



F O R U M
CYBER 4.0

**Tecnologie emergenti e
aspetti core di cybersecurity**

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Agenda

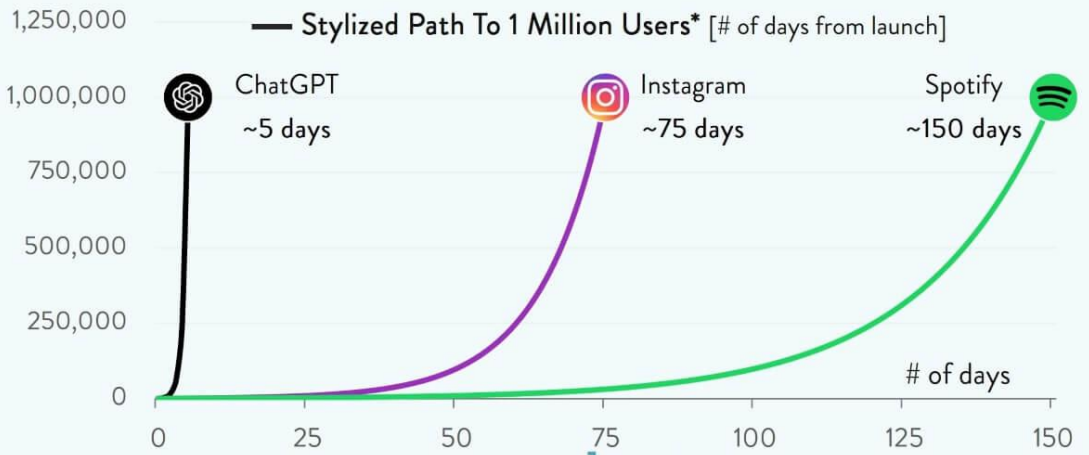
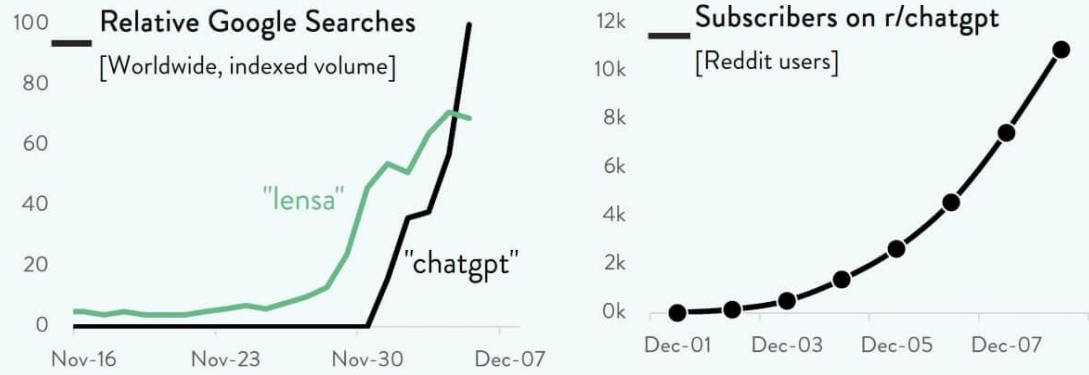
- Trend digitali
- Il rischio cyber nella trasformazione digitale
- Cambio di paradigma nella cybersecurity

Trend digitali

Tecnologie abilitanti



ChatGPT From OpenAI Is A Bot Taking The Tech World By Storm



Sources: Google, Subredditstats, Media Reports **charttr** *Path is stylized to the 1m milestone

ChatGPT Sprints to One Million Users

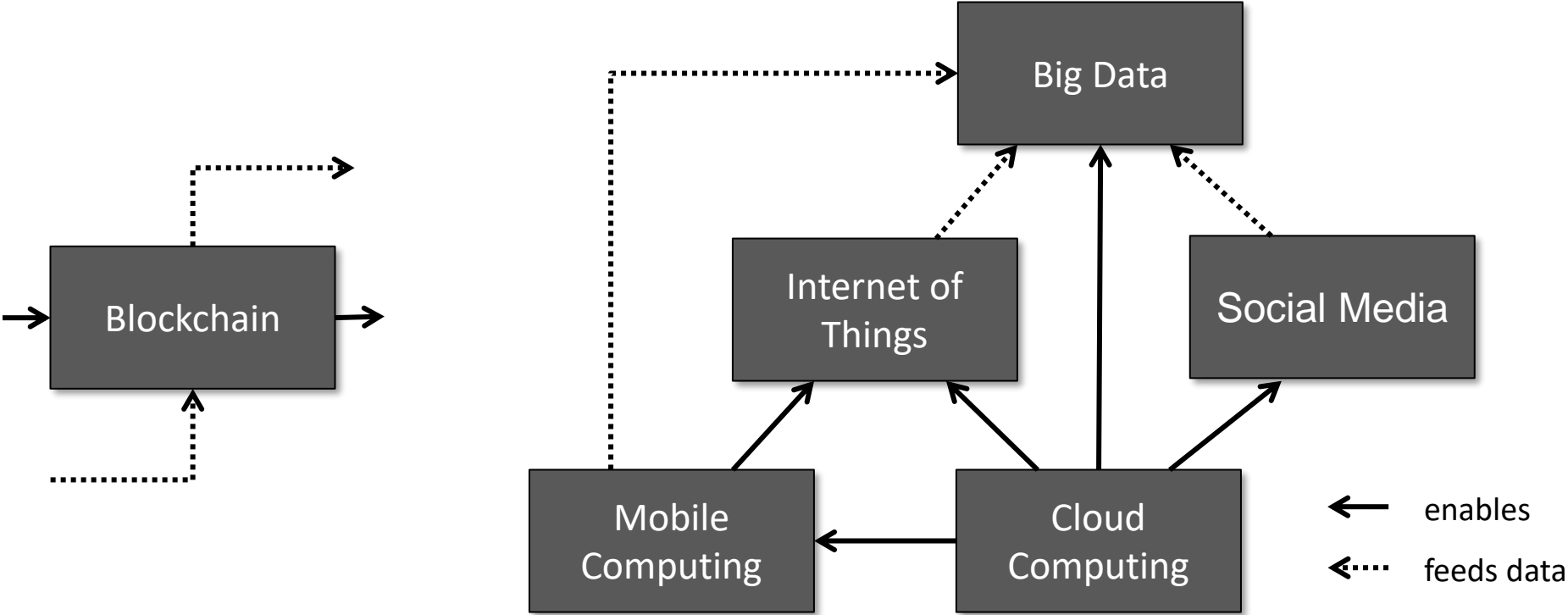
Time it took for selected online services to reach one million users



* one million backers ** one million nights booked *** one million downloads
Source: Company announcements via Business Insider/LinkedIn



The Big Five or more



● Cloud computing
Argomento

● IoT
Termine di ricerca

● social media
Termine di ricerca

● mobile computing
Termine di ricerca

● big data
Termine di ricerca

Italia

2004 - Presente

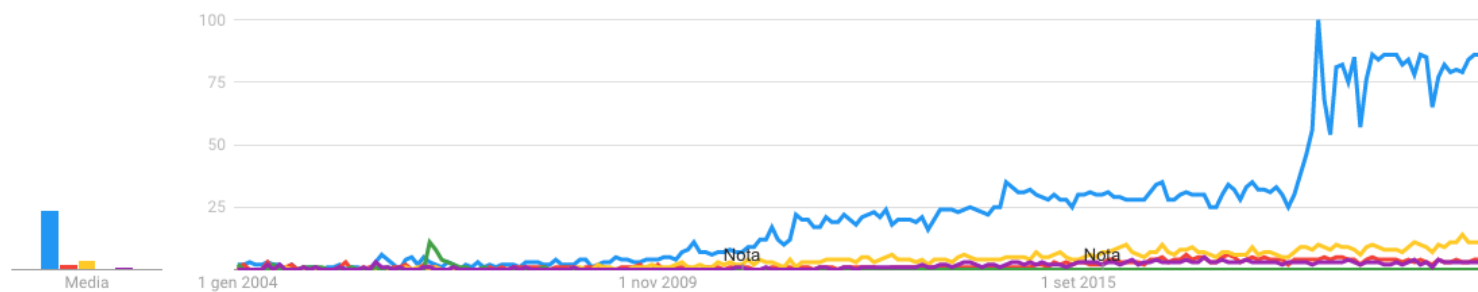
Tutte le categorie

Ricerca Google

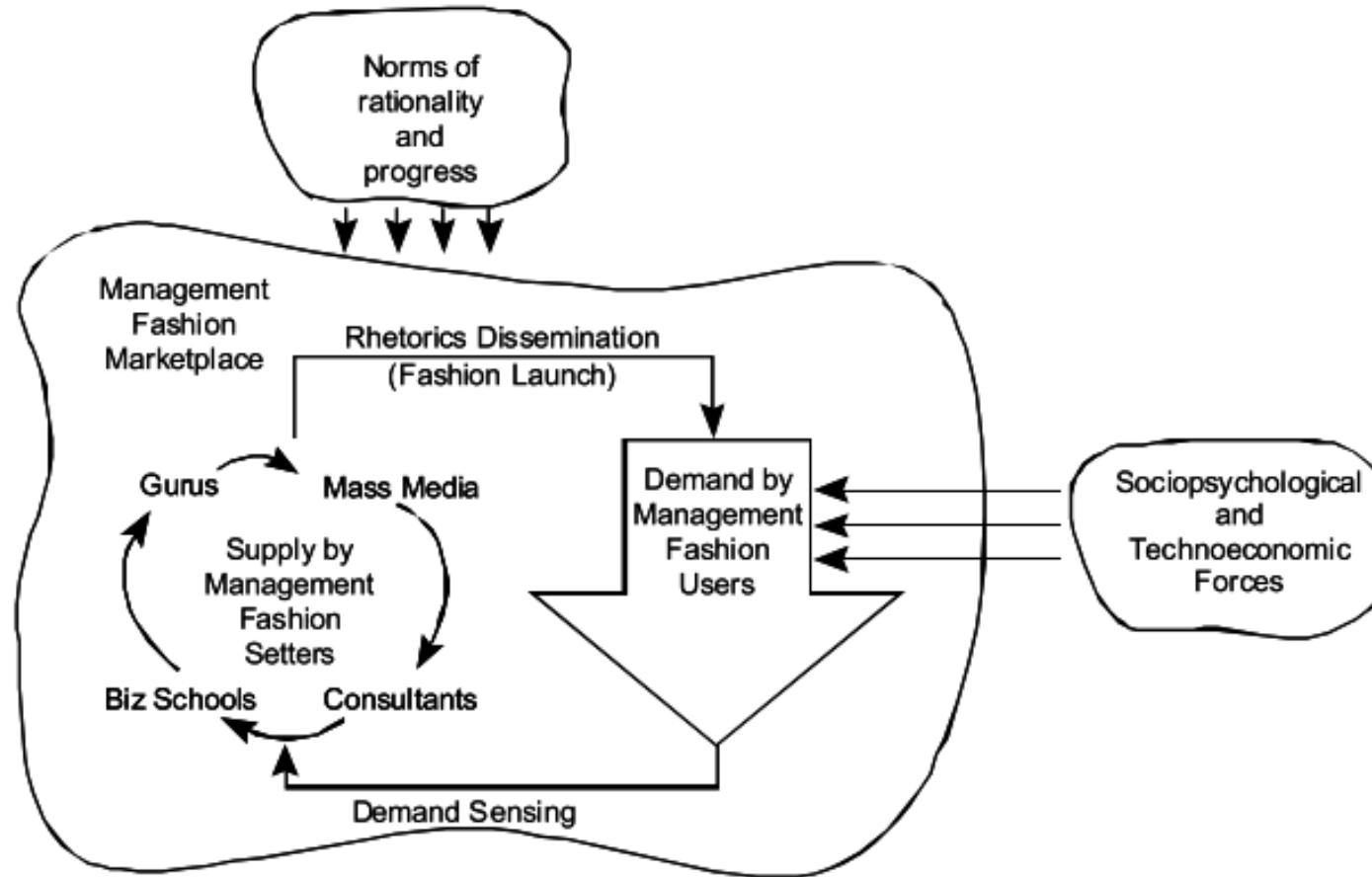
Nota: Questo confronto contiene argomenti e termini di ricerca, che vengono misurati in modo diverso.

[ULTERIORI INFORMAZIONI](#)

Interesse nel tempo



Fashion waves in management and information systems (the Milan theory)



Office automation

Business Process Reengineering

Enterprise Resource Planning

Enterprise 2.0

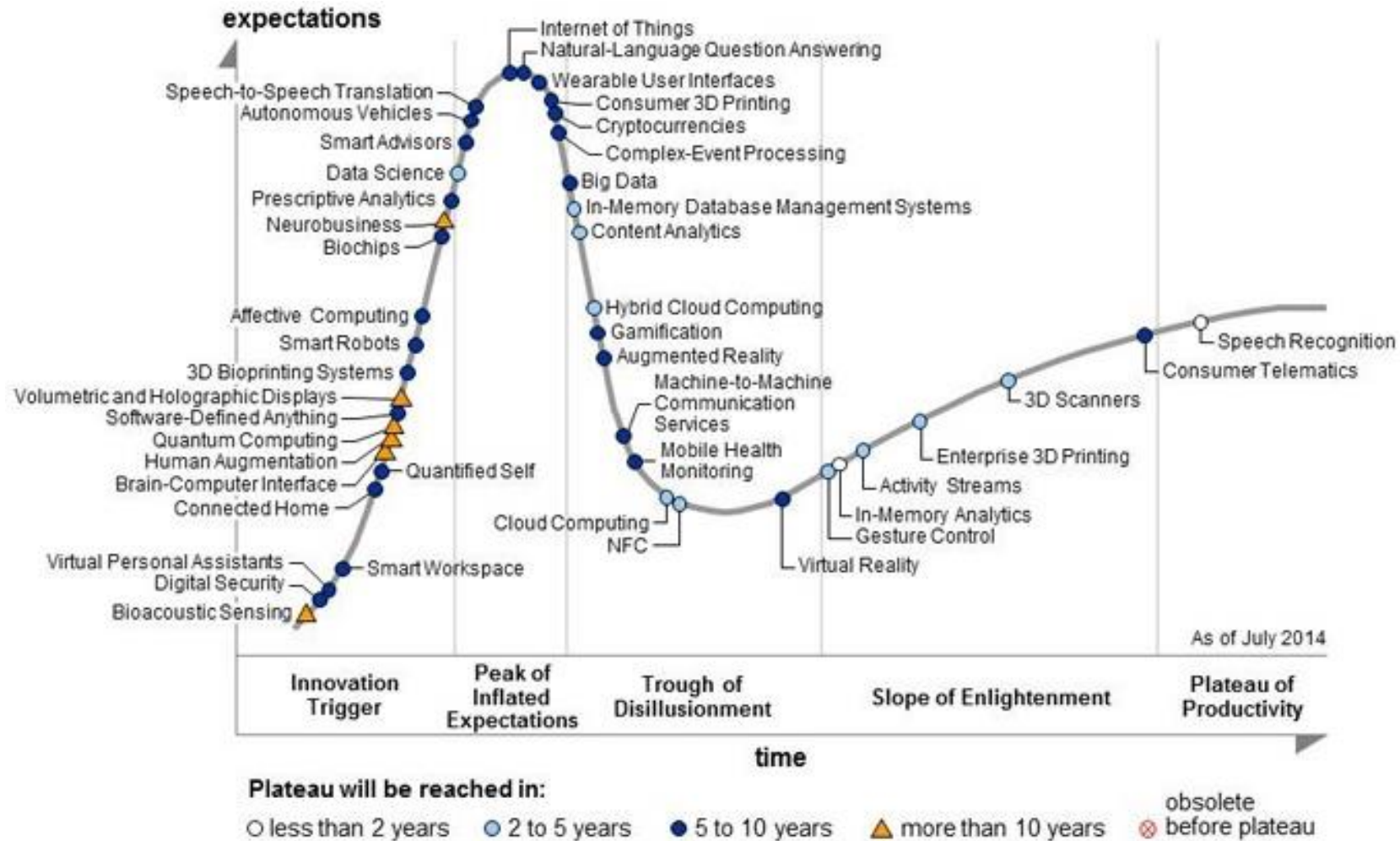
Cloud computing

IoT

Big Data

...

Il percorso verso la produttività

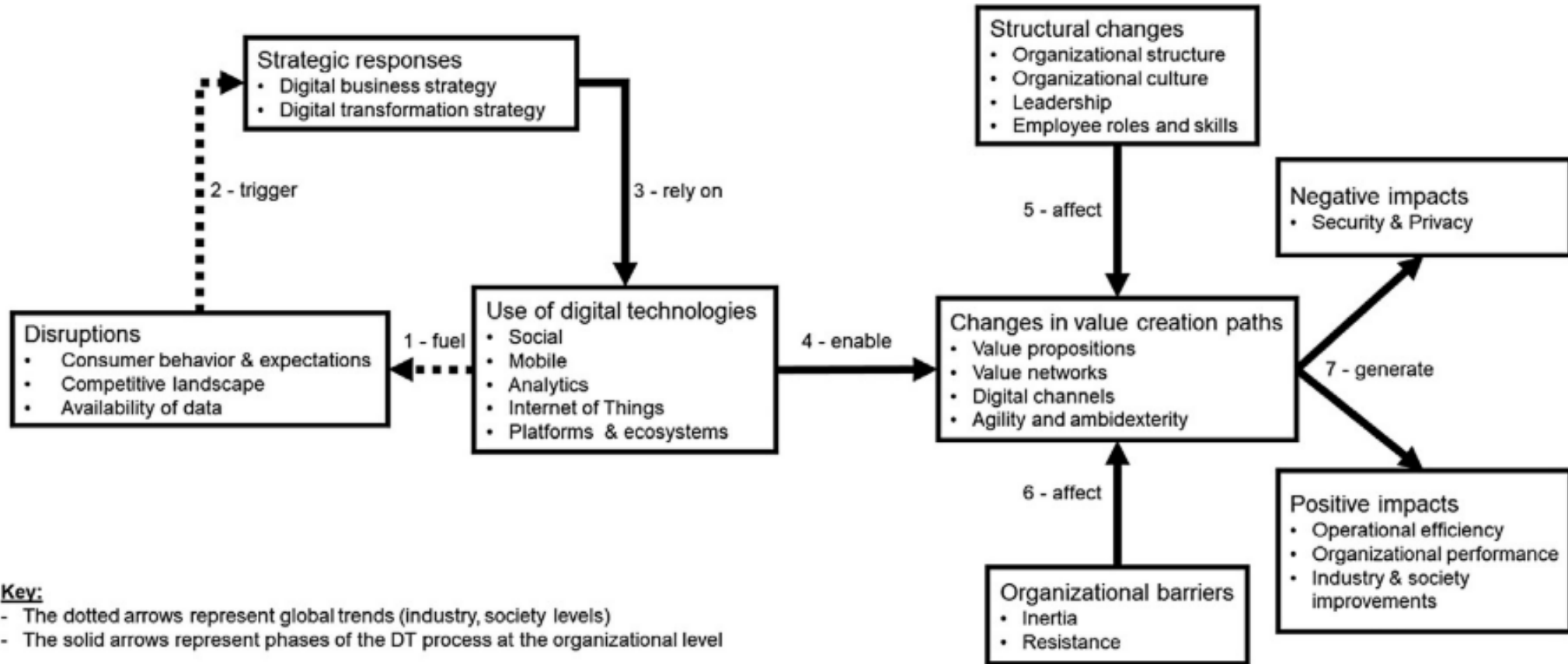


Il rischio cyber nella trasformazione digitale

Security infrastructures



Digital transformation



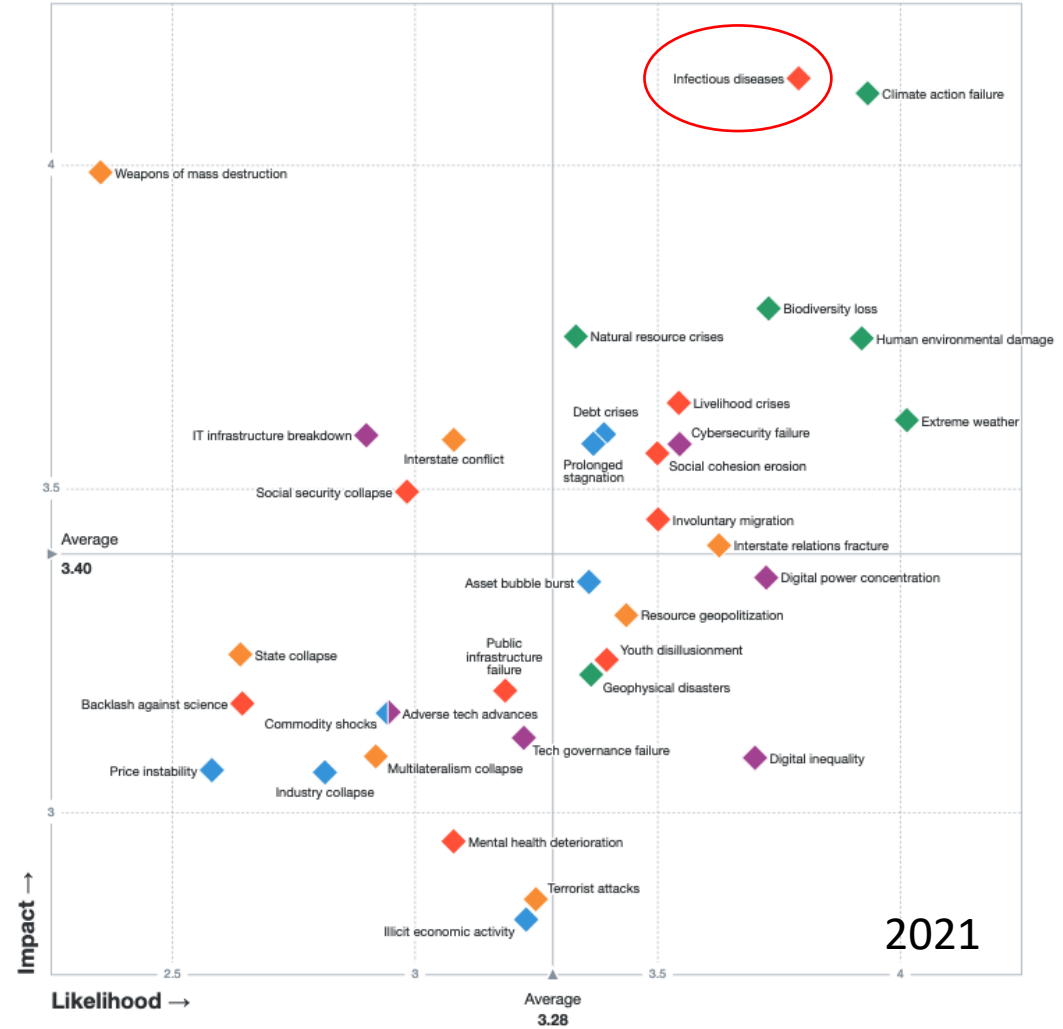
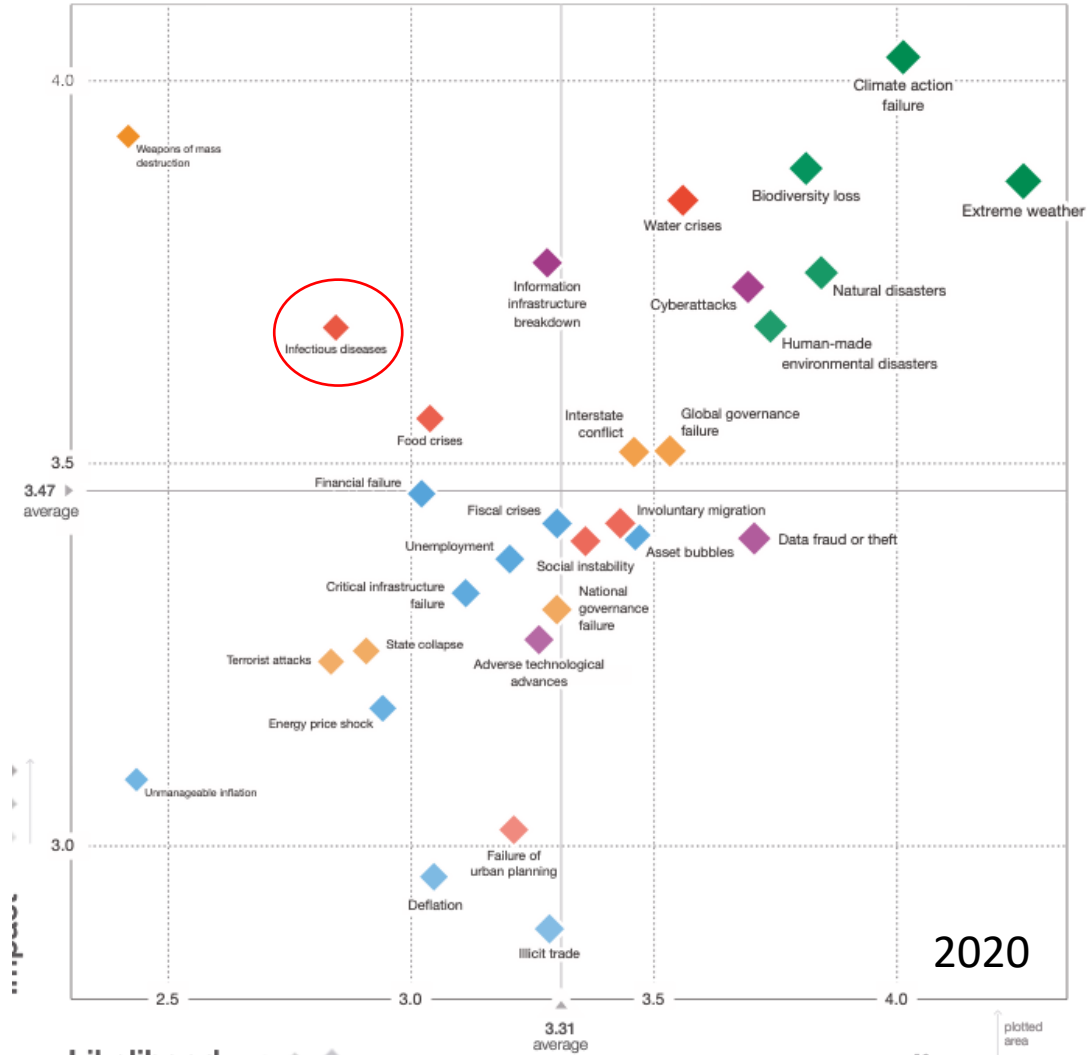
New value creation logics

- direct and indirect network effects in digital platforms
- generativity of digital platform ecosystems
- responsible (social, economic and environmental) value creation
- managing technological risk and cyber threats



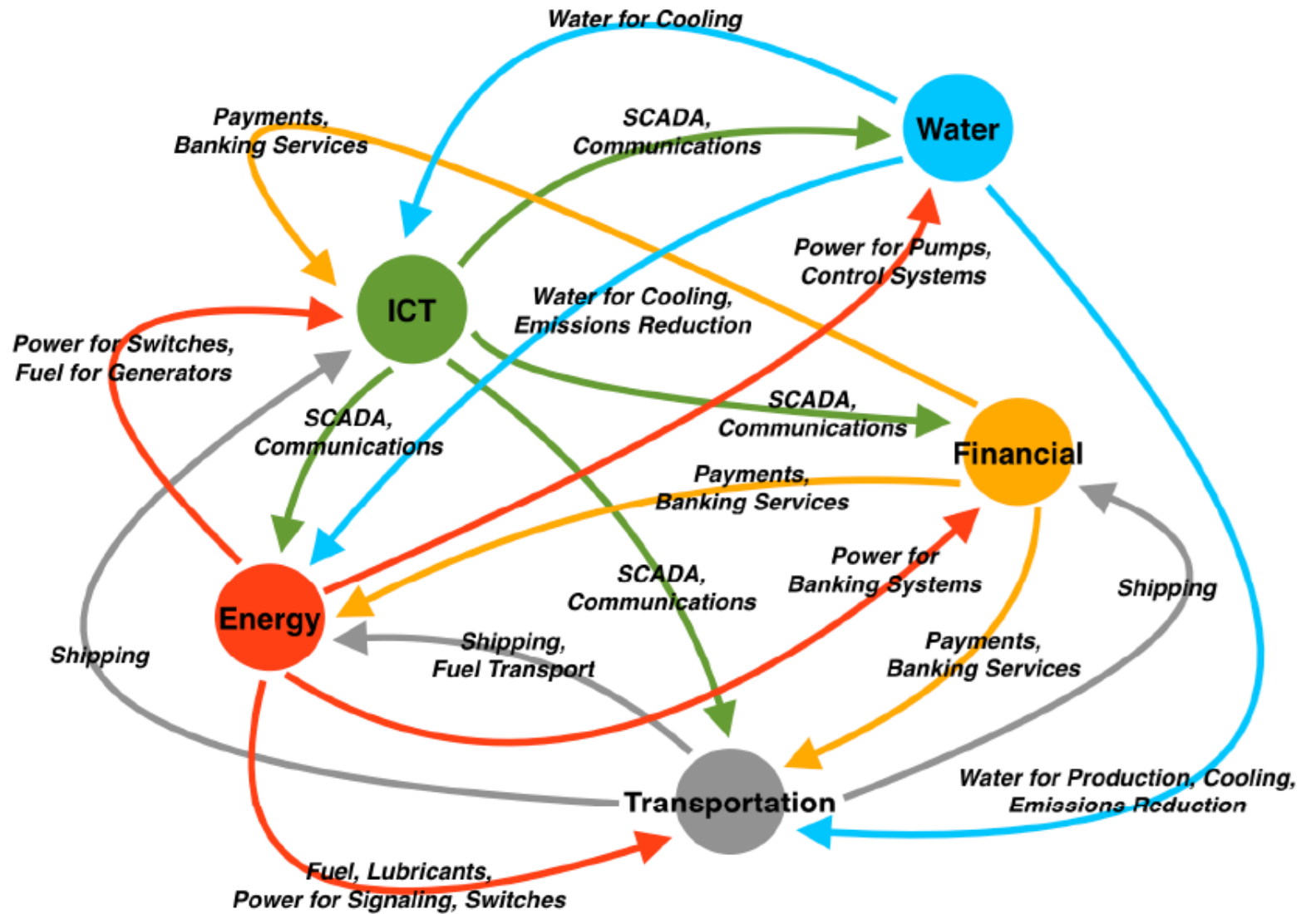
*"Leadership and competition in digital ecosystems
painted by Frida Kahlo" (DALL-E)*

The map of global risks



Source: World Economic Forum Global Risks Perception Survey 2020–2021

Cascading effects



Canzani (2016). Modeling Dynamics of Disruptive Events for Impact Analysis in Networked Critical Infrastructures. In ISCRAM.

The 2022 SIM IT Issues and Trends Study

The Society for Information Management's 42nd Annual IT Issues and Trends Study received responses from 796 IT executives, including 334 CIOs and 540 unique organizations. The average revenue of participating organizations was \$6.1 billion (median \$400 million). IT spending as a percentage of revenue was 5.9%, up slightly from 2021 but close to the 10-year average of 5.7%. However, 74.6% of organizations reported increasing IT headcount, a 10-year high and up from 63.6% in 2021. Similarly, 94.8% reported increases in average IT salaries. The top five IT management issues for organizations in 2022 were Cybersecurity, Alignment, Analytics, Compliance and Digital Transformation; the top five largest IT investments were Analytics, Cybersecurity, Cloud, Application Development and ERP; while the five most difficult to find soft skills were Critical Thinking, Teamwork, Business Acumen, Leadership and Problem Solving. The most common criteria for assessing CIO performance were Value of IT to the Business, Internal Customer Satisfaction, Cybersecurity, Strategic Contribution of IT and IT Availability. The average tenure of CIOs was 5.9 years (median 4 years) with 48% reporting to the CEO. CIOs continue to come from outside organizations at record levels (82%), and 24.6 came from prior non-IT positions.¹

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Dedication

The IT Trends research team would like to thank Leon Kappelman for leading the Annual IT Trends Study for the past decade. Leon retired from academia in 2021 after a career of enlightening students. Thank you for your wisdom, mentorship and friendship.



Society of Information Management (scholars, consultants, IT manager & non-IT manager) in 2022, 42nd ed.

“one of the most comprehensive investigations of IT and IT leadership in organisations”

796 IT executives, 334 CIO

554 organizations, average revenues 6.1bln USD

average IT spending 359.9mln USD (5.9%)

Organizations' Top 10 Most Important IT Management Issues

Organizational IT Issue	2022 (n= 540)	2021 (n= 454)	2020 (n= 624)	2019 (n= 618)	2018 (n= 793)	2017 (n= 769)	2016 (n= 801)	2015 (n= 785)	2014 (n= 717)	2013 (n= 484)
Security/ Cybersecurity/ Privacy ^b	1 (51.1%)	1 (42.5%)	1 (36.1%)	1 (35.9%)	1 (38.3%)	1 (41.9%)	2 (36.0%)	2 (31.5%)	2 (17.6%)	7 (11.2%)
Alignment of IT with the Business	2 (33.9%)	2 (33.3%)	2 (35.1%)	2 (33.2%)	2 (32.8%)	2 (37.3%)	1 (41.7%)	1 (42.4%)	1 (26.2%)	1 (43.7%)
Data Analytics/Data Management	3 (28.7%)	3 (24.7%)	3 (25.3%)	3 (25.7%)	3 (26.9%)	3 (23.4%)				
Compliance and Regulations (e.g., HIPAA, SarBox, SAS70, PCI etc.)	4 (28.3%)	5 (23.6%)	4 (24.4%)	5 (20.6%)	6 (19.9%)	4 (20.7%)	12 (13.5%)	11 (16.2%)	12 (9.1%)	16 (6.0%)
Digital Transformation	5 (22.2%)	4 (24.4%)	4 (24.4%)	4 (22.2%)	7 (19.5%)	8 (18.7%)				
IT Talent/Skill Shortage/Retention	6 (20.6%)	16 (9.9%)	18 (9.6%)	17 (11.8%)	17 (11.3%)	17 (10.9%)	15 (11.0%)	14 (13.5%)	18 (7.0%)	16 (6.0%)
Business Continuity	7 (17.8%)	7 (19.2%)	7 (22.8%)	16 (12.0%)	12 (14.0%)	18 (10.8%)	11 (13.7%)	15 (12.4%)	22 (5.0%)	
Cloud/Cloud Computing	8 (16.9%)	6 (19.4%)	9 (18.3%)	6 (19.7%)	13 (13.7%)	14 (12.2%)				
Velocity of Change - Business	9 (16.5%)	14 (11.0%)	21 (7.9%)	18 (11.2%)	18 (10.3%)	15 (11.2%)	13 (12.4%)	15 (12.4%)	7 (13.0%)	
Innovation	10 (15.4%)	10 (15.6%)	11 (16.7%)	9 (18.3%)	4 (20.3%)	7 (19.5%)	3 (23.2%)	4 (23.4%)	8 (12.8%)	
Strategic Planning - Business	10 (15.4%)	12 (14.1%)	13 (11.2%)	14 (12.5%)	15 (12.9%)	11 (16.3%)	9 (15.6%)	13 (14.4%)		

Organizations' Largest IT Investments

IT Investment Area	2022 (n= 540)	2021 (n= 454)	2020 (n= 624)	2019 (n= 618)	2018 (n= 793)	2017 (n= 769)	2016 (n= 801)	2015 (n= 785)	2014 (n= 717)	2013 (n= 482)
Analytics/Business Intelligence/Data Mining/Forecasting/Big Data	1 (40.0%)	3 (34.1%)	2 (35.6%)	1 (37.9%)	1 (37.7%)	1 (41.6%)	1 (39.5%)	1 (38.0%)	1 (30.1%)	1 (42.1%)
Security/Cybersecurity	2 (37.2%)	2 (38.8%)	3 (33.0%)	3 (33.3%)	2 (37.1%)	2 (36.2%)	3 (29.5%)	3 (28.9%)	7 (11.9%)	14 (7.5%)
Cloud Computing (e.g., SaaS, PaaS, IaaS etc.)	3 (36.9%)	1 (43.0%)	1 (38.1%)	2 (36.1%)	3 (33.9%)	3 (31.1%)	4 (27.8%)	7 (22.9%)	5 (15.6%)	3 (18.7%)
Application Software Development/Maintenance	4 (29.3%)	4 (28.6%)	4 (27.6%)	4 (28.3%)	4 (30.6%)	4 (30.6%)	2 (34.1%)	4 (28.8%)	4 (18.4%)	6 (11.8%)
ERP (Enterprise Resource Planning)	5 (23.9%)	5 (23.6%)	6 (22.3%)	6 (22.5%)	5 (26.6%)	5 (28.6%)	6 (25.0%)	2 (32.2%)	3 (18.7%)	4 (16.6%)
CRM (Customer Relationship Management)	6 (21.9%)	6 (21.8%)	5 (22.8%)	5 (24.1%)	5 (23.7%)	6 (24.1%)	5 (26.0%)	5 (24.5%)	6 (13.8%)	2 (19.5%)
Legacy Applications - Replacing/Replatforming	7 (14.8%)	7 (17.2%)	7 (15.7%)	7 (18.8%)	9 (15.0%)	9 (15.5%)	11 (13.2%)			
Disaster Recovery/IT Continuity Planning	8 (13.0%)	15 (9.7%)	14 (10.7%)	14 (9.1%)	12 (10.6%)	11 (12.1%)	11 (13.2%)	13 (10.7%)	10 (6.7%)	11 (8.3%)
Data Center/Infrastructure	9 (12.2%)	8 (13.0%)	9 (14.3%)	8 (15.4%)	7 (21.9%)	7 (20.9%)	7 (24.7%)	6 (24.2%)	2 (19.1%)	
Legacy Applications - Maintaining (Updating/Consolidation)	9 (12.2%)	12 (10.1%)	12 (11.7%)	9 (12.8%)	10 (11.7%)	10 (12.5%)	10 (13.6%)			

IT Leaders' Personally Most Important/Worrisome IT Management Issues

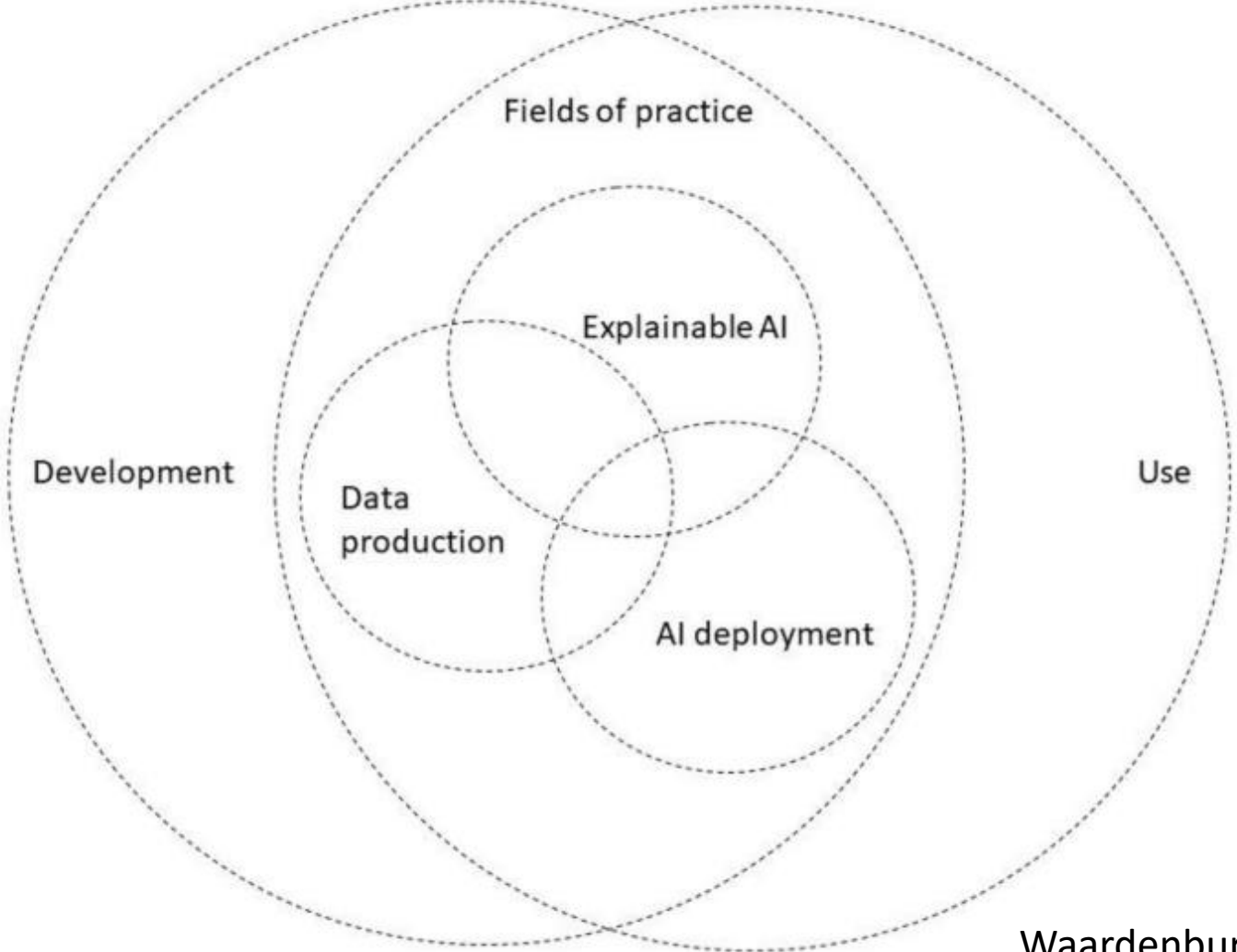
Organizational IT Issue	2022 (n= 540)	2021 (n= 454)	2020 (n= 624)	2019 (n= 618)	2018 (n= 793)	2017 (n= 769)	2016 (n= 801)	2015 (n= 785)	2014 (n= 717)	2013 (n= 480)
Security/Cybersecurity/ Privacy	1 (55.2%)	1 (46.9%)	1 (40.9%)	1 (46.3%)	1 (46.4%)	1 (47.7%)	1 (46.4%)	1 (36.8%)	1 (25.5%)	2 (19.8%)
IT Talent/Skill Shortage/	2 (38.1%)	3 (22.2%)	5 (18.4%)	3 (21.5%)	2 (25.6%)	3 (23.5%)	2 (28.3%)	3 (28.3%)	2 (20.9%)	3 (19.6%)
Alignment of IT and/with the Business	3 (25.2%)	2 (24.4%)	2 (23.4%)	2 (25.1%)	4 (19.8%)	4 (21.8%)	3 (24.0%)	2 (29.7%)	3 (19.9%)	1 (32.5%)
Compliance and Regulations (e.g., HIPAA, SarBox, SAS70, PCI etc.)	4 (19.4%)	6 (16.5%)	7 (15.9%)	5 (15.7%)	6 (16.3%)	5 (16.9%)	11 (12.1%)	13 (12.2%)	14 (7.5%)	16 (7.5%)
Business Continuity	5 (19.3%)	5 (17.4%)	3 (21.8%)	8 (14.1%)	5 (17.4%)	8 (14.0%)	5 (17.4%)	7 (16.2%)	13 (7.8%)	
Credibility of IT/Perception of IT Leadership	6 (17.8%)	4 (21.6%)	4 (20.4%)	4 (20.4%)	3 (22.1%)	2 (24.4%)	4 (20.3%)	6 (16.4%)	18 (7.1%)	
Agility/Flexibility - IT	7 (15.2%)	7 (14.3%)	8 (15.4%)	12 (11.5%)	7 (15.8%)	6 (15.7%)	8 (14.7%)	5 (19.5%)	16 (7.4%)	
Data Analytics/Data Management	7 (15.2%)	9 (14.1%)	12 (12.3%)	7 (14.2%)	8 (14.1%)	7 (14.2%)				
Digital Transformation	9 (14.4%)	7 (14.3%)	6 (16.2%)	11 (12.0%)	17 (10.8%)	19 (10.3%)				
Disaster Recovery	10 (13.9%)	12 (11.5%)	13 (12.0%)	13 (10.7%)	9 (12.7%)	12 (12.1%)	6 (16.5%)	9 (15.3%)	10 (8.8%)	

Infrastrutture digitali per la sicurezza

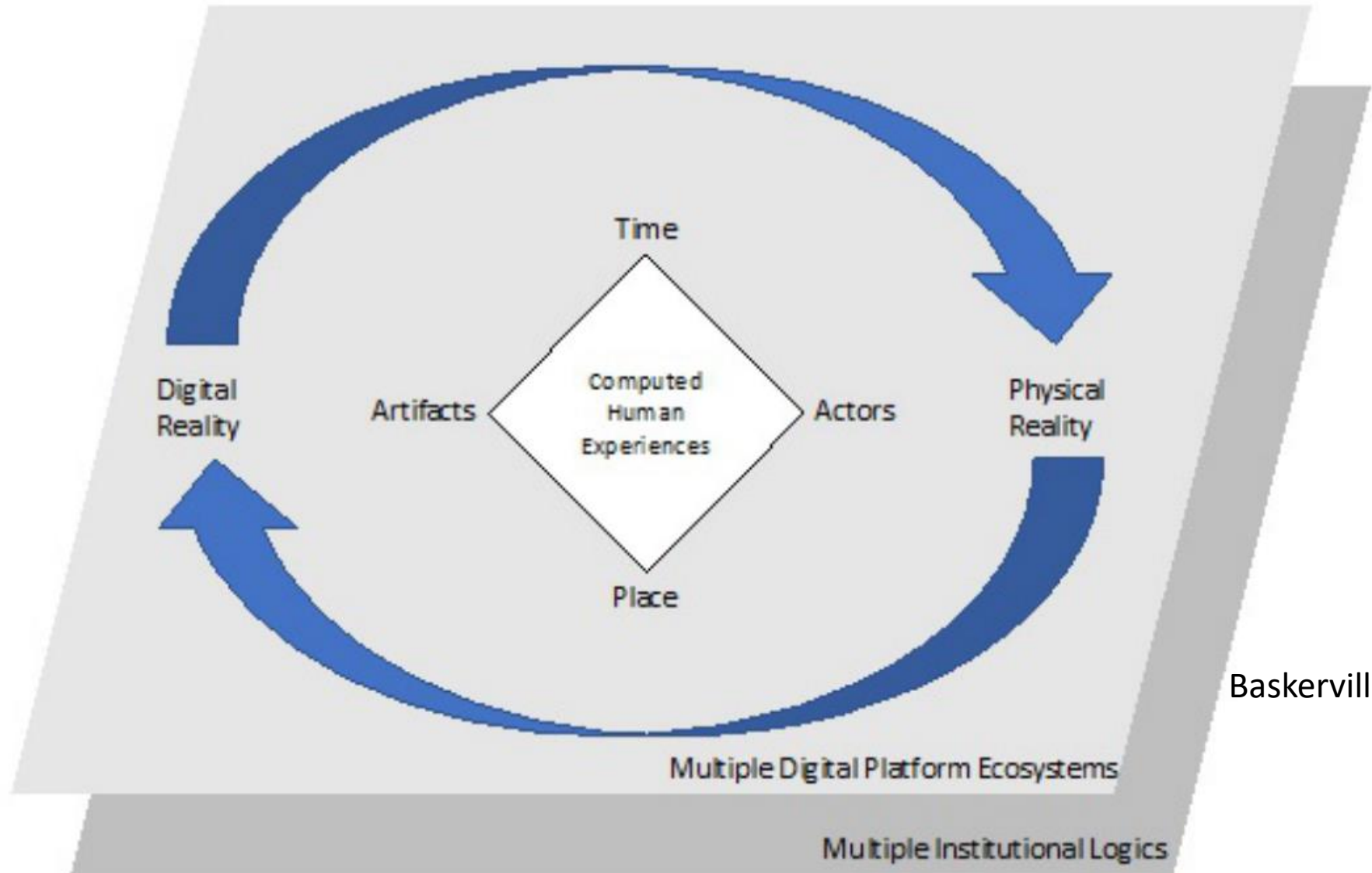
Verso un cambio di paradigma



Le sfide dell'AI

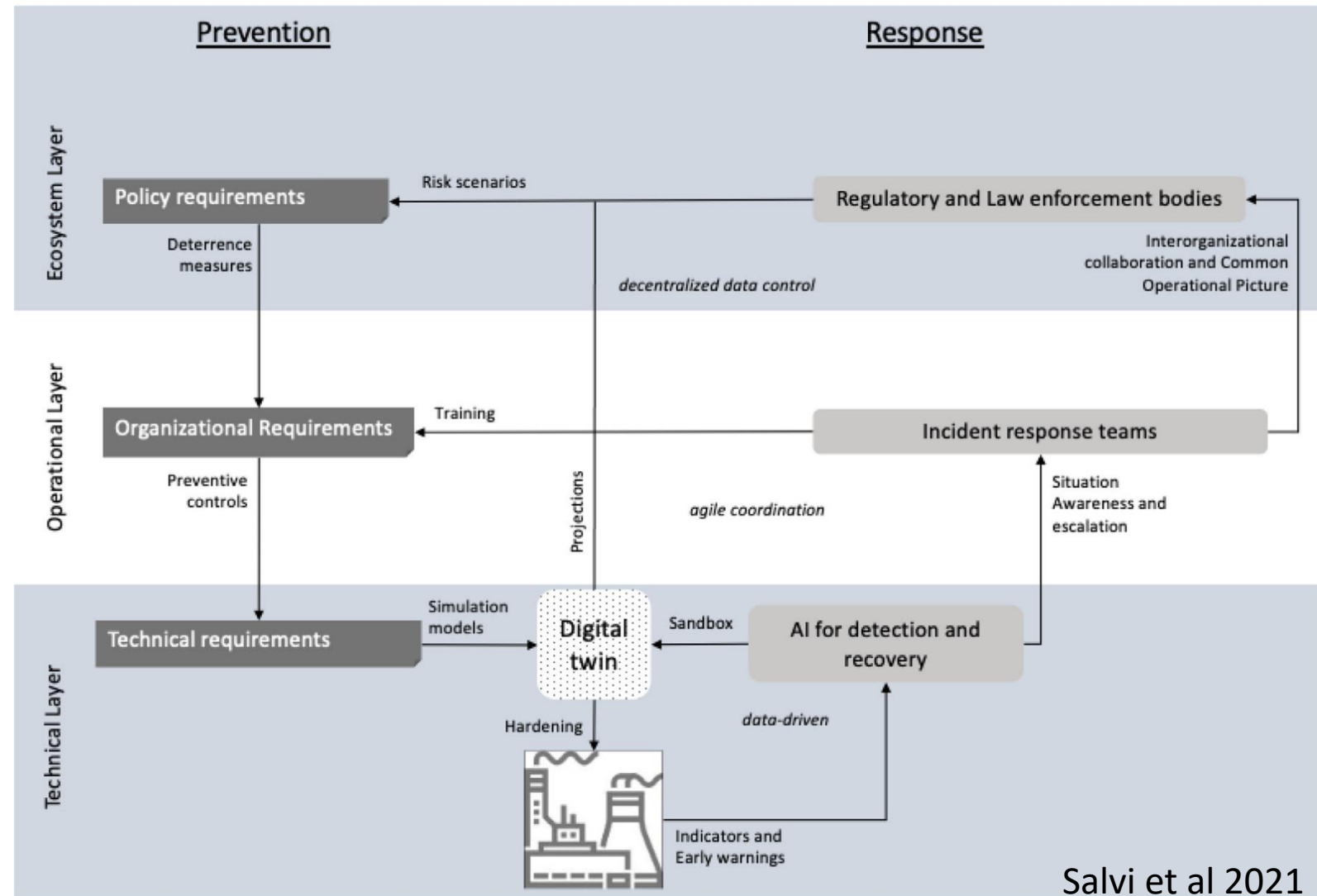


L'inversione ontologica



Baskerville et al 2020

Dalla protezione del dato alla sicurezza fisica



In conclusione

- una lettura critica delle tecnologie emergenti – come artefatti socialmente costruiti - e del loro impatto nel contesto d'uso è necessaria per il governo della complessità
- la cybersecurity deve avanzare di pari passo con lo sviluppo delle tecnologie emergenti per evitare effetti sistemici dovuti al propagarsi degli incidenti negli ecosistemi digitali
- le tecnologie emergenti (es. blockchain, AI) devono essere adeguatamente integrate negli ecosistemi digitali (es. smart contract) e allo stesso tempo contribuire al rafforzamento delle infrastrutture per la sicurezza (es. digital twin)

References

- Berner, M., Graupner, E., & Maedche, A. 2014. The Information Panopticon in the Big Data Era. *Journal of Organization Design*, 3(1): 14. <https://www.jorgdesign.net/article/view/9736>
- Kappelman, L., Torres, R., McLean, E. R., Maurer, C., Johnson, V. L., Snyder, M., & Guerra, K. (2022). The 2021 SIM IT Issues and Trends Study. *MIS Quarterly Executive*, 21(1), 75–114. <https://doi.org/10.17705/2msqe.00060>
- Kazemargi, N., Spagnoletti, P., Constantinides, P., & Prencipe, P. (2023). Data control coordination in cloud-based ecosystems: the GAIA-X case. In C. Cennamo, G. B. Dagnino, & F. Zhu (Eds.), *Handbook of Research on Digital Strategy*. Edward Elgar.
- Baskerville, R., Spagnoletti, P., & Kim, J. (2014). Incident-centered information security: Managing a strategic balance between prevention and response. *Information & Management*, 51(1), 138–151. <https://doi.org/10.1016/j.im.2013.11.004>
- Salvi, A., Spagnoletti, P., & Noori, N. S. (2022). Cyber-resilience of Critical Cyber Infrastructures: integrating digital twins in the electric power ecosystem. *Computers & Security*, 102507. <https://doi.org/10.1016/j.cose.2021.102507>
- Spagnoletti, P., & Za, S. (2022). Digital Resilience to Normal Accidents in High-Reliability Organizations. In S. Aier, P. Rohner, & J. Schelp (Eds.), *Engineering the Transformation of the Enterprise: A Design Science Perspective* (pp. 339–353). https://doi.org/https://doi.org/10.1007/978-3-030-84655-8_21



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**Grazie
dell'attenzione**