

An aerial night view of the Singapore skyline, featuring the Marina Bay Sands hotel and the Esplanade - Theatres on the Bay. The image is overlaid with a network of white lines and glowing nodes, suggesting a digital or data theme.

# **Discussion:** **Digitalization, Accounting Jobs, and Financial Reporting Quality**

ABFER 9<sup>th</sup> Annual Conference  
May 24, 2022

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ROBERT H. SMITH  
SCHOOL OF BUSINESS

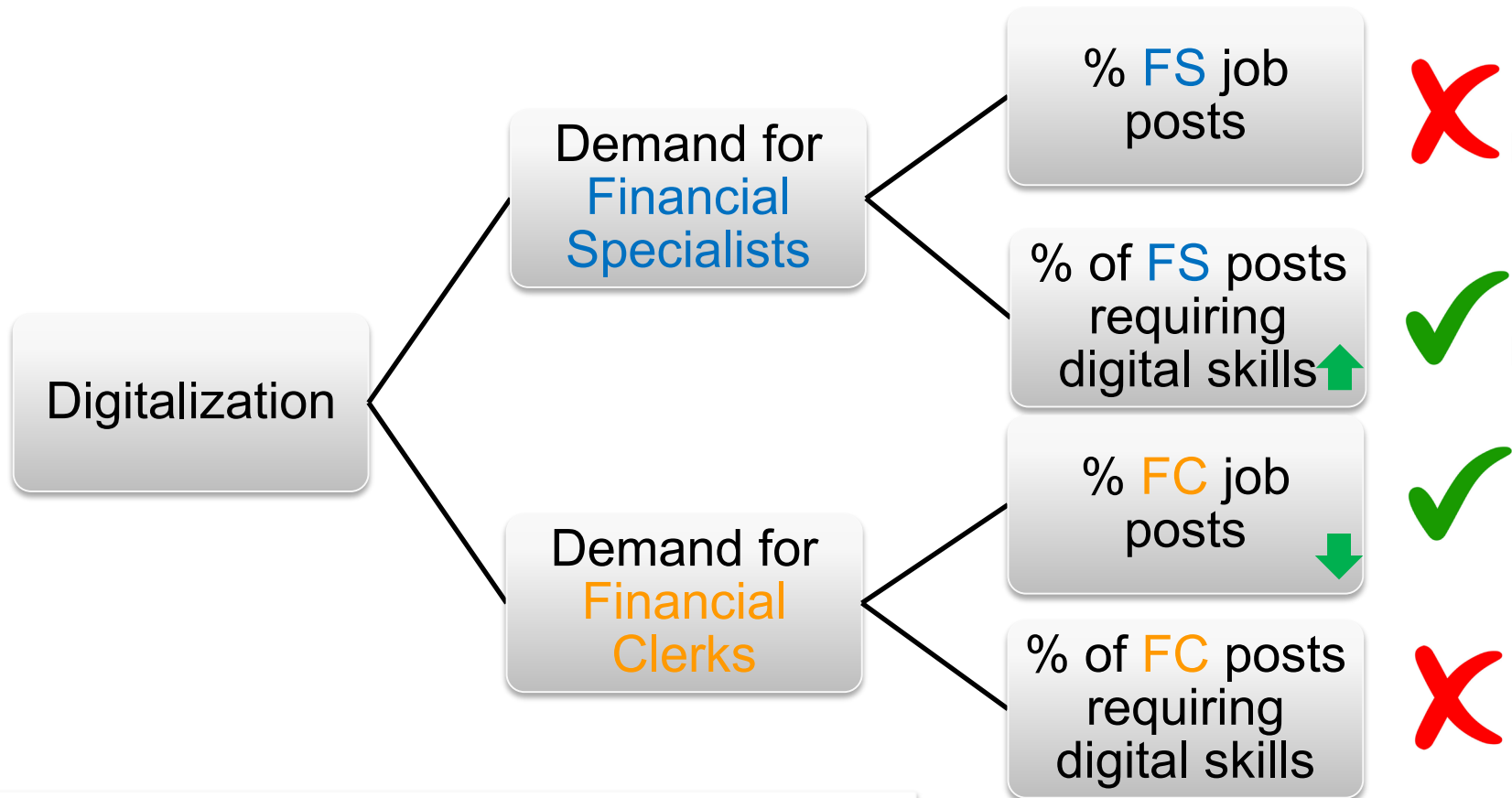
# Awyong Cheng Deng Wang (2022)

How digitalization affect the *corporate* accounting labor market?

- Does digitalization affect the demand for the number of accountants (financial specialists and financial clerks) and their digital skills?
- Whether digitalization and accountants' digital skills independently or jointly affect financial reporting quality?



# ACDW (2022): What They Find



Digitalization does not substitute for financial specialists.

# ACDW (2022): What They Find

Digital skills of financial specialists complement digitalization to jointly improve financial reporting quality.

Digitalization



Better Financial Reporting Quality



Requiring FS to have digital skills



Better Financial Reporting Quality



Digitalization



Requiring FS to have digital skills



Better Financial Reporting Quality



# ACDW (2022)

- Key takeaway: Investment in accountants' human capital is an integral part of firms' digitalization strategy.

- ✓ Timely and important questions
- ✓ Exploit rich job-post data
- ✓ Solid empirics

## My Discussion:

1. Place the paper in the related literatures
2. Big picture comments
3. Sample & data: digitalization and accountants
4. Empirics

# ACDW (2022)



ACDW  
(2022)

Accounting:  
Tech & Audit  
Labor Market

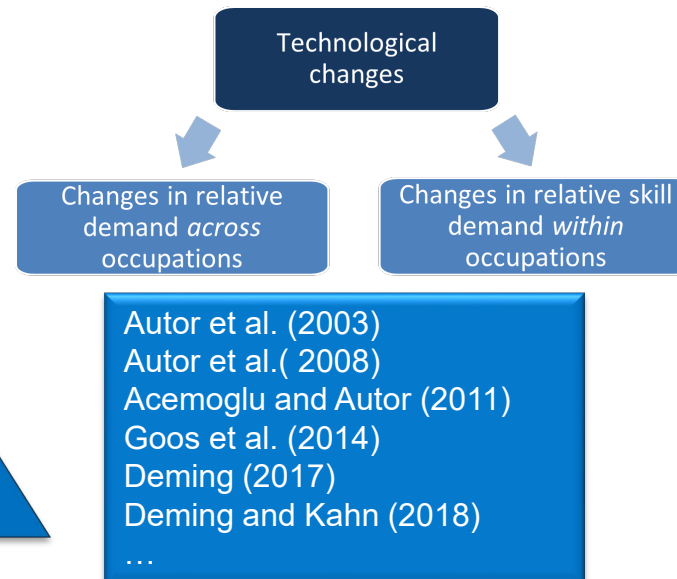
Labor Economics:  
Tech & Labor Market

Other:

- IT transformation and firm value/firm productivity (e.g., Brynjolfsson and Hitt 2000, Brynjolfsson et al. 2017; Chen and Srinivasan 2021)
- Auditor attributes and audit quality (e.g., Gul et al. 2013; Beck et al. 2018; Aobdia et al. 2019)

...

# ACDW (2022)



# Autor, Levy and Murnane (2003): Computerization and Task Share

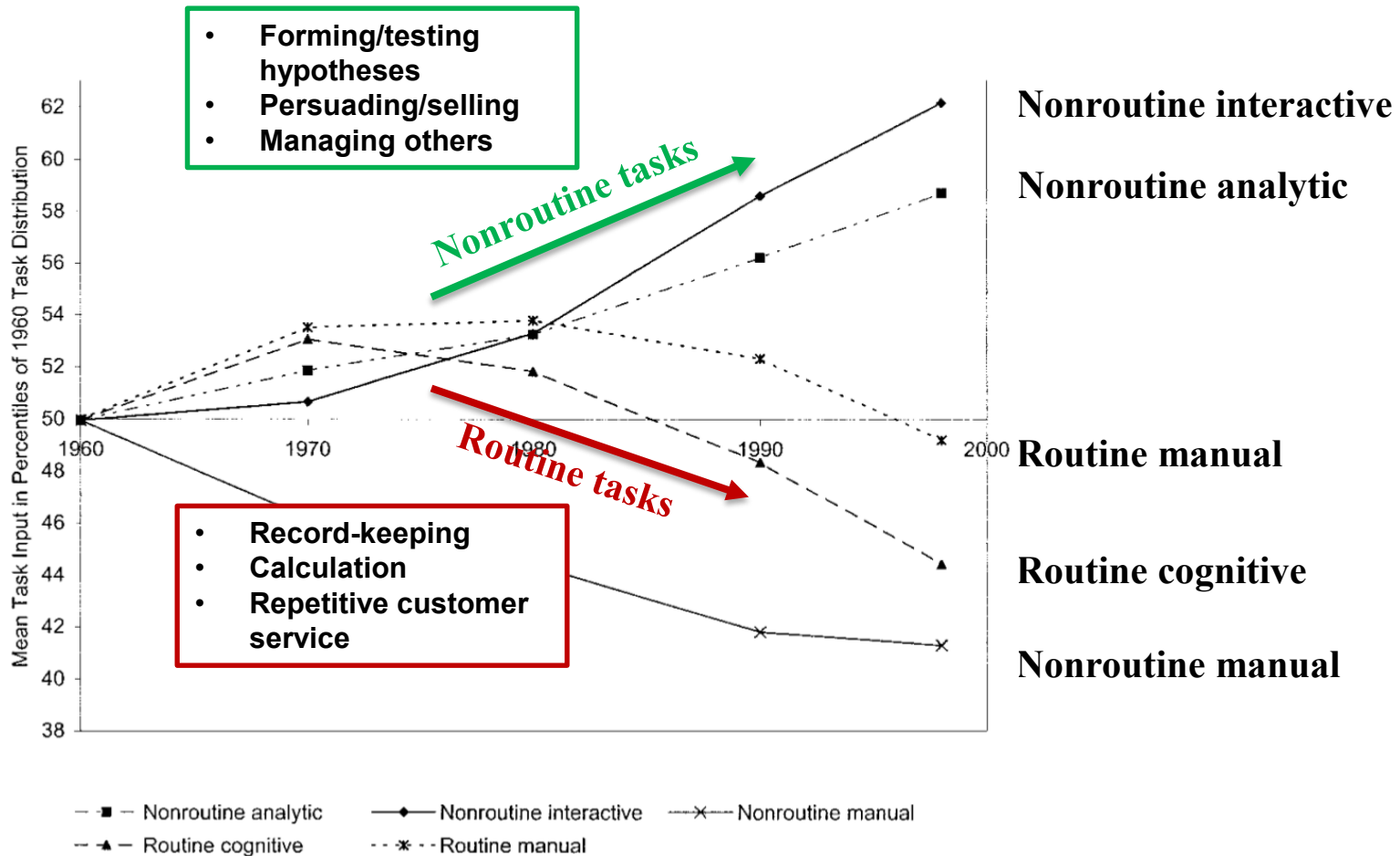


FIGURE I  
Trends in Routine and Nonroutine Task Input, 1960 to 1998

ACDW  
(2022)

Skills and  
Auditors

Labor Economics





The New York Times

# The Robots Are Coming for Phil in Accounting

Workers with college degrees and specialized training once felt relatively safe from automation. They aren't.

March 6, 2021



## Accountants and Auditors

# 94%

[Vote](#) [Comment](#)

Will "Accountants and Auditors" be replaced by AI & Robots?

It's highly likely this occupation will be replaced by robots/AI. However, our poll is less clear, and shows a 65% chance of automation within the next couple of decades.

AUTOMATION RISK LEVEL

### You are doomed

or 94% probability of automation

PROJECTED GROWTH

### 11%

by 2024

MEDIAN ANNUAL WAGE

### \$68,150

or \$32.76 hourly

PEOPLE EMPLOYED

### 1,246,540

as of 2016

COMPARE



How this compares with other jobs: 598 out of 706

CAST YOUR VOTE

- Highly likely
- Likely
- Could go either way
- Small chance
- No chance

[Submit vote and see results](#)

How likely do you think this occupation will be taken over by robots/AI **within the next 20 years?**

# ACDW (2022)



ACDW  
(2022)

Accounting:  
Tech & Audit  
Labor Market

Labor Economics:  
Tech & Labor Market

Law and Shen (2021)  
Fedyk, Fedyk, Hodson, and Khimich (2021)  
Ham, Hann, Rabier, Wang (2021)  
Austin et al. (2020)  
Cooper et al. (2020, 2021)

...

# ACDW (2022)



ACDW  
(2022)

**Tech & Corporate Accountants**

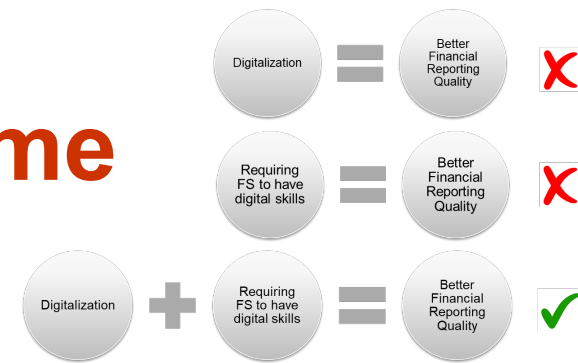
Accounting:  
Tech & Audit  
Labor Market

Labor Economics:  
Tech & Labor Market

- Corporate accountants vs. Auditors: Ex ante how are they different?
- Exploit the setting
  - More heterogeneity in the level of digitalization and tasks/skills
  - Shed light on the mixed evidence

# Mechanism and Outcome

- Digitalization + Digital Skills = FRQ
  - Cloud computing + virtual assistant = FRQ
  - Types of digitalization and digital skills wrt FRQ
- One cross-sectional test: Uncertain accounting estimates
  - Use amount of level 2 and level 3 fair value
  - Non-financial firms: Mostly Level 1



- Digitalization in the context of financial reporting
- From keynote:
  - Digitalization ≠ Correct insights
  - Other outcomes: higher quality, lower costs, better screening
- Other cross-sectional tests to shed light on mechanisms
  - Types of technology and digital skills

7 topics:  
analytics, automation,  
artificial intelligence  
(AI), big data, cloud (-  
computing), digitization  
and machine learning  
(ML)

# #1 Sample & Data: Excluding Tech and Financial

## *Panel A: Sample selection*

	# of firm-years	# of unique firms	
Firm-years in Compustat between 2010 and 2019	85,902	13,411	
Less:			
Financial and utility industry (SIC 6000-6999, 4900-4949)	21,133	3,038	~40%
Technology firms	14,679	2,523	
Firm-years without Burning Glass data	37,948	7,257	
Firm-years with missing data for calculating related variables	4,514	2,182	
Singleton firms	578	578	
Total	7,050	1,333	

# #1 Sample & Data: Excluding Tech

## *Digitalization*

Ranked score for the total number of digital-related words disclosed in a firm's 10-K filing in a year. It is set as 1 (2) [3] if the total number of digital-related words is not zero and is in the bottom (middle) [top] tercile of the sample distribution in year  $t$ . Digital-related words are those listed in Appendix A. It is set as 0 if there are no digital-related words disclosed in a firm's 10-K filing.

- Follow Chen and Srinivasan (2020) and focus on non-tech to mitigate measurement errors.
- How to define a tech firm?

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- Follow Chen and Srinivasan (2020) and focus on non-tech to mitigate measurement errors.
- How to define a tech firm?
  - Tech: An opportunity
    - Also need accountants
    - But, already have the infrastructure
    - Do they have a higher bar for digital skills for their accountants? And greater benefits?
    - One place to differentiate from research on audit firms

# #2 Sample & Data: Digitalization

## Digitalization

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Panel B: Sample distribution by year

Year	# of firms (1)	# of firms with digitalization (2)	Digitalization percent (3) = (2)/(1)	# of firms requiring digital skills from accountants (4)	Digital skills accountant percent (5) = (4)/(1)
2011	639	55	9%	137	21%
2012	698	84	12%	181	26%
2013	749	100	13%	202	27%
2014	760	114	15%	222	29%
2015	768	153	20%	229	30%
2016	795	262	33%	265	33%
2017	832	252	30%	284	34%
2018	936	288	31%	330	35%
2019	873	398	46%	339	39%
Total	7,050	1,706	24%	2,189	31%

- Business description section of the 10-K
- Who are the non-digital firms?



# #3 Sample & Data: Accountants – FS & FC

## *Accountants*

The number of job postings for accountants divided by the total number of job postings for a firm in a year. Accountants are those with an SOC code of 13-2000 and 43-3000, after excluding 13-2021 Property Appraisers and Assessors, 13-2041 Credit Analysts, 13-2052 Personal Financial Advisors, 13-2053 Insurance Underwriters, 13-2071 Credit Counselors, 13-2072 Loan Officers, 13-2081 Tax Examiners and Collectors, and Revenue Agents, 43-3041 Gambling Cage Workers, and 43-3071 Tellers.

- BG job post data: Advantages and limitations
  - Demand  $\neq$  Supply
  - Skills required  $\neq$  actual stock of skills
  - Number of accountant job posts: turnovers
  - SOC classifications

# #3 Sample & Data: Accountants – FS & FC

Variable	N	Mean	Std. Dev.	Q25	Median	Q75
<u>Variables used in the analysis of the demand for accounts and accountants' digital skills</u>						
<i>Digitalization</i> <sub>t-1</sub>	7,050	0.385	0.771	0.000	0.000	0.000
<i>Accountants</i> <sub>t</sub>	7,050	0.043	0.082	0.000	0.018	0.046
<i>Accountants</i> <sub>t</sub> <sup>FS</sup>	7,050	0.030	0.068	0.000	0.007	0.030
<i>Accountants</i> <sub>t</sub> <sup>FC</sup>	7,050	0.012	0.033	0.000	0.001	0.011
<i>Digital Skills</i> <sub>t</sub> <sup>Acct</sup>	7,050	0.069	0.162	0.000	0.000	0.059
<i>Digital Skills</i> <sub>t</sub> <sup>FS</sup>	7,050	0.085	0.188	0.000	0.000	0.077
<i>Digital Skills</i> <sub>t</sub> <sup>FC</sup>	7,050	0.014	0.070	0.000	0.000	0.000

- A non-trivial percentage of firms has 0 accounting job posts => by definition 0 digital skill requirement
  - No demand for accountants or no turnover?
  - E.g., Digitalization => Less financial clerks or low turnover?
- Robustness excluding the firms with 0 accounting posts

# #3 Sample & Data: Accountants – FS & FC

Panel D: Job postings distribution by year

Year	# of firms	# of accounting job postings	# of accounting postings requiring digital skills	Digital skills accountant percent	Average # of digital skills required per accounting job posting requiring digital skills	
		(1)	(2)	(3) = (2)/(1)	(4)	
2011	639	12,991	20 posts per firm	1,295	10%	1.5
2012	698	14,821	per firm	1,305	9%	1.5
2013	749	17,248		1,679	10%	1.6
2014	760	18,469		1,759	10%	1.8
2015	768	21,841		2,287	10%	1.9
2016	795	20,276		2,556	13%	1.8
2017	832	20,579		2,945	14%	1.8
2018	936	23,335		3,420	15%	1.9
2019	873	23,604	27 posts per firm	3,642	15%	2.1
Total	7,050	173,164	per firm	20,888	12%	1.8

- More descriptive stat:
  - Distribution of the # of accountant job posts: substantial variation?
- Variation driven by the denominator
  - Alternative scaler
- Measurement issues from turnover
  - Industry turnover data from BLS by SOC

# #3 Sample & Data: Accountants – FS & FC

- 13-2000 Financial Specialists
  - 13-2010 Accountants and Auditors
    - 13-2011 [Accountants and Auditors](#)
  - 13-2020 Property Appraisers and Assessors
    - 13-2020 [Property Appraisers and Assessors](#) X
  - 13-2030 Budget Analysts
    - 13-2031 [Budget Analysts](#)
  - 13-2040 Credit Analysts
    - 13-2041 [Credit Analysts](#) X
  - 13-2050 Financial Analysts and Advisors
    - 13-2051 [Financial and Investment Analysts](#)
    - 13-2052 [Personal Financial Advisors](#) X
    - 13-2053 [Insurance Underwriters](#) X
    - 13-2054 [Financial Risk Specialists](#)
  - 13-2060 Financial Examiners
    - 13-2061 [Financial Examiners](#)
  - 13-2070 Credit Counselors and Loan Officers
    - 13-2071 [Credit Counselors](#) X
    - 13-2072 [Loan Officers](#) X
  - 13-2080 Tax Examiners, Collectors and Preparers, and Revenue Agents
    - 13-2081 [Tax Examiners and Collectors, and Revenue Agents](#) X
    - 13-2082 [Tax Preparers](#)
  - 13-2090 Miscellaneous Financial Specialists
    - 13-2099 [Financial Specialists, All Other](#)

ings for accountants divided by the total number of in a year. Accountants are those with an SOC code 0, after excluding 13-2021 Property Appraisers and Credit Analysts, 13-2052 Personal Financial Advisors, 13-2053 Insurance Underwriters, 13-2071 Credit Counselors, 13-2072 Loan Officers, 13-2072 Tax Examiners and Collectors, and Revenue Agents, and 43-3071 Tellers.

- Some discussion on the rationale behind the inclusions/exclusions.
- Crosscheck with job titles to validate BG's 6-digit SOC classification
- Are the results robust to including just 13-2010?

# Comments on Empirics

- Correlations: *Digitalization, Accountants, and Size...*
  - E.g., Are digitalized firms larger => more job posts => larger denominator for *Accountants*
  - CEM helps, but useful to see different firm attributes
- Main regression on FRQ:
  - Main effects on digitalization and digital skills are positive.
  - The interaction term is negative: complement?
- Endogeneity: digital skills is a function of digitalization
- Falsification test (for FRQ) using digital skills of FC or other skills

# Other Comments

- Include some figures - plot some of the trends
- ERP not included in keywords
- Focuses on human capital wrt accountants' digital skills.
  - Alternative dimension of human capital: Firms may recruit more (non-accountant) technology personnel and require them to have some financial skills.
  - Which type of human capital investment have a stronger complementarity effect?
- Timing: one year or longer to affect FRQ?

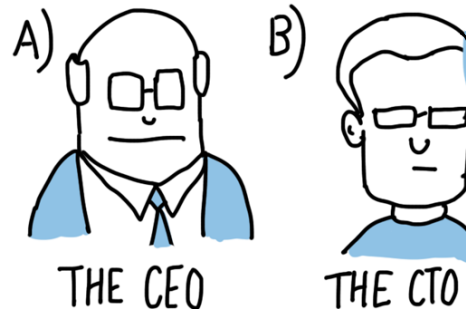
# Conclusion

- Understanding how digitalization has affected the accounting labor market is important!
- Digitalization in the context of financial reporting
- Exploit the corporate accountant setting:
  - heterogeneity in industry (tech) and different tasks (SOCs)
- Measurement on digitalization and accountants (and their skills)
- Interesting paper!

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WHO LED THE DIGITAL TRANSFORMATION  
OF YOUR COMPANY ?

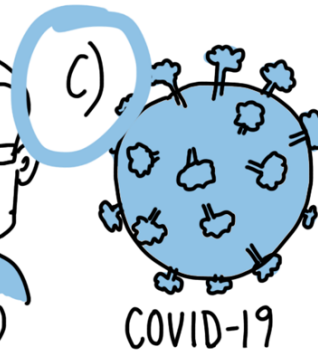




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Thank  
You!