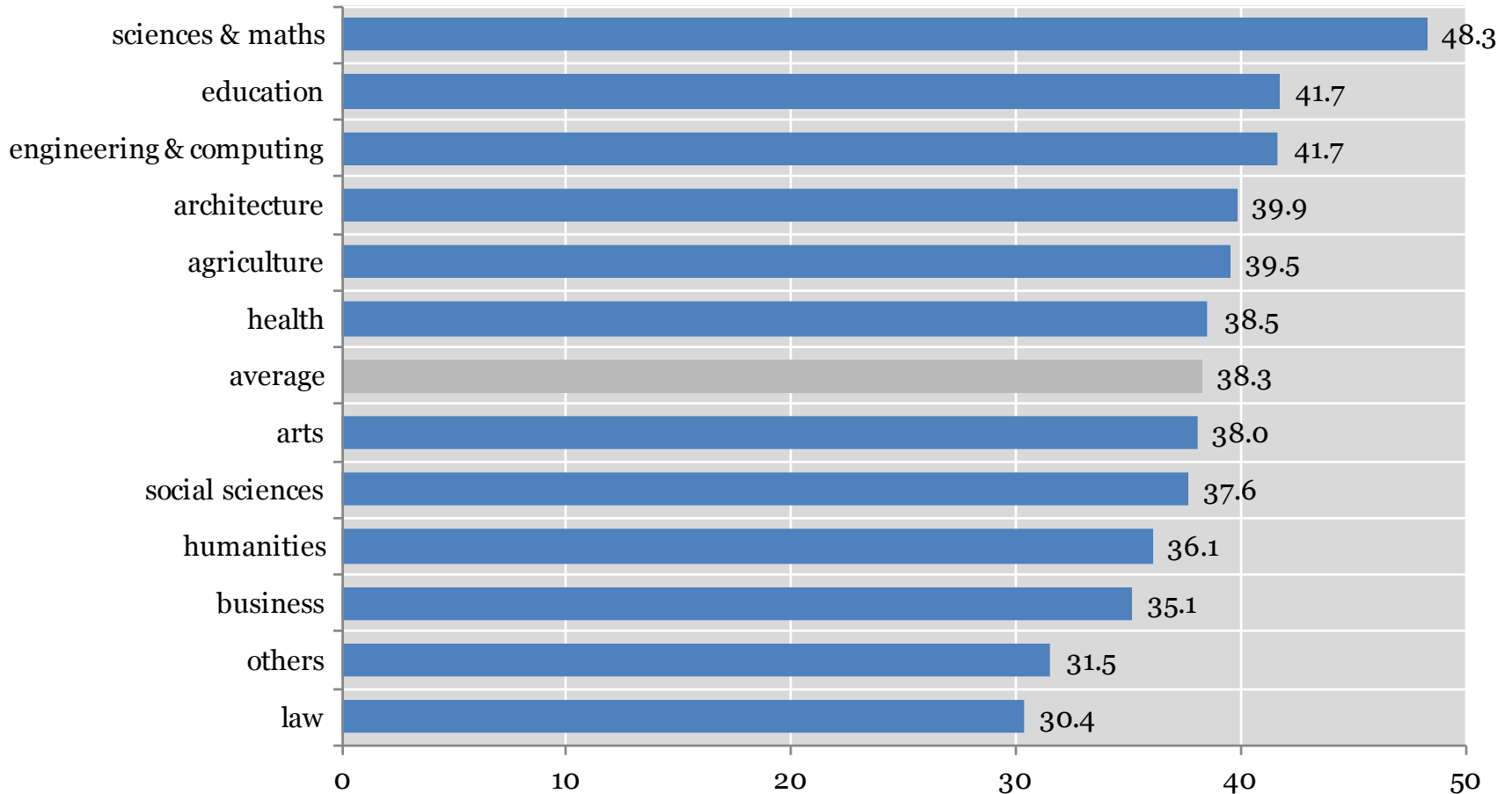
Technology, tool, instrument innovation





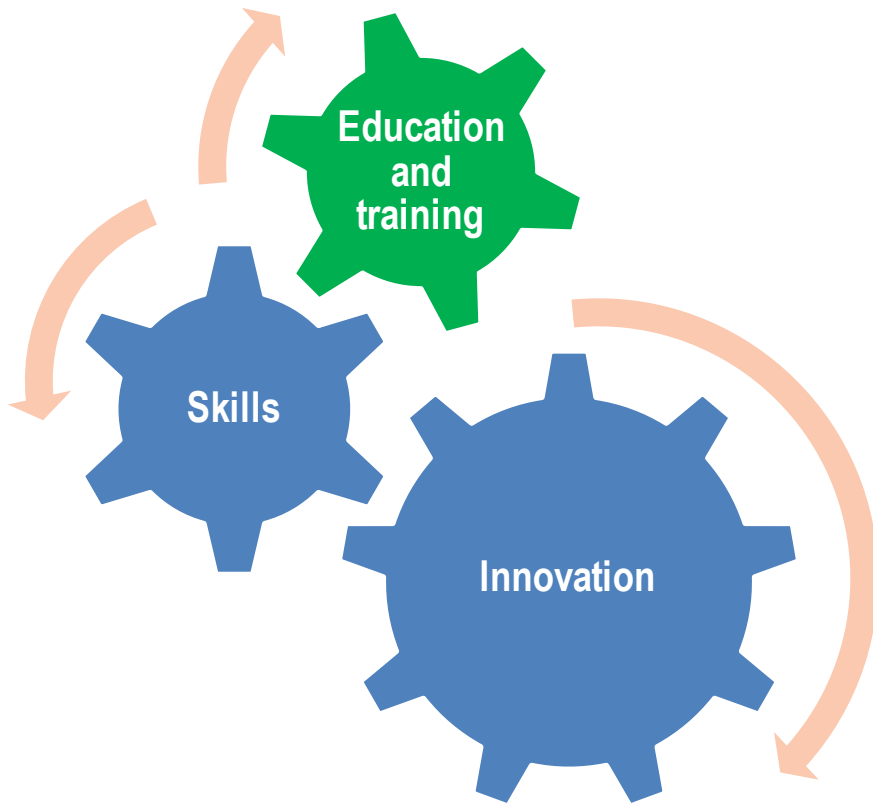
What share of graduates of a given field have a highly innovative job?

Knowledge / method innovation





Higher education for innovation

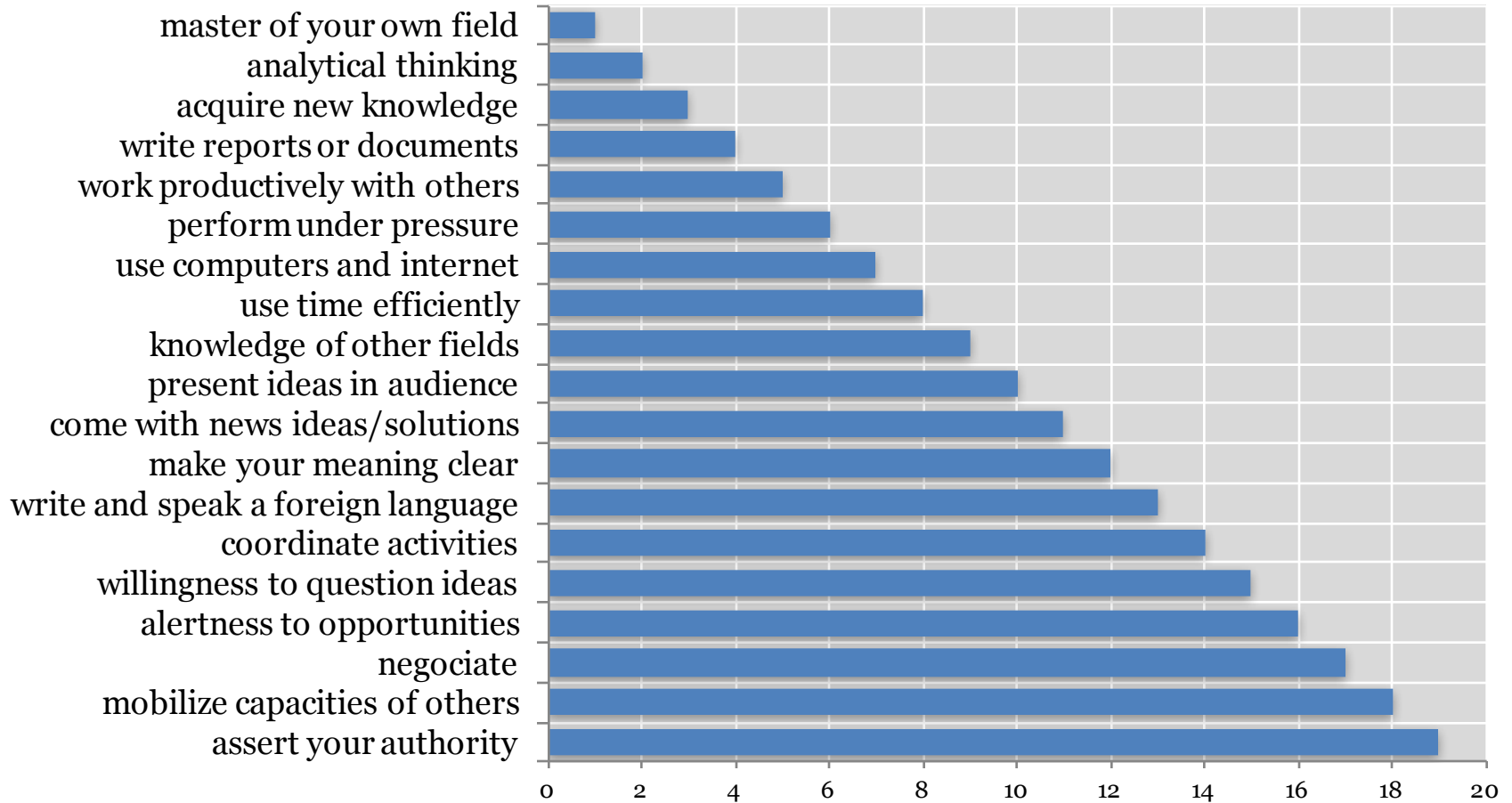


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Strong points of higher education

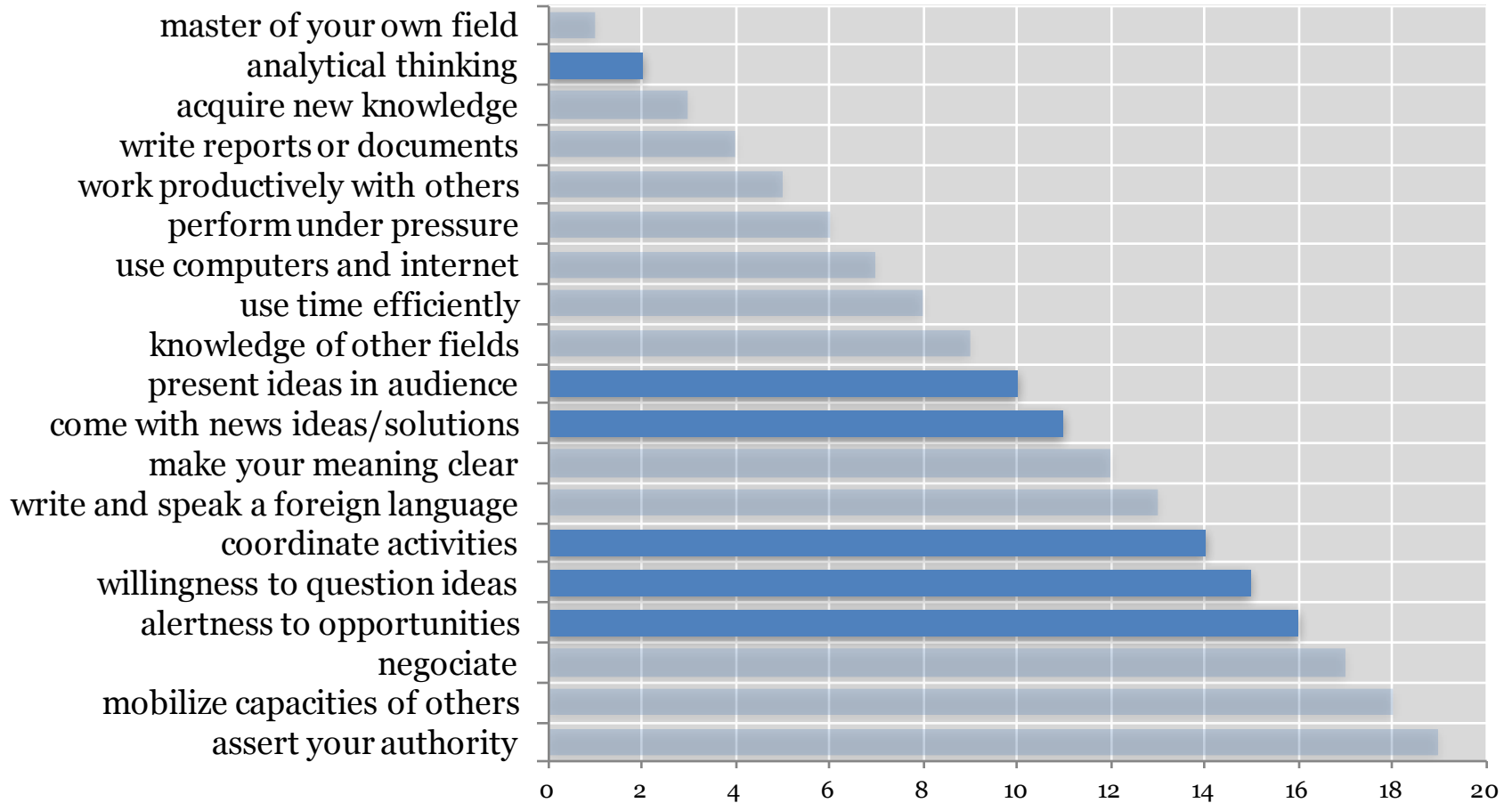
Ranking of 3 top strong skills by graduates





Strong points of higher education

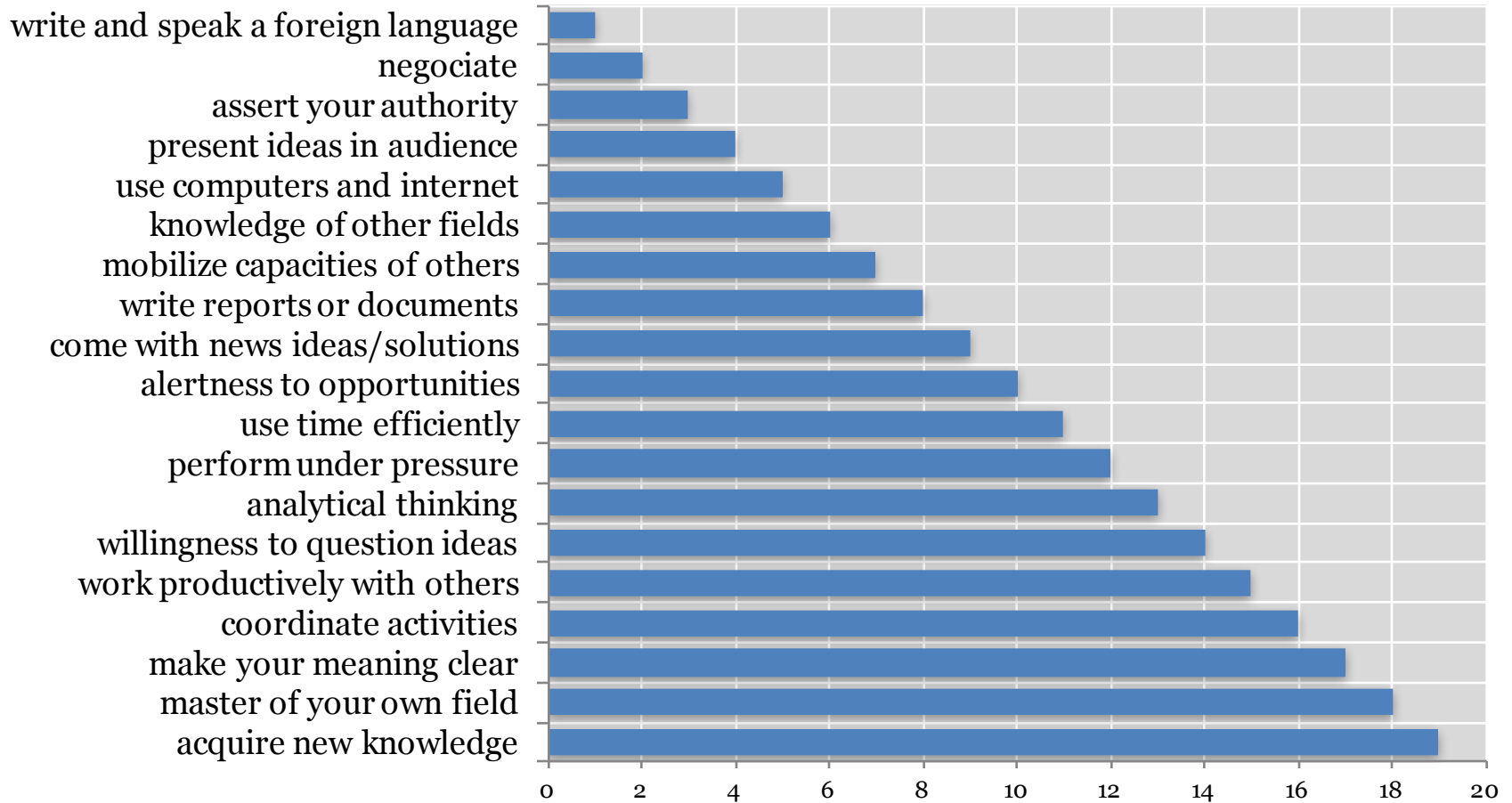
Ranking of 3 top strong skills by graduates





Weak points of higher education

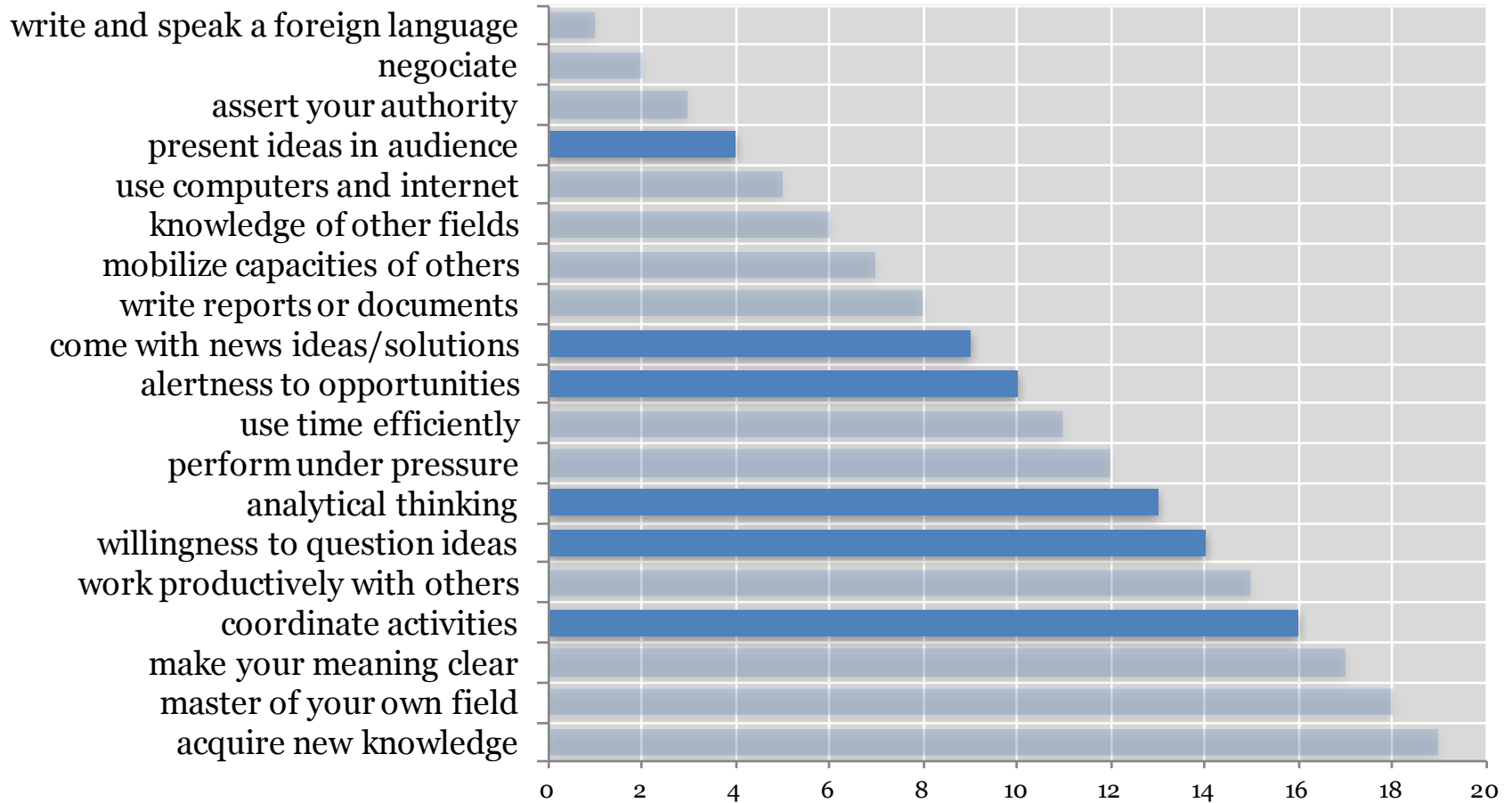
Ranking of 3 top weak skills by graduates





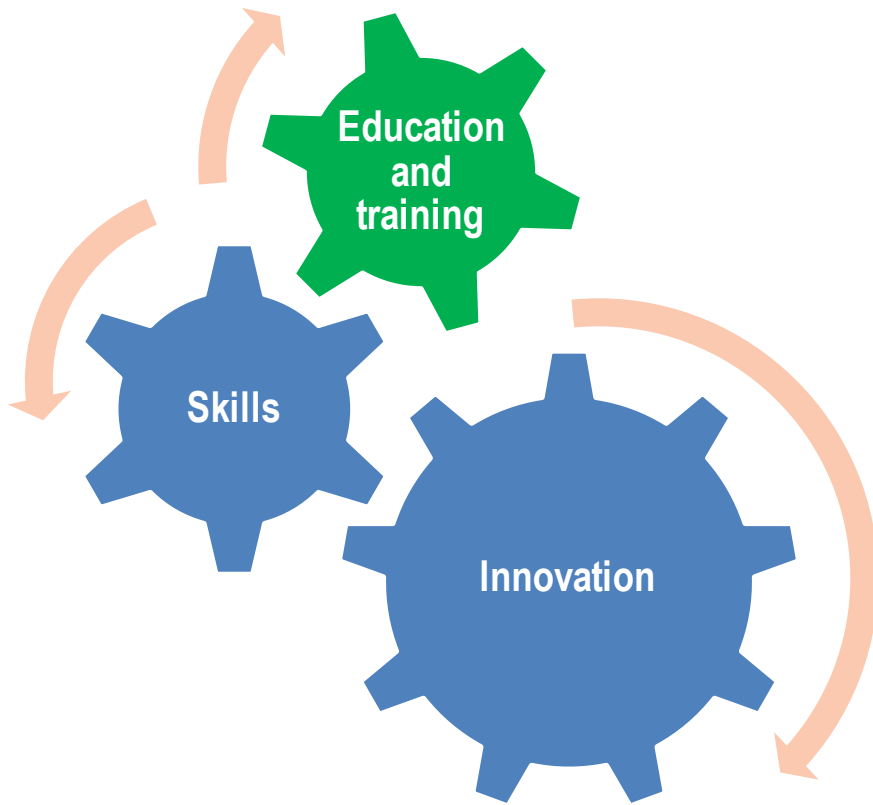
Weak points of higher education

Ranking of 3 top weak skills by graduates





Higher education for innovation

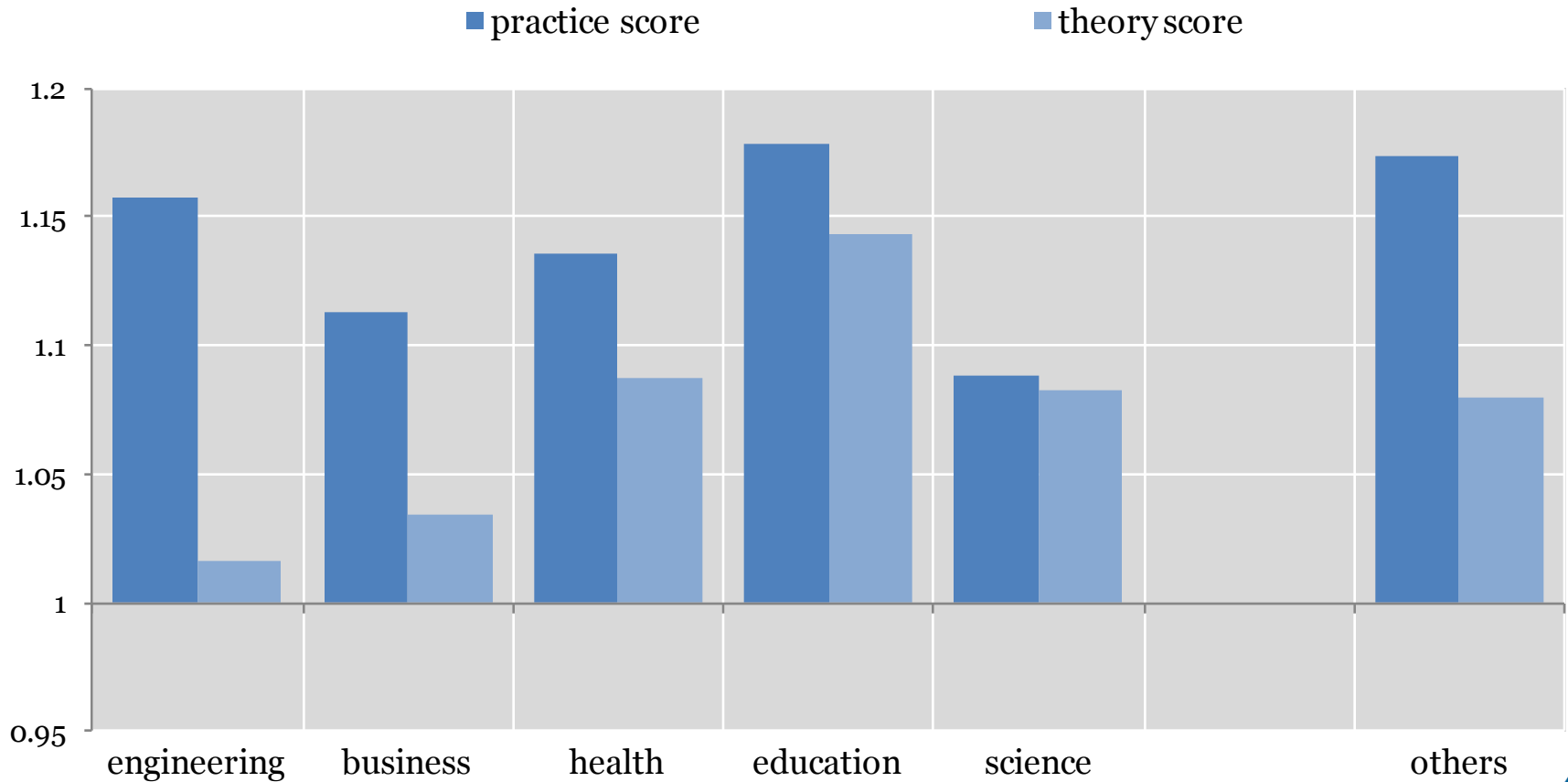


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Innovation and the relative emphasis on practice- and theory-based instruction

Odds ratios between innovators and non-innovators, by field of study

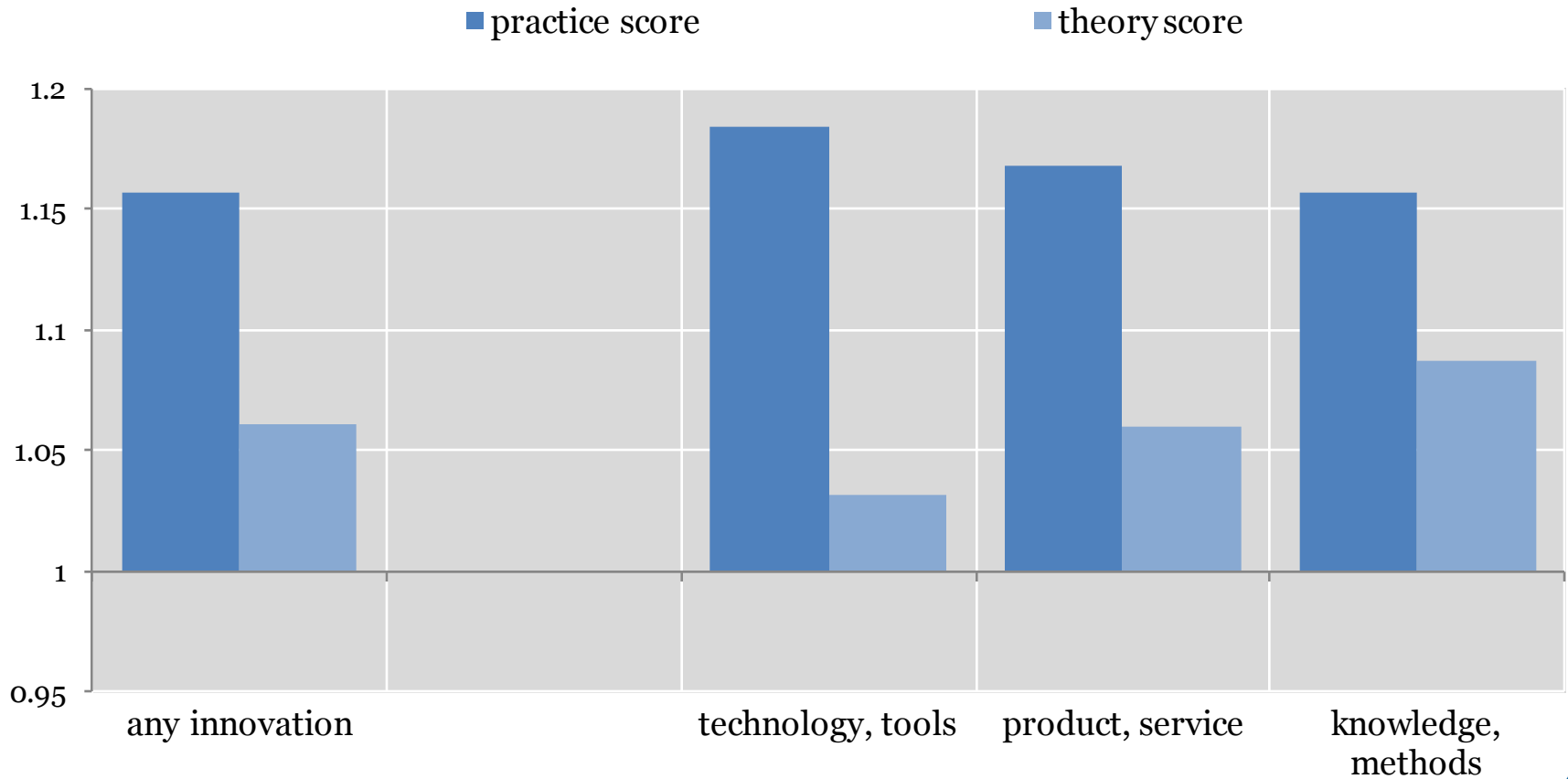


Source: OECD, based on REFLEX and HEGESCO data



Innovation and the relative emphasis on practice- and theory-based instruction

Odds ratios between innovators and non-innovators, by type of innovation



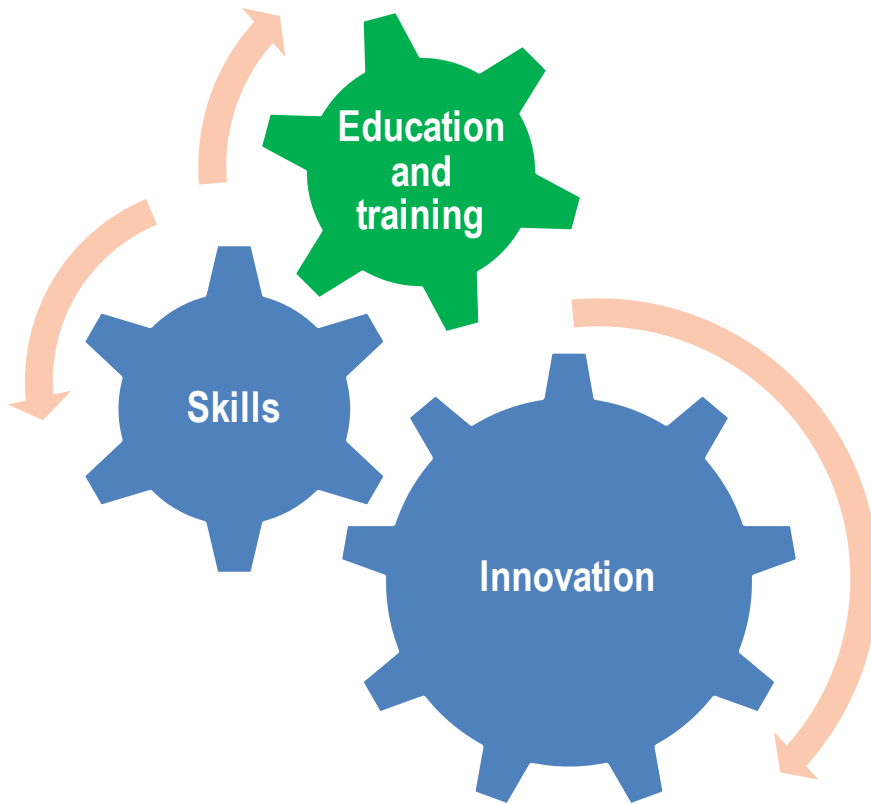
Source: OECD, based on REFLEX and HEGESCO data



what is the effectiveness of
certain pedagogical practices?



Higher education for innovation



- Problem-based learning
- ICT-enhanced educational models
- Design thinking and other approaches
- A new project around fostering creativity and critical thinking



Evidence on Problem-based learning

(OECD WP by Hoidn and Kärkkäinen)

- Review of effects of PBL on student learning outcomes
 - Knowledge acquisition and academic achievement
 - Reasoning and knowledge application
 - Social and behavioural skills
- PBL more beneficial regarding long-term retention and application of knowledge and skills
- Positive impact on students' motivation, satisfaction, and attitudes toward learning
- No clear difference emerges as to test performance, but traditional approaches seem to have an edge



Traditional approaches versus PBL (effect sizes)

	Basis of the assessment																
	Knowledge						Performance or skills					Mixed knowledge and skills		Non-performance, non-skill and non-knowledge			
	Short-term					Long-term retention	Case analysis					Observation ratings	Oral	USMLE 3	Satisfaction		
	NBME 1	Multiple-choice	Short Answers	Progress	Free recall		NBME 2	Patient simulations	Case-based						Students	Faculty	1st choice residency
									Cases	Essay questions	Modified essay						
Albanese and Mitchell (1993)	-					+	+					+			+	+	+
Vernon and Blake (1993)	-	-					+					+			+	+	
Berkson (1993)	-						+			+							+
Kalaian, Mullan and Kasim (1999)	-						+										
Colliver (2000)	-											+			+		
Dochy, Segers, Van den Bossche, and Gijbels (2003)	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+
Newman (2003)	-	-						+	+	+	+						
Gijbels, Dochy, Van den Bossche, and Segers (2005)	-	-	+	-	-/+	-/+	+	+	+	+	+	+	-/+	+			
Overall effect size	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+
Favours	Traditional learning						PBL					PBL		PBL			



Traditional approaches versus PBL (effect sizes)

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Newman (2003)	-	-							+	+							
Gijbels, Dochy, Van den Bossche, and Segers (2005)	-	-	+	-	-/+	-/+	+	+	+	+	+	+	-/+	+			
Overall effect size	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+
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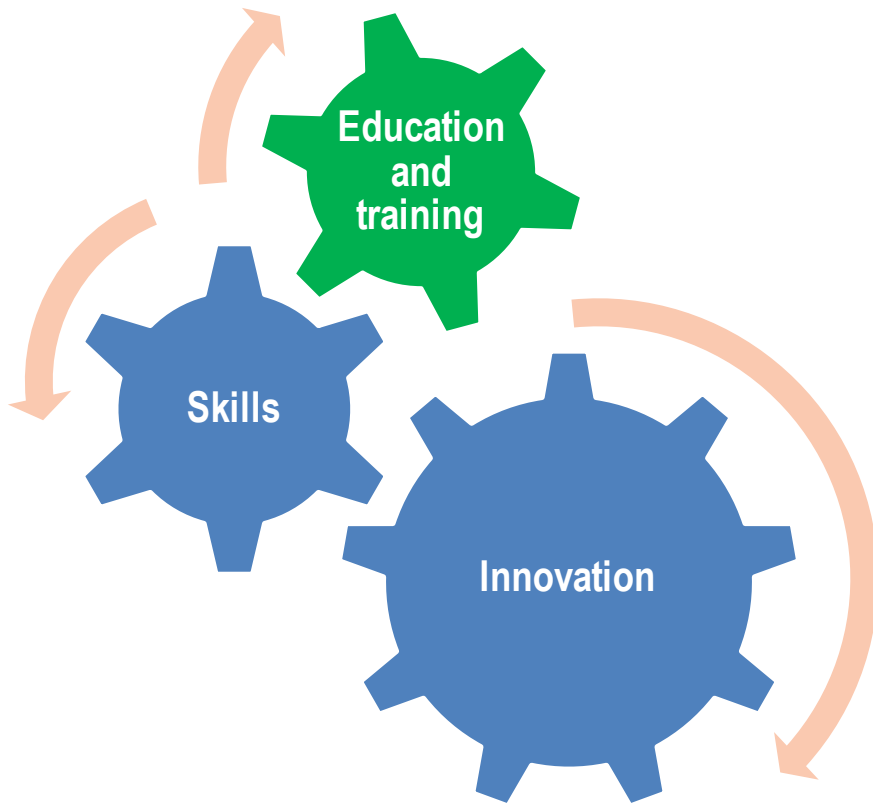


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Newman (2003)	-	-						+	+								
Gijbels, Dochy, Van den Bossche, and Segers (2005)	-	-	+	-	-/+	-/+	+	+	+	+	+	+	-/+	+			
Overall effect size	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+
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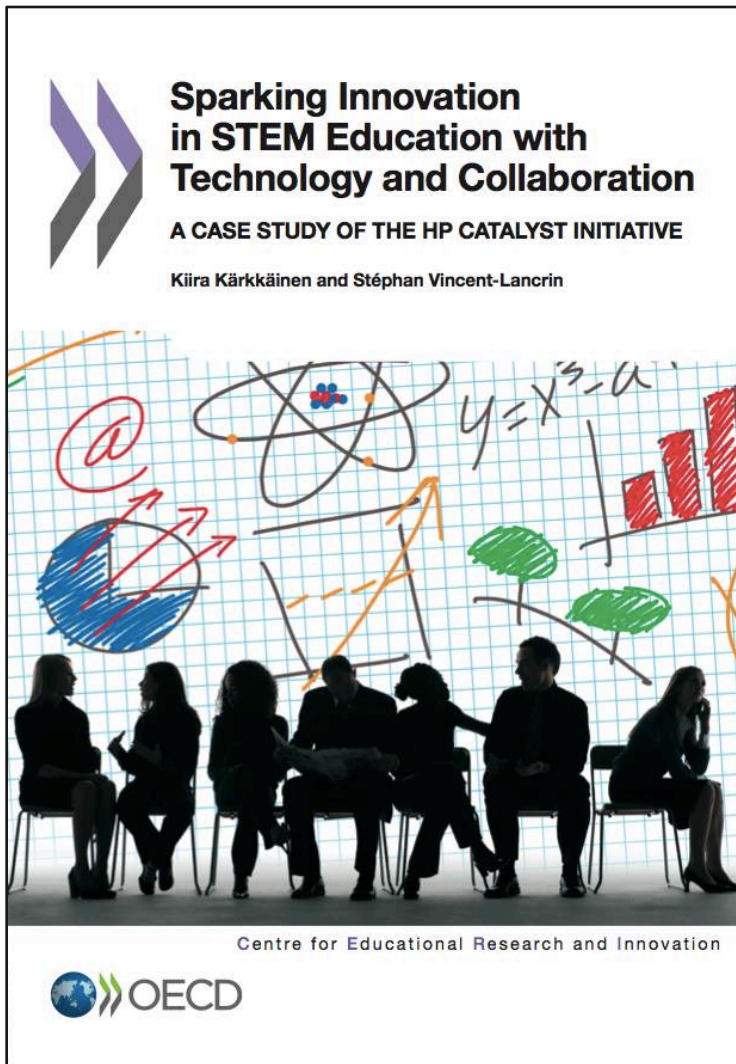
Higher education for innovation



- Problem-based learning
- ICT-enhanced pedagogic models
- Design thinking and other approaches
- A new project around fostering creativity and critical thinking



ICT-enhanced pedagogic models to foster « skills for innovation » in STEM



- Virtual and remote laboratories
- Educational games
- Technology-enhanced cooperative learning
- Real-time formative assessment
- Skills-based assessment

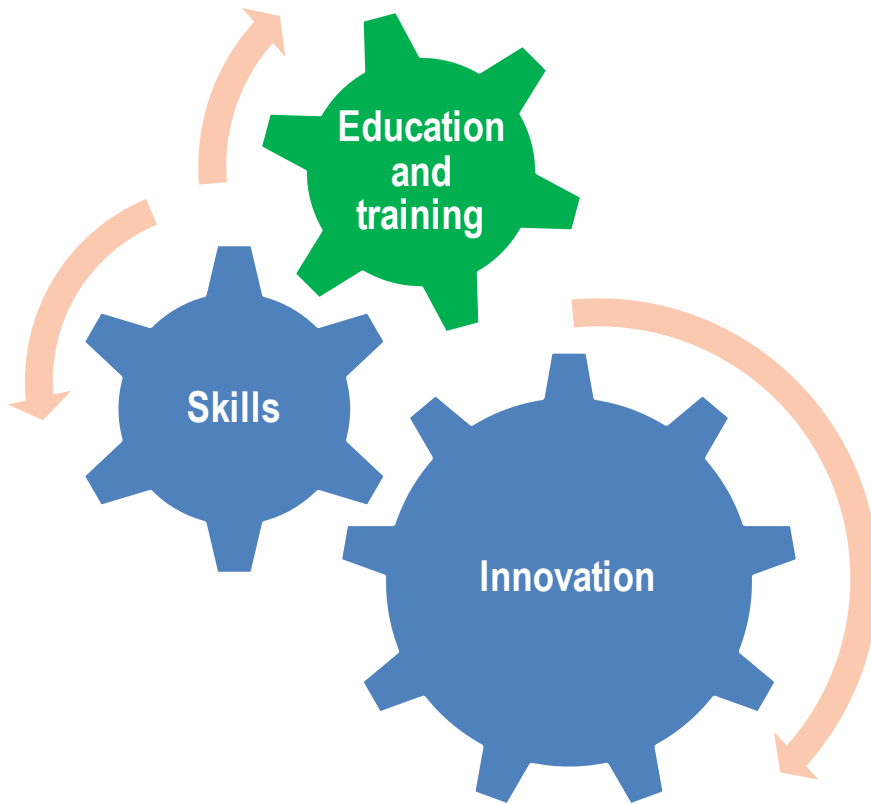


A few pedagogical models fostered by ICT

- Experiential learning (e.g. remote and virtual labs, project-based and enquiry-based pedagogies)
- Hands-on pedagogies (e.g. game development)
- Cooperative learning (e.g. local and global collaboration)
- Interactive and metacognitive pedagogies (e.g. real-time assessment)



Higher education for innovation



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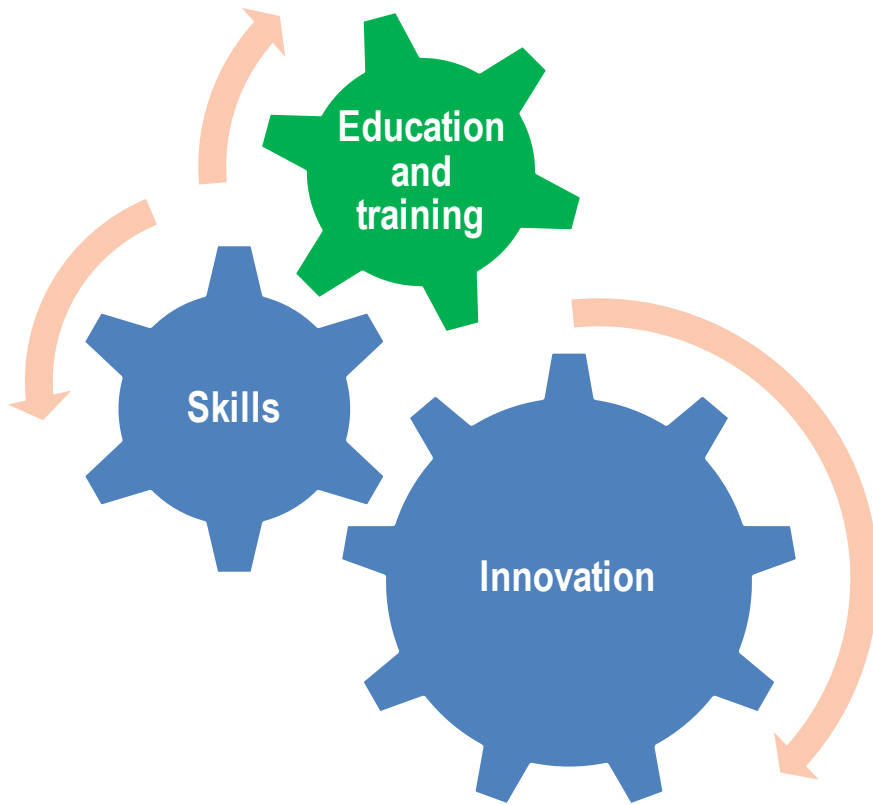


New types of transversal programmes

- Pedagogical change:
 - **Design thinking** (IStanford University; EMLyon Business school and Ecole Centrale de Lyon (France); i-school at Tokyo University; UDD, UC, etc. (Chile))
 - **Design factories:** Aalto Design Factory, Aalto service factory (Finland), MIT Fab labs (US), etc.
 - **Entrepreneurship programmes** (Centre for Entrepreneurship (Amsterdam university))
- Institutional change:
 - Aalto University in Finland (economics, arts and design, science and technology)
 - European Institute of Innovation and Technology (structured around Knowledge and Innovation Communities (KIC))
 - Olin College of Engineering in the US; etc.



Higher education for innovation



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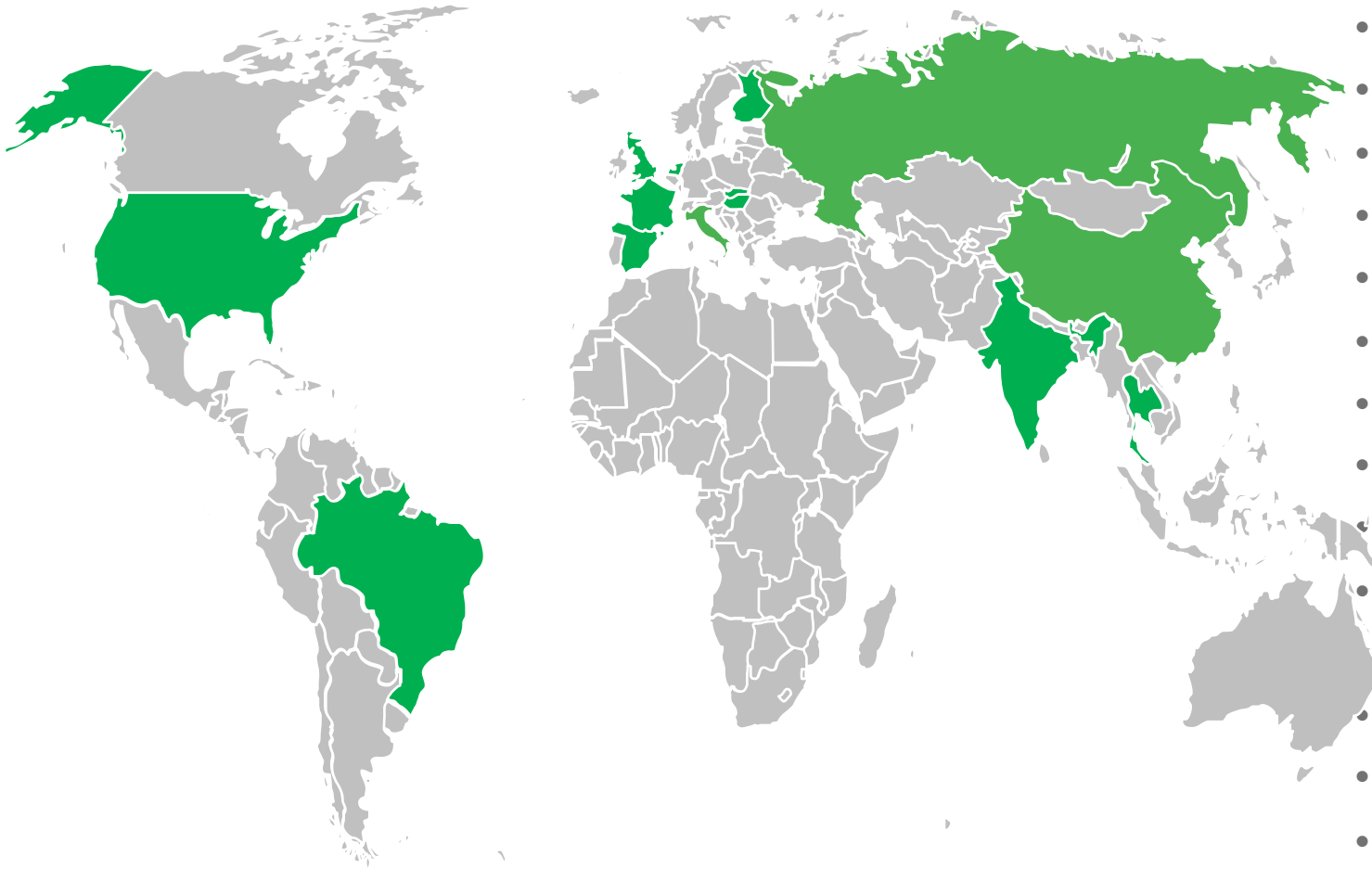


Ongoing OECD project on assessing progression in creativity and critical thinking

- 2 networks:
 - **Higher education to start in 2017**
 - School (primary and secondary)
- 3 possible domains:
 - One STEM discipline
 - One arts education discipline
 - One generic approach to innovation/creativity
- Activities in primary-secondary education:
 - Develop a pedagogical toolkit (rubric, pedagogical activities and assessments, student work)
 - Document pedagogies to foster the selected skills/dispositions
- Activities in tertiary education:
 - Share about pedagogies and identification of skills
 - Pedagogical intervention like in primary and secondary?



Participants in 14 countries (Jan 2016)



- Brazil
- China
- Finland
- France (3 teams)
- India
- Italy
- Hungary
- Netherlands
- Russia
- Slovakia
- Spain
- Thailand
- UK (Wales)
- USA (4 teams)



A pedagogical toolkit

A1.

**Rubric
for
assessment**

Dimensions

**Levels of
progression**

A2.

**Pedagogical
activities**

**Specific
for each
domain**

**Designed
to test
dimensions and
levels of
progression**

A3.

**Set of
exercises**

**Specific
for each
domain**

**Designed
to
prepare
for the
assessment**

A4.

**Portfolio
of
student
work**

**For each
domain**

**As
examples
of
different
skill
levels**



Contextual data collection

B1.

**Subject-based
assessment**

**Standardised
assessment of
academic
achievement**

**(maths and
science; visual
arts and
music)**

B2.

**Creativity
assessment**

**Standardised
test for
creativity
(EPoC)**

**(domain-
specific)**

B3.

**Survey
questionnaires**

**School
principals**

Teachers

Students

B4.

**Interviews /
focus groups**

Teachers

Students



Expert meeting in June 2016

- There is already a lot going on in this area, but few explicit assessment criteria
 - Institution-wide models (North Carolina University)
 - Targeted models (Design thinking, Entrepreneurship, Innovative pedagogic models)
- Creativity seemed more challenging (and needed) than critical thinking
- Main conclusions:
 - International action research would be helpful and feasible
 - Possible domains: teacher education, engineering, others
 - No obvious monitoring instruments: probably need to be tailor-made
 - Have a mix of call for participation and invitations to have a system approach



conclusions



Some future policy challenges

- A broad mix of degrees/qualifications is needed that includes but goes beyond science and engineering
- Does higher education empower people to innovate? Is the glass half-empty or half-full?
- How to rebalance higher education missions to give more weight to good pedagogies?
- Do we have the main drivers in place to foster innovation in the higher education sector – and make sure higher education contributes to innovation in education and more broadly?



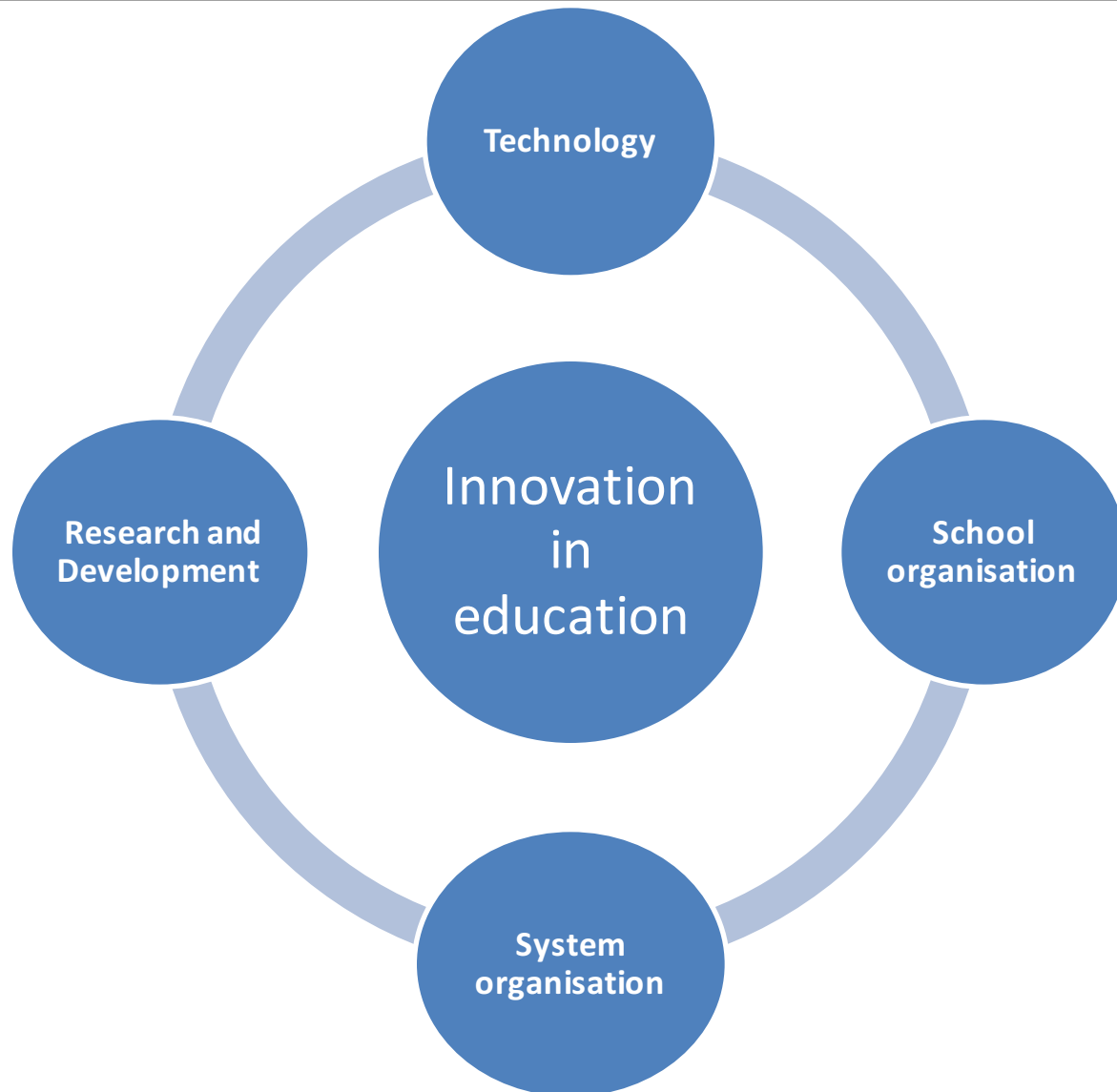
other ongoing work
of possible interest



understanding innovation in (higher) education

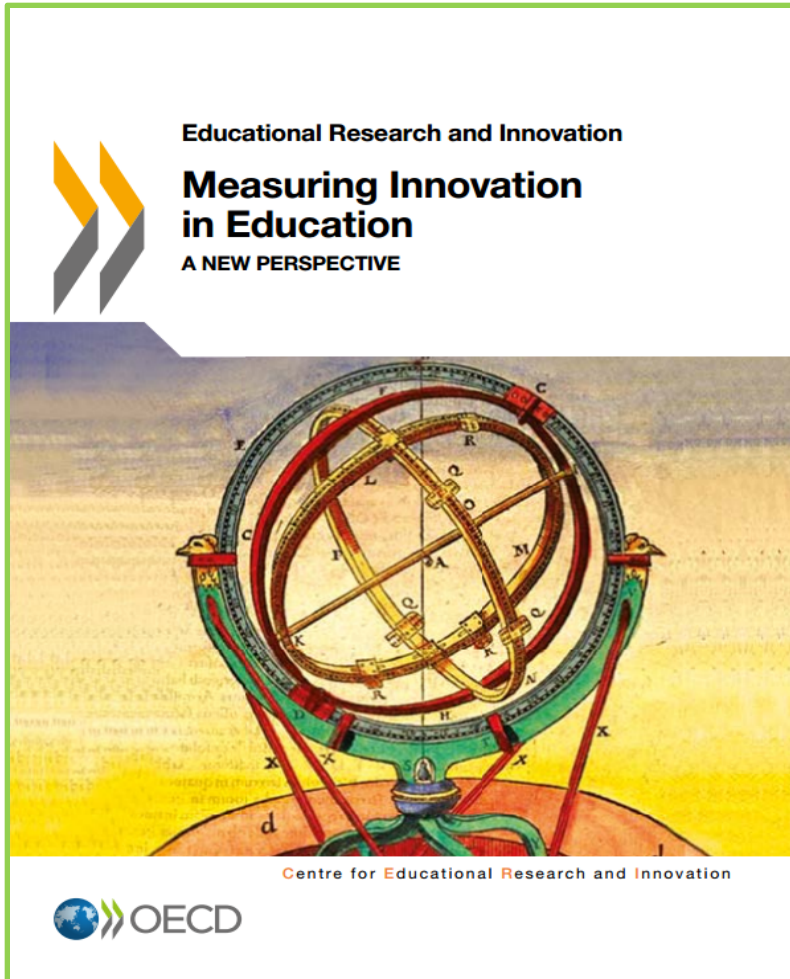


Towards innovation-friendly ecosystems in education?





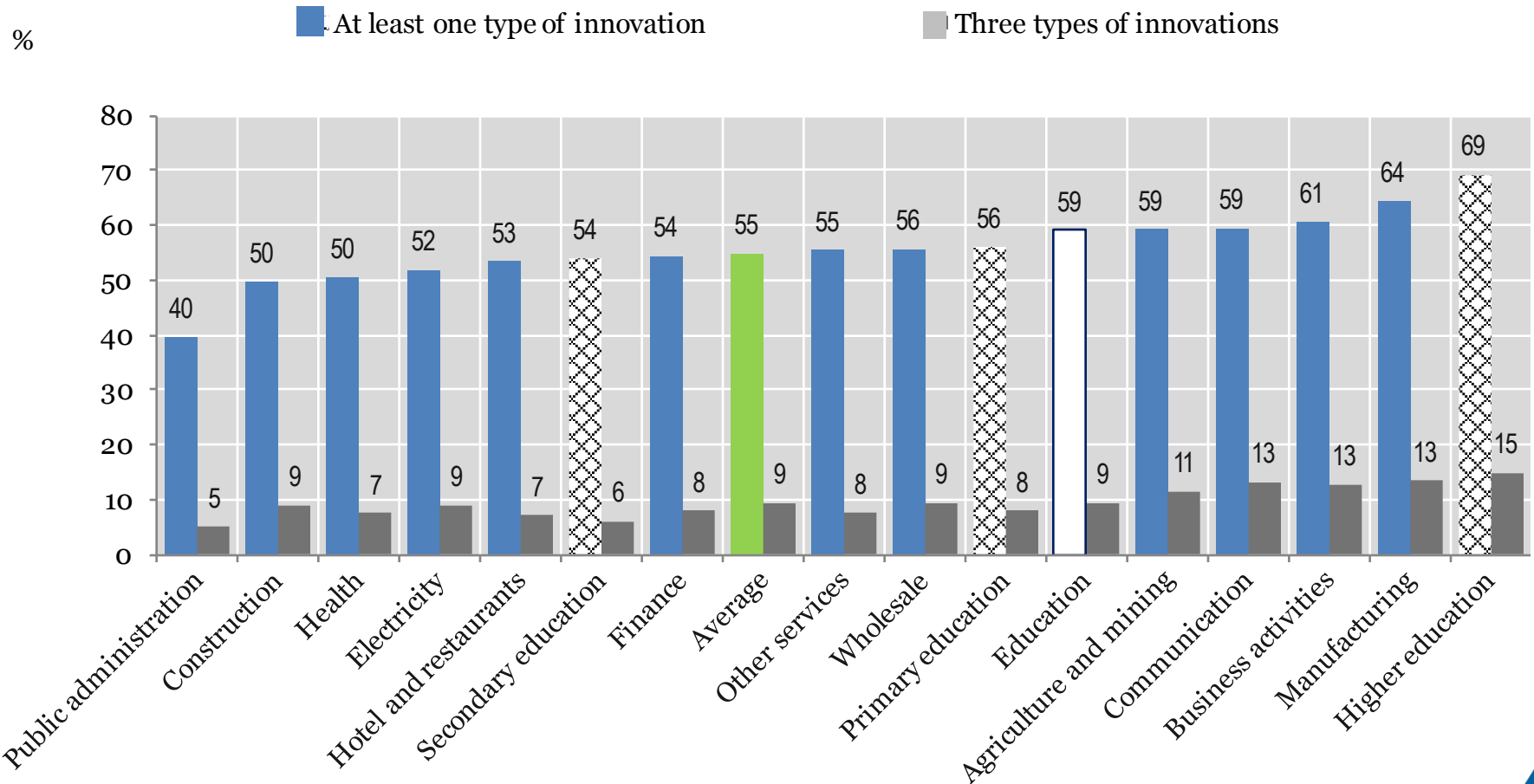
Measurement of innovation in education



- 4 objectives:
 - Informative
 - Methodological
 - Heuristic
 - Prospective
- 2 approaches:
 - Innovation surveys
 - Organisational change surveys
- Databases / Coverage:
 - Reflex and Hegesco (19 EU countries + Japan)
 - PISA, TIMSS, PIRLS (broad international coverage)



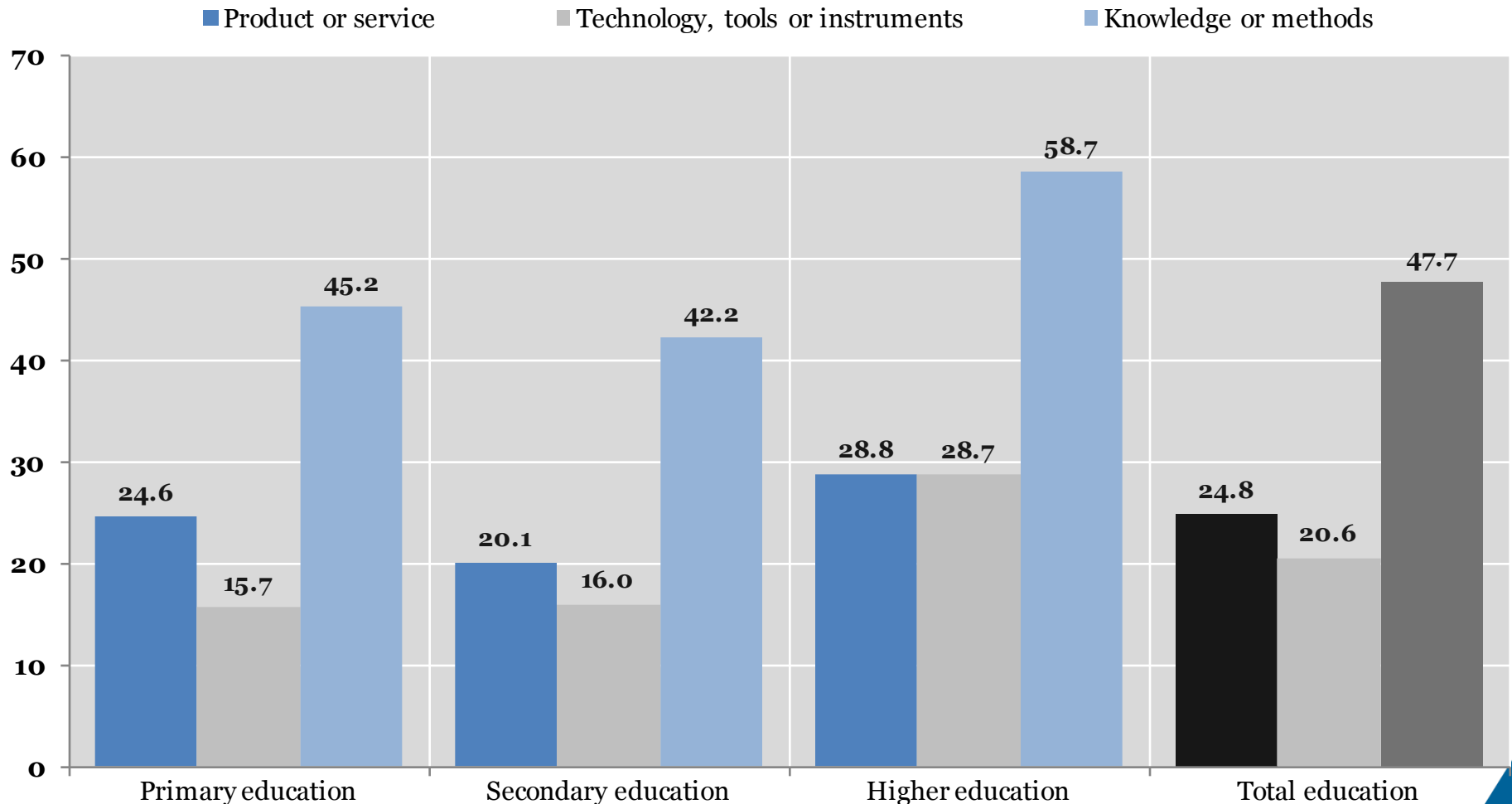
Highly innovative jobs in education and other sectors of the economy



Source: Measuring Innovation in Education (2014), based on REFLEX and HEGESCO data
Source: OECD (Scoreboard on Innovation in Education), based on REFLEX and HEGESCO data



Percentage of highly innovative jobs, by innovation type and education level (2005-2008)



Source: Measuring Innovation in Education (2014), based on REFLEX and HEGESCO data



open higher education



Ongoing project on how digitalisation and openness could affect the future of HE

- International workshop on « Opening Higher Education » (December 2016, Berlin)
 - Massive Open Online Course (MOOCs)
 - Open Educational Resources
 - Open science
 - Open universities
 - Open (learning) data
 - Opening higher education to new stakeholders, missions and populations



policy advise on innovation
and higher education



OECD-Chile Seminar on inclusive innovation programmes in HE (17-18 March 2016)

- High-level OECD-Chile Seminar in the Chilean Congress
 - Patronage of President Bachelet
 - Opened by Minister Delpiano Puelma
 - Closed by Undersecretary Quiroga
 - A panel of world class experts
- Peer learning exchange on innovative efforts to enhance access and completion of underprivileged students
- Part of a STI-led horizontal project on « innovation and inclusive growth »





An example of country advice



- Review of French innovation and research system: diagnosis of education an higher education systems
- Participation in development of France's national strategy for higher education



internationalisation of higher education



Internationalisation, trade and quality assurance in HE



Internationalisation and Trade in Higher Education

OPPORTUNITIES AND CHALLENGES



Quality and Recognition in Higher Education

THE CROSS-BORDER CHALLENGE



Cross-border Tertiary Education

A WAY TOWARDS CAPACITY DEVELOPMENT

Guidelines for Quality Provision in Cross-border Higher Education
Lignes directrices pour des prestations de qualité dans l'enseignement supérieur transfrontalier



THE WORLD BANK



TRADE POLICY IN ASIA

Higher Education and Media Services

36 World Scientific Studies in International Economics

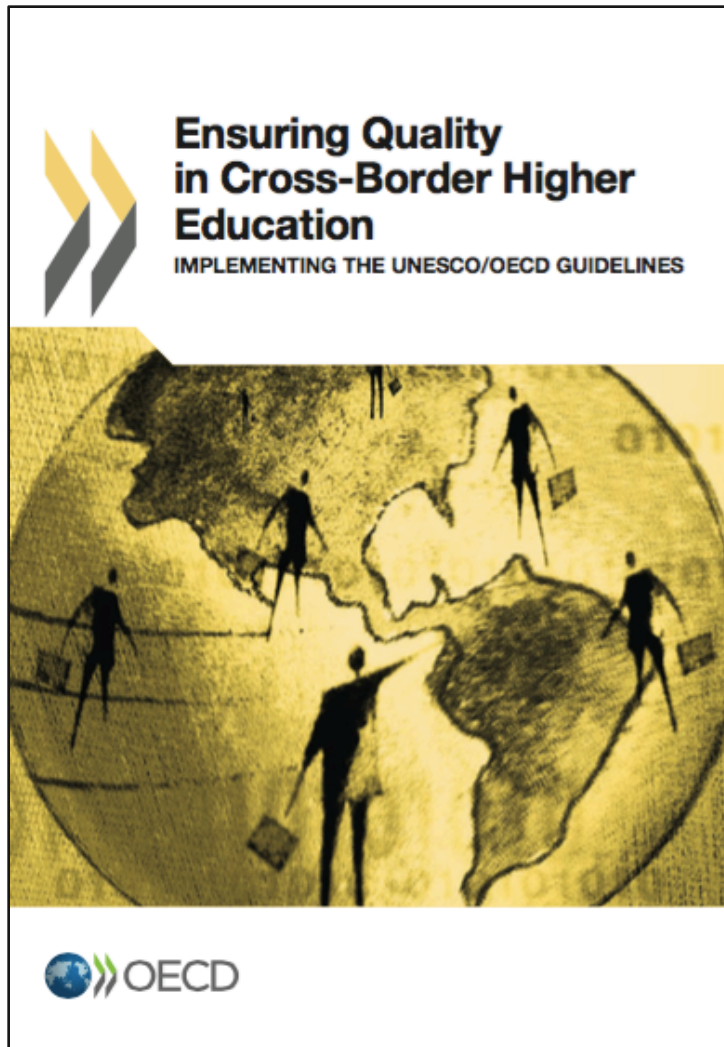
Christopher Findlay
Hildegunn Kyvik Nordas
Gloria Pesadilla

World Scientific





Monitoring report of UNESCO-OECD Guidelines



- A first report in 2012 (based on data collected in 2010) covering 23 countries
- A new monitoring report covering 42 countries (Dec 2015)
- Use of compound indicators to synthesise and visualise the available information
- Follow-up meeting with UNESCO to review the Guidelines in January 2017



Stephan.Vincent-Lancrin@oecd.org

THANK YOU

www.oecd.org/edu/innovation

www.oecd.org/edu/universityfutures

www.oecd.org/edu/internationalisation