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# The role of Intangible Assets in Digital Capabilities building: Evidence from 7 European countries

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# Motivation and aim of the presentation

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- Investments in intangible assets (IAs) are essential for fostering innovation, enhancing productivity, and creating long-term value for businesses and the economy as whole (Corrado et al., 2022; Haskel and Westlake, 2018).
- IAs represent a collection of non-physical resources (generated internally or externally acquired) vital for the production process and indispensable for developing and marketing novel or improved products and processes. (Corrado et al., 2005).
- Merely investing in intangibles is not sufficient to drive growth. Firms should also consider how those intangibles are deployed and used to develop capabilities that create a competitive advantage (Hazan et al., 2021; Haskel and Westlake, 2018)
- Based on this line of reasoning we aim to explore the role of IAs in building and enhancing firms' digital capabilities, i.e., whether they enable businesses to effectively leverage digital technologies and stay competitive in the rapidly evolving digital landscape.

# Data source (1)

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- Despite the widely acknowledged impact of IAs in creating value in business firms, **significant challenges in their measurement remain** (Haskel and Westlake, 2018; Martin and Baybutt, 2021).
- **Few recent business surveys:** measure IAs investments in certain countries (e.g., UK and Italy) (Awano et al., 2010; Angotti, 2017), two Eurobarometer studies (2013, and 2015).
- **The survey data source: Globalinto Business Survey**, carried out in seven European countries late 2020 until early Spring of 2021 as part of the EU Horizon 2020 Globalinto project (Caloghirou et al., 2024).

## Data source (2)

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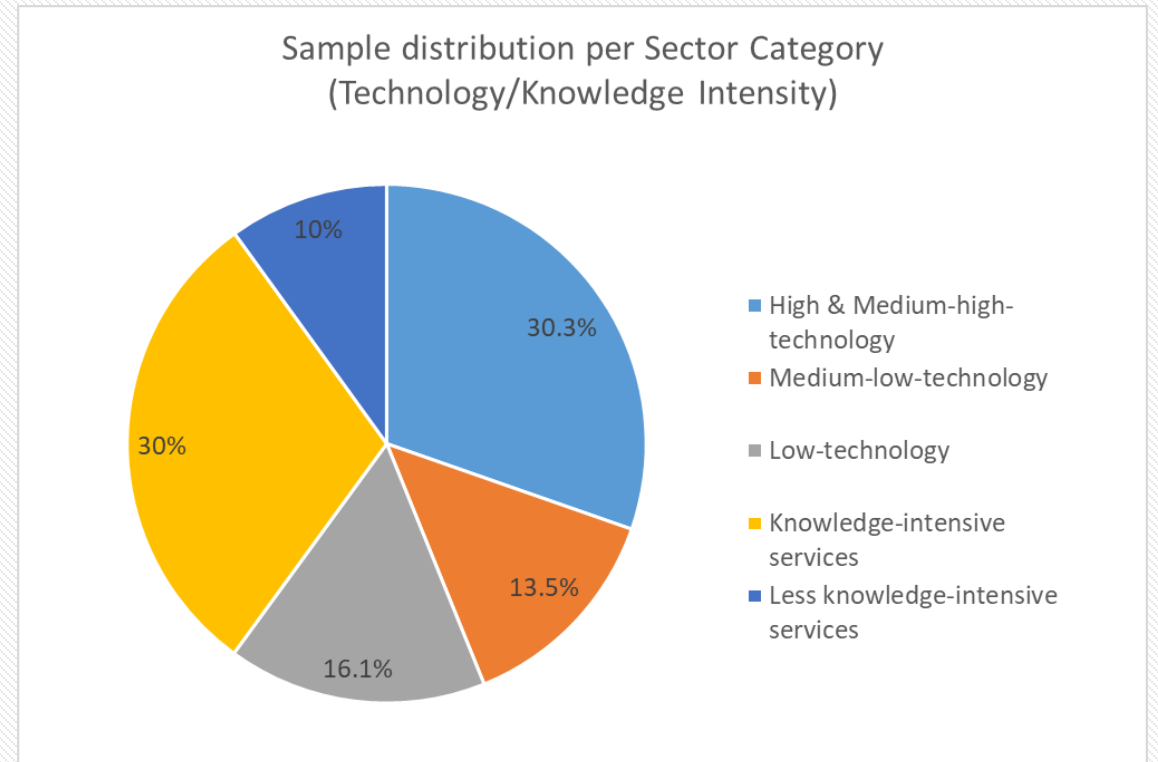
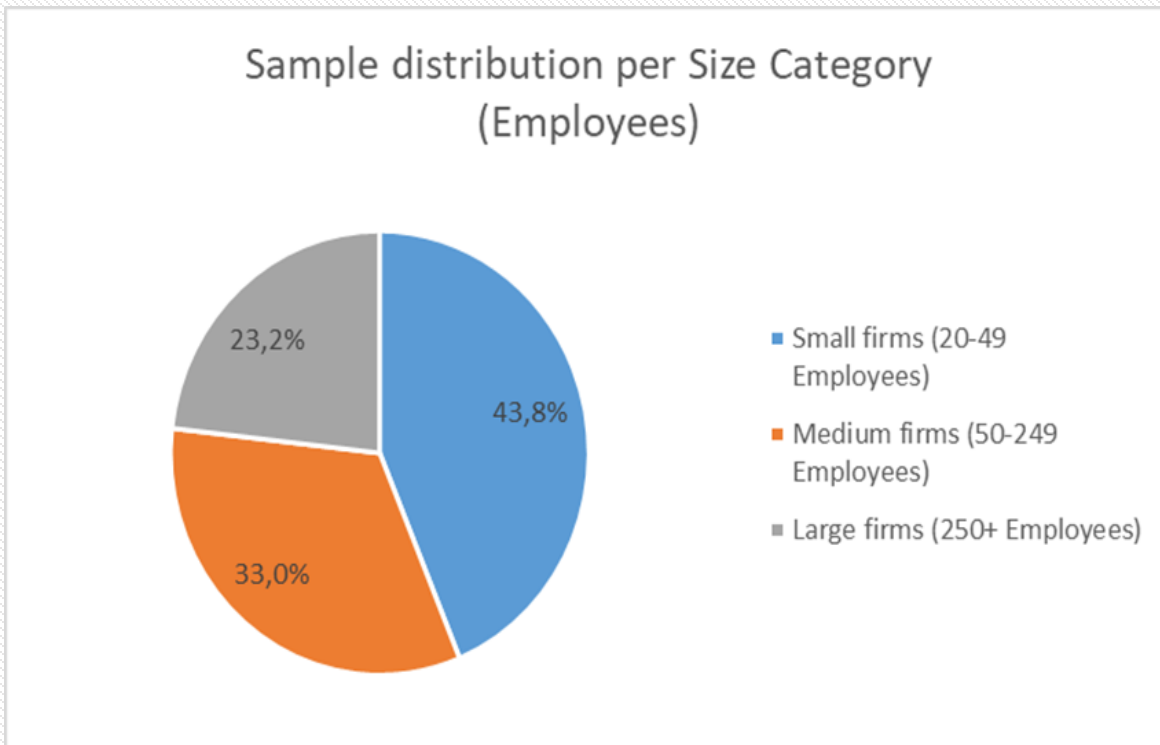
- **The survey focused on internally generated and externally acquired six different intangibles:** R&D, software and databases, staff training, organisation and business process improvement, design, reputation and branding.
- The survey included enterprises with **at least 20 employees** in seven countries: Germany, the UK, France, Finland, Denmark, Slovenia, and Greece.
- Total sample of **1796 firms**, both from **manufacturing** and **services** spanning various sectors

# Sample characteristics

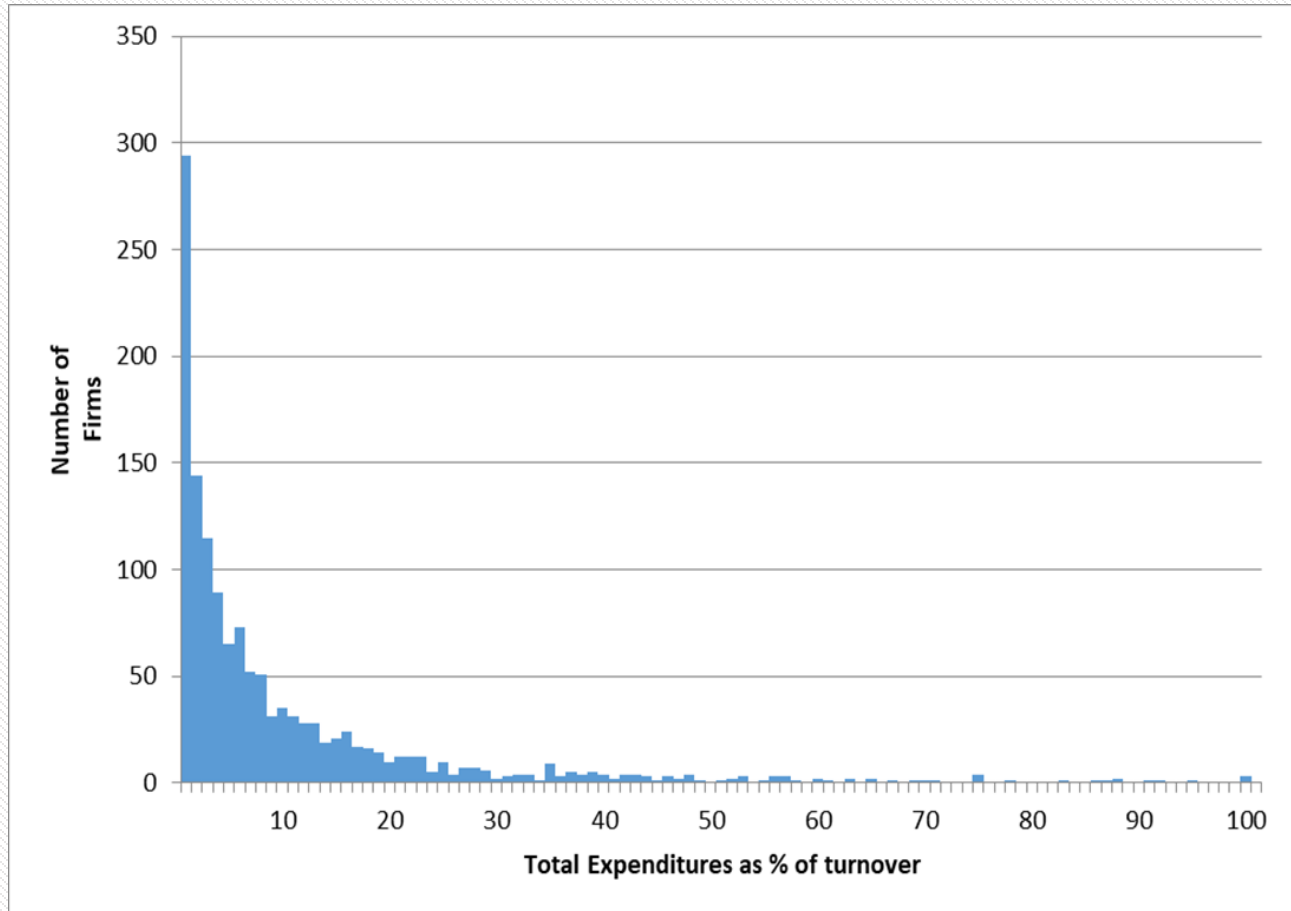
	Manufacturing	Services	TOTAL
Denmark	129	86	215
Finland	128	87	215
France	188	126	314
Germany	186	124	310
Greece	128	87	215
Slovenia	132	83	215
UK	187	125	312
<b>TOTAL</b>	<b>1078</b>	<b>718</b>	<b>1796</b>

# Sample characteristics

- Manufacturing: 60%, Services: 40%
- 60% are high and medium-high tech manufacturing firms and knowledge-intensive services
- Almost two thirds (63.6%) have less than 100 full-time employees



# Firms' total investment distribution as % of turnover



Spending (as % of turnover)	Firms (%)
0 - 1%	21.8
1 - 5%	30.5
5 - 15%	27.3
15 - 25%	9.8
25 - 50%	6.8
> 50%	3.8

53% invest less than or equal to 5% of their turnover, 22% just up to 1%

# Digital technologies adoption: **very low investments in such technologies**

	N	High Extent (% of Firms)	Mean (5-point scale)
Investments in hardware-based technologies (e.g., robots, 3D technologies, sensor technologies)	1737	15.7%	2.00
Investments in data-based technologies (e.g., artificial intelligence, data analytics, IoT, machine learning, virtual and augmented reality, blockchain)	1753	12.6%	1.92

- Digital technologies adoption drives **digitalization**, i.e., the application or increase in use of digital technologies by an organization (industry or country, etc.), for example transforming existing tasks or enabling new ones (Oslo Manual, 2018; Ritter and Pedersen, 2020).
- The EU is lagging behind US in digital adoption rates, especially in the service (and construction) sectors (EIB, 2020).
- Recent surveys show that the rate of adoption for many of these digital technologies is relatively low and skewed toward larger firms. It also has a hierarchical pattern in which the most sophisticated technologies are most frequently accepted only after more basic applications (e.g., Zolas et al., 2021).



# Digital capabilities for using digital technologies: **relatively low** **among sample firms**

	N	High Extent (% of Firms)	Mean (5-point scale)
Digital integration within and across different business functions	1759	39.1%	3.13
Access to and ability to use data analytics to design, develop, commercialise and improve products	1749	29%	2.78
Access to networks and the use of appropriate solutions and architectures (hardware and software)	1765	45.1%	3.25
Effective management of privacy and cybersecurity risks	1782	63.6%	3.75
Adoption of appropriate business models for digital environments, such as e-commerce, participative platforms etc.	1748	26%	2.66

- **Digital competence** is a multi-faceted construct that captures the ability of a firm to benefit from digitalization and address associated challenges (Oslo Manual, 2018)
- **Digital capabilities:** the capacity of a firm to incorporate digital technologies into current business processes and utilize digital resources to improve business management (Annarelli et al., 2021; Young et al., 2024)

# Digital capabilities development by sectoral group (manufacturing vs. services)

	Sectoral Group	N	High Extent (% of Firms)	Mean (5-point scale)	T-test Sig.	Eta squared
Digital integration within and across different business functions	Manufacturing	1054	33.6%	3.00	0.000	0.020
	Services	705	47.4%	3.33		
Access to and ability to use data analytics to design, develop, commercialize and improve products	Manufacturing	1046	24.8%	2.66	0.000	0.015
	Services	703	35.3%	2.96		
Access to networks and the use of appropriate solutions and architectures (hardware and software)	Manufacturing	1057	39.6%	3.10	0.000	0.023
	Services	708	53.2%	3.46		
Effective management of privacy and cybersecurity risks	Manufacturing	1067	58.8%	3.63	0.000	0.018
	Services	715	70.9%	3.92		
Adoption of appropriate business models for digital environments, such as e-commerce, participative platforms etc.	Manufacturing	1046	18.5%	2.42	0.000	0.056
	Services	702	37.2%	3.02		

# Digital platforms' use: **relatively limited among sample firms**

	N	High Extent (% of Firms)	Mean (5-point scale)
Conducting research and development of new products and services	1753	17.5%	2.24
Providing seamless connection (e.g., procurement, manufacturing, shipment, forecasting) among partners	1757	33.9%	2.90
Carrying out pre-sale interactions with existing or potential customers (e.g., advertisements and market research)	1757	25.8%	2.69
Providing customer services including maintaining and repairing services, and technical support	1735	38.5%	2.99

- Digital platforms integrate producers and users at various value chain stages. They often form an ecosystem where new products are developed and sold, and data is generated and exchanged.

# Digital capabilities, digital platforms' use, and intangible investments

Variable		N	Total Investments (% of turnover)	Internal Investments (% of turnover)	External Investments (% of turnover)
Digital Capabilities	Weak development	892	8.37	5.10	3.27
	Strong development	417	12.74	8.18	4.56
Digital Platforms' use	Weak use	1104	8.70	5.26	3.44
	Strong use	199	15.91	10.82	5.09

- Digital capabilities are created and further developed and sustained through the **synergistic effects of diverse intangible assets** such as human capital (training), organizational capital, software and databases, or brand capital

# Intangible investments, Digital capabilities and Digital platforms utilization (linear regressions)

Variable	Digital Capabilities	Digital Platforms Utilization
<i>Control Variables</i>		
Size	0.251***	0.112**
Sector [Services (+) / Manufacturing (-)]	0.202***	-0.040
<i>Investments in Intangible Assets_as % of turnover</i>		
Software & Databases	0.615***	0.619**
Training	0.607**	0.614**
OBP improvement	0.679***	0.328
R&D	0.008	0.350**
Design	-0.055	0.316*
Reputation & Branding	0.509*	1.633***
<i>Strategy &amp; Human Capital</i>		
Strategic priority_Innovation	0.218***	0.318***
Human Capital (% of employees with Uni degree)	0.409***	0.205**
N	1270	1264
F	16.91***	16.37***
R <sup>2</sup>	0.1776	0.1736
Adjusted R <sup>2</sup>	0.1671	0.1630

Notes: Country dummies are included in all models. Three, two, and one asterisk correspond to  $p < 0.01$ ,  $p < 0.05$ , and  $p < 0.10$ , respectively.

# Conclusions

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- Very low adoption of state-of-the-art digital technologies (AI, virtual and augmented reality, robotics, 3D printing) among sample firms
- Relatively low digital capabilities and digital platforms' use, especially in manufacturing
- Large heterogeneity of firms regarding the investments in IAs
- Digital capabilities are created and, most importantly, further developed and sustained through the synergistic effects of diverse intangible assets such as human capital (training), organizational capital, software and databases, or brand capital.
- Strong use of digital platforms suggests a greater propensity to invest in relevant supportive ICT and digital resources. However, IT is both a significant intangible asset and a critical connector of other intangible assets, suggesting the significance of investing simultaneously in other intangible types such as R&D, organizational business improvement, marketing, and training.
- Digital transformation is multifaceted, requiring enhancements in technology, skills, processes, and customer engagement.

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Ευχαριστώ πολύ για την προσοχή σας!