SURAT PENUGASAN
No. 083/Pengabdian/STM-PPM/20

Kepada : **Erlinda N. Yunus, Ph.D**
Dari : Koordinator *Research Center And Case Clearing House*
Hal : Penugasan Pengabdian Masyarakat

Koordinator *Research Center And Case Clearing House* dan PKM Sekolah Tinggi Manajemen PPM menerbitkan Surat Tugas kepada:

Erlinda N. Yunus, Ph.D

Sebagai pembicara Researchers Bi-Monthly Meeting denga tema *"The Mark of Industry 4.0: How Managers Respond to Key Revolutionary Changes"* dalam Kegiatan Pengabdian Masyarakat untuk umum yang dilaksanakan pada:

Hari dan Tanggal : Jumat, 27 November 2020

Waktu : 09.00 – 10.30 WIB

Tempat : Zoom Meeting

Demikian surat tugas Pengabdian kepada Masyarakat ini diterbitkan untuk dapat dilaksanakan sebagaimana mestinya.

Jakarta, 19 November 2020

Rike Penta Sitio, M.M.
Koordinator *Research Center And Case Clearing House*

Paraf

FORM PEMBERIAN POIN

No. 070/POIN-PKM/STM-PPM/20

Lampiran Surat Keputusan

No. : 126/SK/Dir.Mi/XII/2018

Hal : Implementasi Pemberian Poin Kegiatan Pemasaran dan CSR

Nama Pembicara : Erlinda N. Yunus, Ph.D.

Kriteria : Menyampaikan Orasi Ilmiah DI STM-PPM

Tanggal Pelaksanaan : Jumat, 27 November 2020 Pukul 09.00 – 10.30 WIB

JUDUL	POIN
RBM - "The Mark of Industry 4.0: How Managers Respond to Key Revolutionary Changes"	**5**
Total POIN	**5**

Mohon dimasukan pada Poin D-CSR-1

Jakarta, 2 Desember 2020

Mengetahui,

Waket I Bid. Akademik dan Kemahasiswaan

Erlinda N. Yunus, Ph.D.

Menyetujui,

Koordinator RC-CCH

Rike Penta Sitio, M.M.

Paraf

Researchers' Bimonthly Meeting | 27 November 2020

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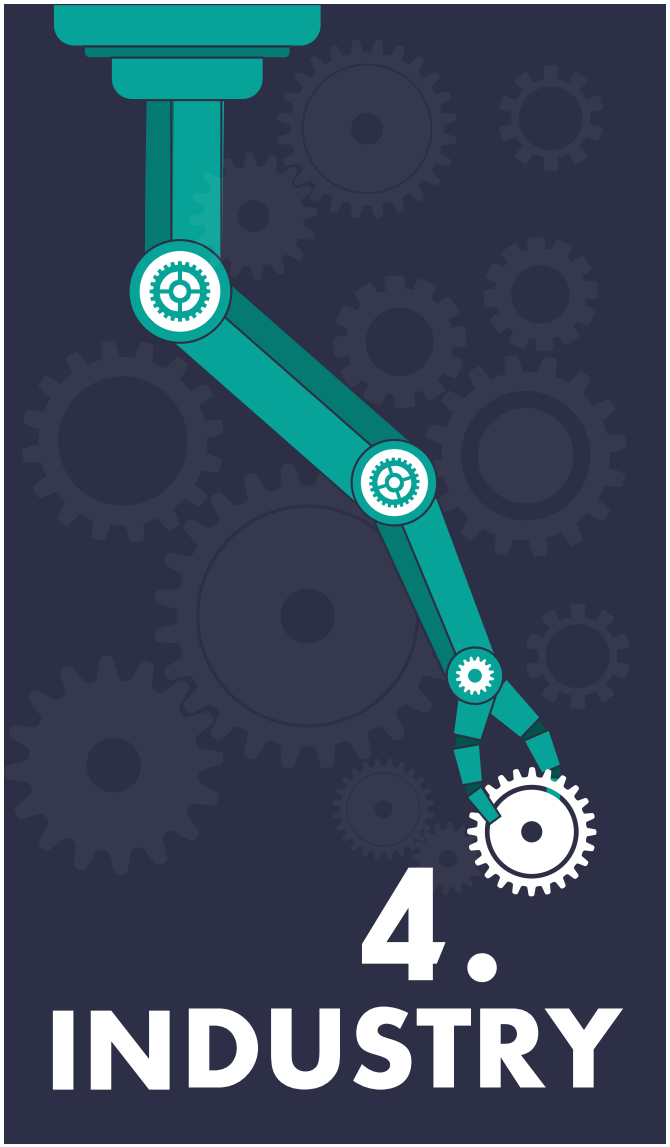
The Mark of ...

INDUSTRY 4.0

How Managers Respond to Key Revolutionary Changes

Erlinda Nusron Yunus
Sekolah Tinggi Manajemen PPM



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Agenda

01 **Research Background**

Motivation, Research Gap, Purpose

02 **Literature Review**

Brief Synthesis of Prior Studies

03 **Methodology**

Grounded Theory Method

04 **Results & Discussion**

The mark of industry 4.0: how managers respond to key revolutionary changes

Erlinda N. Yunus
Sekolah Tinggi Manajemen PPM, DKI Jakarta, Indonesia

Received 29 December 2019
Revised 2 May 2020
10 May 2020
Accepted 29 May 2020

Abstract

Purpose – The purpose of this study is to provide a framework of managerial responses to the Industry 4.0 phenomenon, which has impacted the productivity of Indonesian manufacturing companies while revolutionizing global industries.

Design/methodology/approach – The study employs qualitative research using the Grounded Theory Method since research in this area is still in its preliminary stages. The study elicits insights from 12 operation managers through a semi-structured interview and a focus group discussion. Using content analysis, the study formulates relationships among Industry 4.0 initiatives, its driving factors and challenges as well as critical success factors and the expected benefits.

Findings – The findings reveal that Indonesian manufacturers have engaged in Industry 4.0 initiatives: cyber-physical systems, the internet of things, Big Data and cloud computing. These initiatives require managers to adopt best practices, appoint champions as change agents, conduct training and even tailor the job qualifications of their subordinates to suit the current technology.

Research limitations/implications – The qualitative method allows an in-depth investigation that is synthesized into a conceptual framework, but this framework still needs to be empirically tested. The study is currently based on informants from large manufacturing companies. Future studies could scale up the research and validate the findings.

Practical implications – This exploratory framework could guide managers in their strategic and operational decisions while embracing the Industry 4.0 transformation inside the organization.

Originality/value – Prior studies examining the adoption of Industry 4.0 principles by Indonesian manufacturing companies are rare. Furthermore, conceptual studies dominate the existing literature related to the Industry 4.0 concept. This study attempts to fill the gap and provides a framework that is based on grounded empirical data of manufacturing companies in Indonesia, a newly industrialized economy.

Keywords Industry 4.0, Indonesian manufacturing firms, Grounded theory method

Paper type Research paper

1. Introduction

The term "Industry 4.0" was first introduced at the 2011 Hannover Fair in Germany and sparked considerable attention from scholars, practitioners and government representatives (Sung, 2018; Erro-Garcés, 2019). The concept, initially a high-technology strategy promoted by the German government, refers to the transformation of industries towards fully integrated, optimized and digitized manufacturing systems (Kagermann *et al.*, 2013). Vaidya *et al.* (2018) described Industry 4.0 as "a new level of organization and control over the entire value chain of the life cycle of products" (p. 233).

Some scholars argue that the Industry 4.0 strategy should not be confused with the Fourth Industrial Revolution, which is broader, more expansive and impacts not only industries but also societies, human identity and economies (Schwab, 2016; Sung, 2018). Indeed, the Fourth Industrial Revolution—marked by the technological advancement in "physical, digital and biological worlds"—significantly triggered the Industry 4.0 phenomenon in industries

The author is most grateful to the anonymous reviewer(s) for the valuable and thorough feedback, which significantly improved the contents of this paper. The author would also like to extend their gratitude to the Editor.

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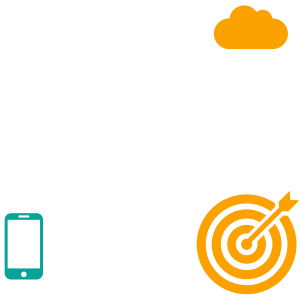
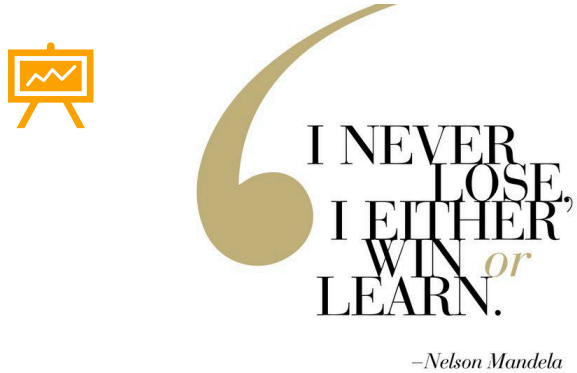
DOI 10.1108/IJPPM-12-2019-0590





The Journey

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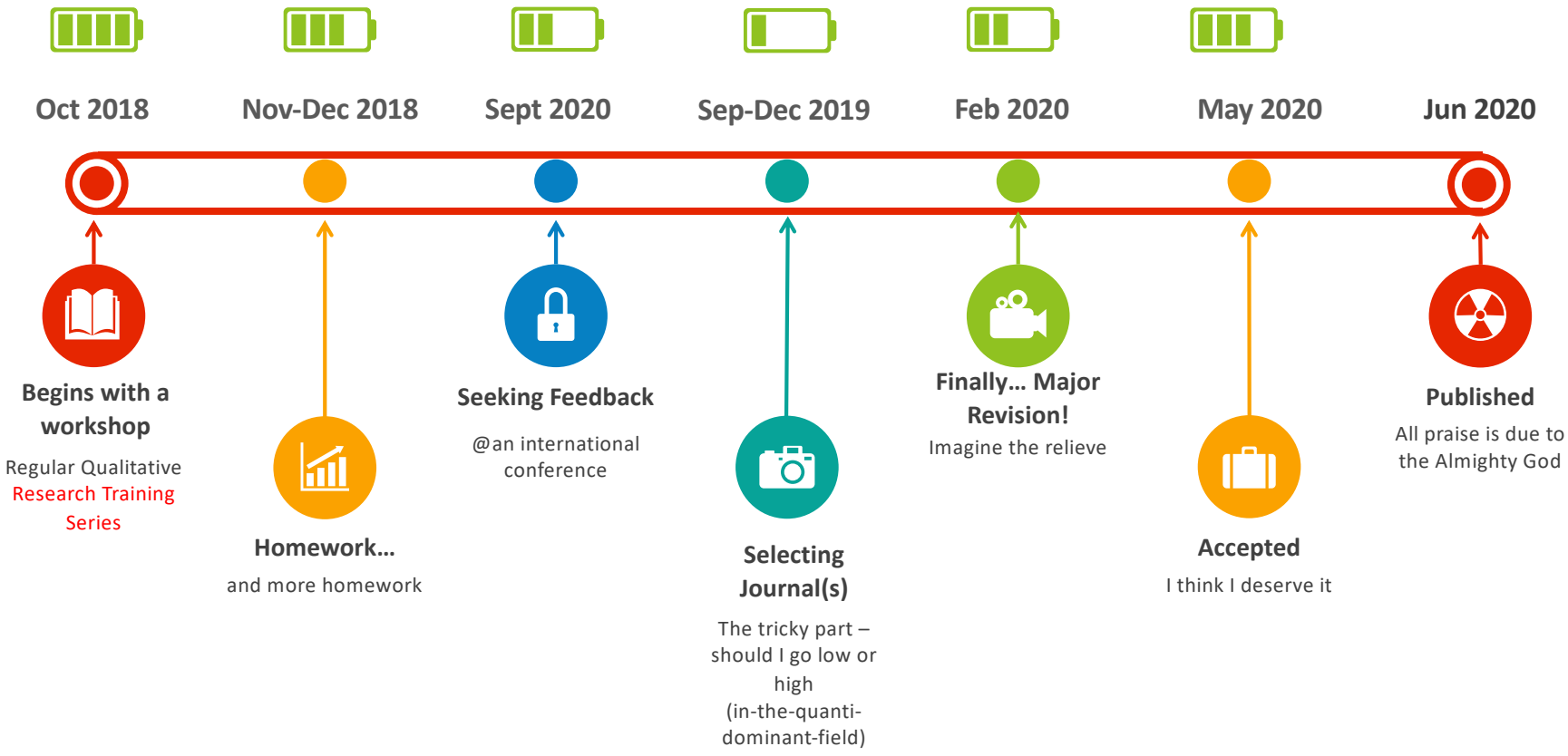

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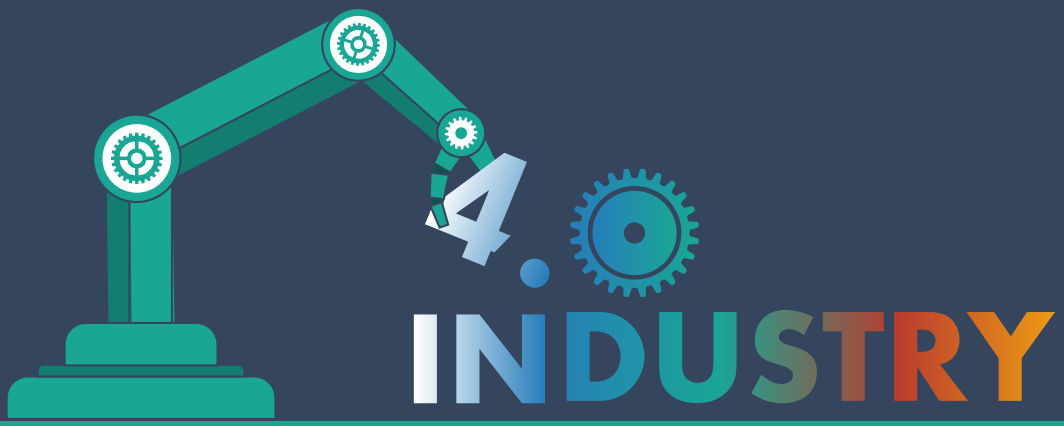

The Paper

What is it about?

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Industry 4.0

"Industry 4.0": Hannover Fair in Germany, 2011 *(Sung, 2018; Erro-Garces, 2019).*

A high-tech strategy promoted by the German government *(Kagermann et al., 2013).*

Characteristic

a "machine will operate independently or will coordinate with humans to produce customer-oriented manufacturing, that constantly works to maintain itself" *(Sung, 2018; p. 41).*

vs. the Fourth Industrial Revolution

Fourth Industrial Revolution, which is broader, more expansive and impacts not only industries but also societies, human identity and economies *(Schwab, 2016; Sung, 2018).*

Drivers

The internet of things (IoTs), cloud computing, cyber-physical systems and Big Data *(Kagermann et al., 2013; Magruk, 2016; Vaidya et al., 2018; Cordeiro et al., 2019; Klingenberg et al., 2019).*

The Gap

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Indonesia

Officially undertaking Industry 4.0 initiatives to reduce costs by around 12–15%.

One of the “newly industrialized economies in global value chains” *(Boddin, 2016, p. 5).*

Its industries as less-advanced and less-modernized compared to those of Asian countries *(World Bank and the Asian Development Bank)*

Existing literature > dominated by conceptual studies *(e.g. Magruk, 2016; Zhang et al., 2016; Sung, 2018; Vaidya et al., 2018)*

especially in the Engineering literature *(Muhuri et al., 2019),*

empirical evidence are limited *(e.g. Lin et al., 2018)*

Research Question

How do operations managers at manufacturing companies in Indonesia respond to Industry 4.0 initiatives?

Purpose of the Study

Purpose – to provide a framework of managerial responses to the Industry 4.0 phenomenon, which has impacted the productivity of Indonesian manufacturing companies while revolutionizing global industries.

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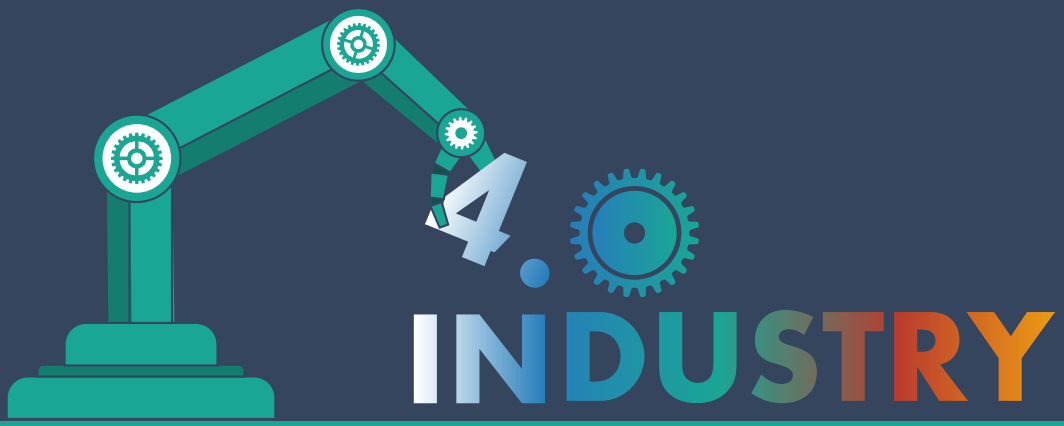
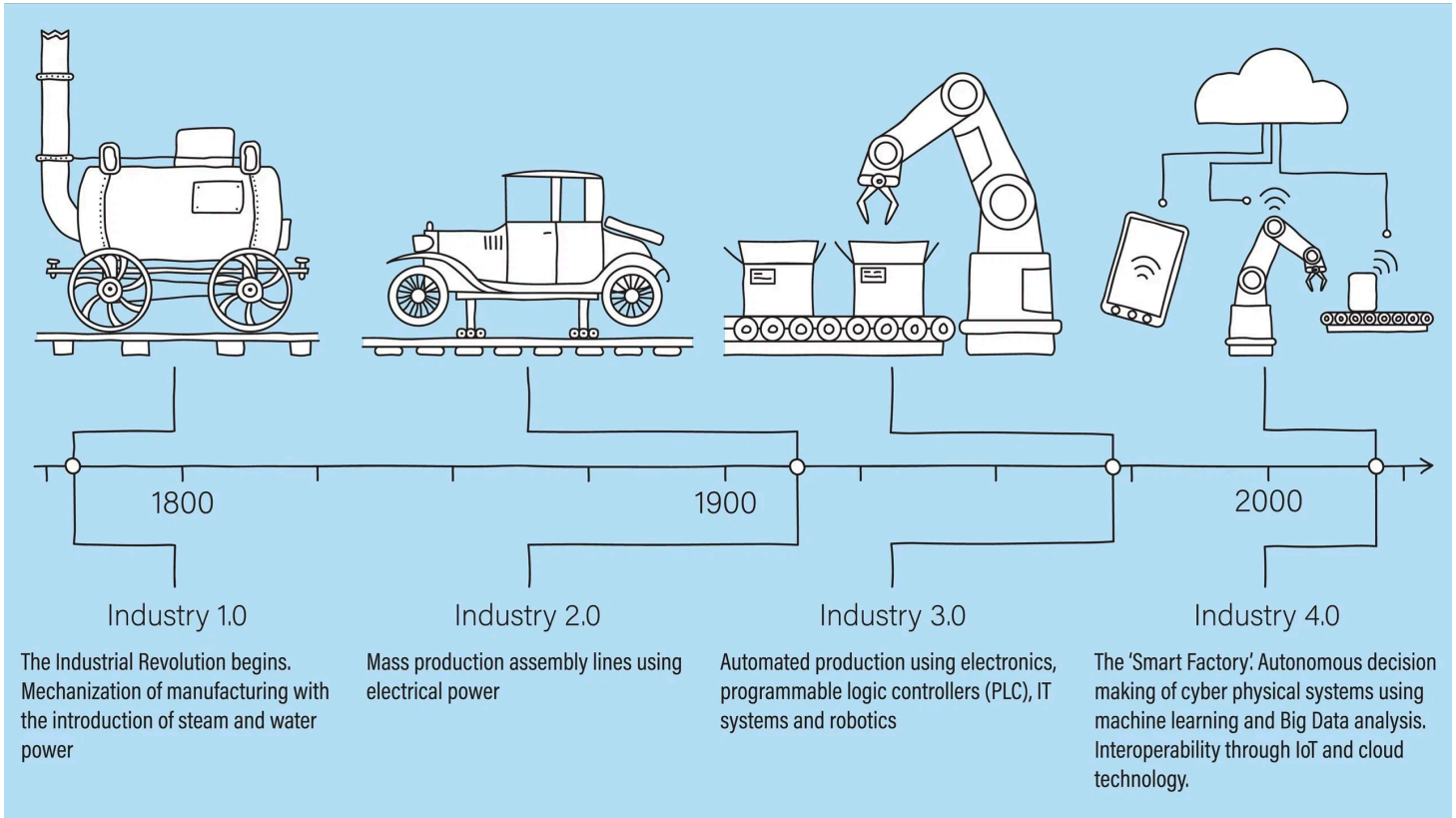


Literature Review



Jenkin (2020) | https://indigo.careers/cyborg-careers-approaching-the-4th-industrial-revolution-in-career-education-and-guidance/

The evolution of industry 4.0 | Empirical research regarding the industry 4.0 phenomenon

- In Germany, traditional plants → smart factories to produce customized products *(Kagermann et al., 2013; Weyer et al., 2015; Zhang et al., 2016)* → around the world *(Magruk, 2016; Cordeiro et al., 2019).*

- The impacts of the Industry 4.0 revolution *(Magruk, 2016; Sung, 2018; Vaidya et al., 2018):*

  1. A need for new expertise in data analytics and corporate digitization;
  2. Data security as a significant consideration;
  3. Horizontal networks with critical suppliers, customers and partners in the value chain, as well as vertical networks from product development, procurement, manufacturing and distribution;
  4. A decline in human resource requirements with current expertise.

The evolution of industry 4.0 | **Empirical research regarding the industry 4.0 phenomenon**

- Expected benefits:
  - increased process and product flexibility *(Magruk, 2016; Birkel et al., 2019; Dalenogare et al., 2018);*
  - improved decision-making capabilities aided by big-data analytics *(Dalenagore et al., 2018),*
  - increased company productivity *(Dalenogare et al., 2018; Rejikumar et al., 2019)* and
  - competitiveness *(Muëller et al., 2018).*

- Obstacles:
  - difficulties in synergizing between organizational structures/systems and their production teams *(Muëller et al., 2018; Culot et al., 2020);*
  - necessary transformations *(Sung, 2018);*
  - the lack of competent experts and human resources *(Zhang et al., 2016; Sung, 2018).*

>> Birkel et al. (2019) for a comprehensive framework of risks associated with the implementation of Industry 4.0 initiatives.

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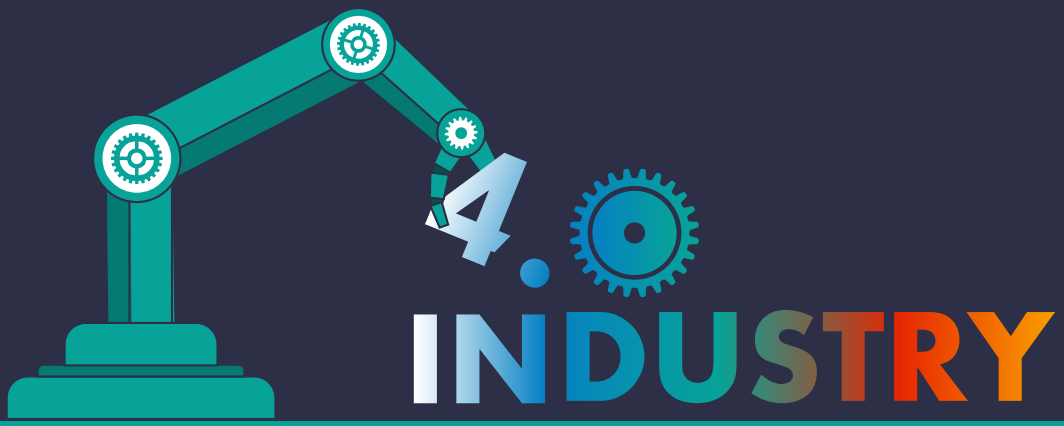
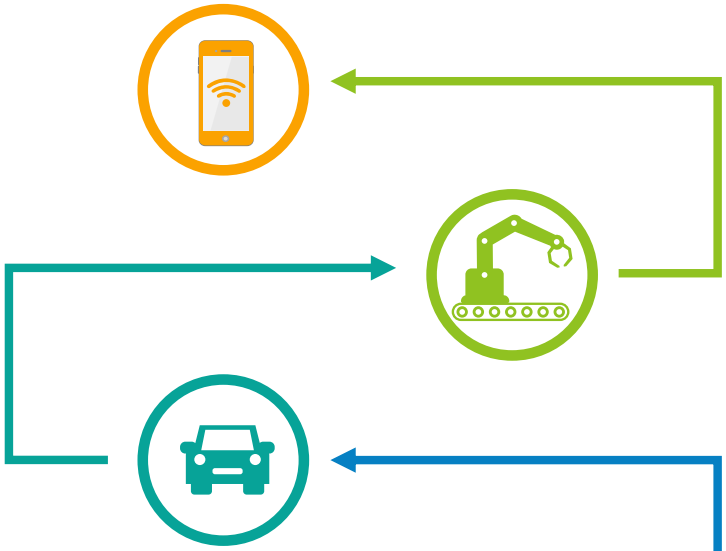


Methodology

Grounded Theory Method

GTM (Glasser and Strauss, 1967) develops theories that emerge from or are "grounded" in the data, as opposed to depending upon variables from pre-existing theories *(Corbin and Strauss, 1990; Charmaz, 1996).*

GTM does not necessarily connote ignorance of literature or a systematic procedure *(Suddaby, 2006).*



Data Collection and Analysis

In-depth interviews FGD.

GTM recognizes data collection and analysis as simultaneous processes *(Corbin and Strauss, 1990).*

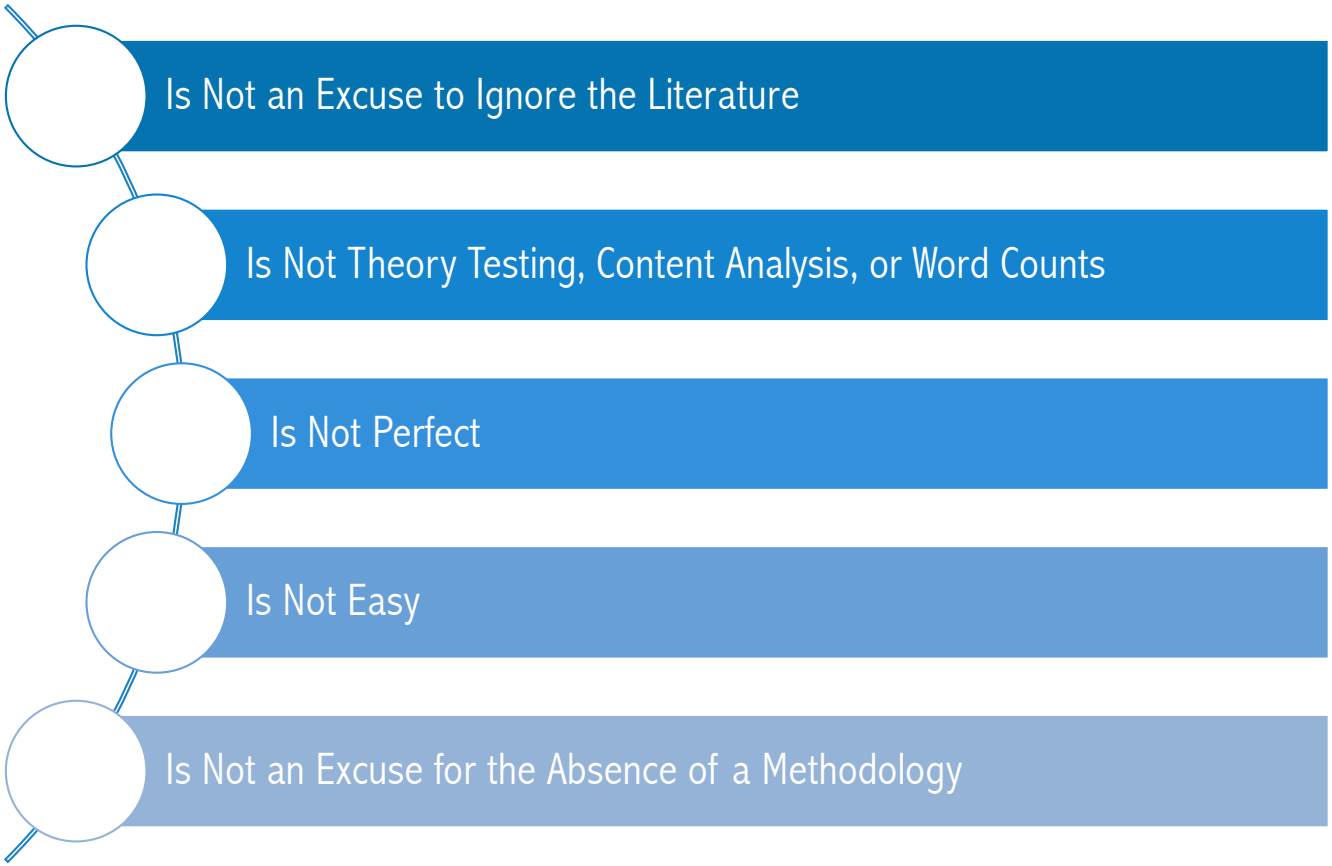
Informant

1. The informant should be an operation manager or a person who is in charge of company operations;
2. The informant should work in the manufacturing industry;
3. The informant should work for at least one year in the current company.

Grounded Theory Methodology

- Originally developed by two sociologists, Barney Glaser and Anselm Strauss.
- Theories are 'grounded' in the data > emerged, rather than rely on analytical constructs, categories or variables from pre-existing theories (Corbin & Strauss, 1990; Charmaz, 1996).
- *"We gather data, compare them, remain open to all possible theoretical understandings of the data, and develop tentative interpretations about these data through our codes and nascent categories. Then we go back to the field and gather more data to check and refine our categories."* (Charmaz and Henwood, 2008: 241)
- Data collection and analysis are interrelated processes (Corbin & Strauss, 1990).
- The process of data collection and data analysis in grounded theory continues until theoretical saturation has been achieved.

Grounded Theory



(Suddaby, 2006)

Less focused on subjective experiences of individual actors per se;

more attentive to how such subjective experiences can be abstracted into theoretical statements about causal relations between actors.

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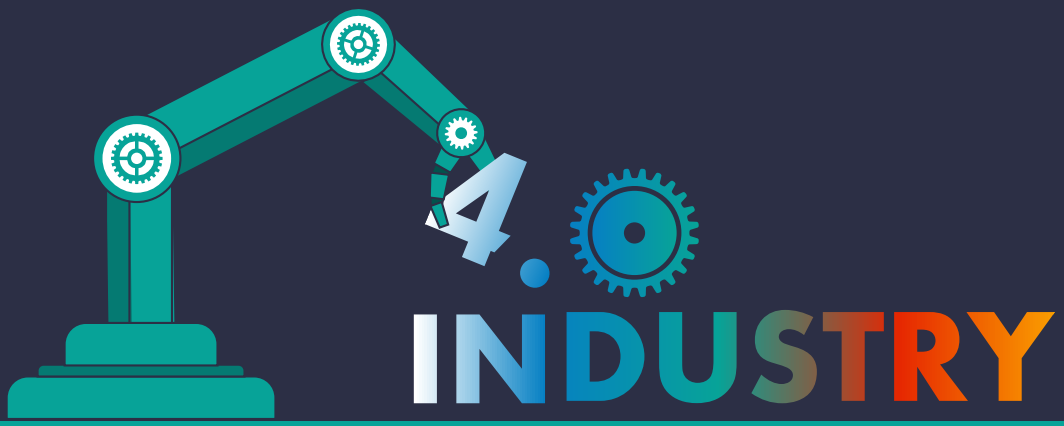

Results

ID	Current title	Industry	Ownership type	Company size	Methods of collecting data
A	Marketing and operations director (company 1)	3448 – prefabricated metal buildings and components	Family-owned	Large	Interview and plant visit
B	Production manager (company 2, plant X)	2020 – dairy products	National public ltd	Large	
C	Production manager (company 2, plant Y in different province)	2020 – dairy products	National public ltd	Large	
D	Production manager (company 3)	2834 – pharmaceutical	Family-owned	Large	Interview
E	Production manager (company 4)	2840 – soap, detergents, cleaning preparations, perfumes, cosmetics	Family-owned	Large	
F	Transformation senior staff, in charge of operations (company 5)	2870 – agricultural chemicals	State-owned	Large	
G	Production manager (company 6)	2834 – pharmaceutical	Multinational	Large	
H	Production manager (company 7)	2834 – pharmaceutical	Multinational	Large	Focus group discussion
I	Site operations manager (company 8)	2834 – pharmaceutical	National public ltd	Large	
J	Supply chain manager (company 9)	2834 – pharmaceutical	Multinational	Large	
K	Operations manager (company 10)	2754 – food and beverage	National public ltd	Large	
L	Senior manager (company 11)	3448 – prefabricated metal buildings and components	National public ltd	Medium	

Table 1.
The profiles of informants and data collection methods

	Informant						
	A	B	C	D	E	F	G
First heard of Industry 4.0	2016 at the ministry	2016	2016	2018 since the minister of trade visited the plant	2018 thru online media	2017, endorsed by holding company	2018
Have implemented	Yes since 2012	Yes since 2016	Yes	2012 since 2012	Yes since 2018	Yes at the basic level	Yes at the basic level
Perception of Industry 4.0	Machines communicate with server	Man vs machine	The greater usage of ICT for production	Let the machines talk	n/a	Everything can be controlled from afar thru Internet	The internet of things
Triggers	Labor strike and company growth	Difficulty in analyzing productivity (invalid and unreal time data)		Compliance to U.K. requirements	Efficiency	For accurate data and reporting	Efficiency (paperless)
Industry 4.0 programs*	(1) New machines replaced labor (2) Machines sent data directly to control room (3) Face recognition for warehouse	(1) Smart manufacturing project (machine automation) (2) Machine digitalization to capture accurate and real-time data	Machines sent data directly to server (ERP system)	Machines sent data directly to server	(1) Robots replaced workers (2) Machine sent data directly server to production manager, SCM manager, and director	Data tracking thru server: production to distribution	Smart manufacturing project (machine automation)
How to develop Industry 4.0 technology	Mostly in-house	Company's IT and vendor	Company's IT and vendor	In-house (company group)	Mostly vendor	Mostly in-house by holding co	Vendor

(*continued*)

	Informant						
	A	B	C	D	E	F	G
Main challenges**	IT infrastructure and HR	HR and system	Old machine and HR	Limited knowledge, HR, government regulation	HR and QC	Security and HR (building the right culture)	Big investment (funding)
Managerial responses	Benchmark, learning, implement	Explain the change and the benefits to the employees	Change management (intensive communication), training	Champions	Hire supervisor with mechanical engineering background	Change management (change of habits)	Learning (adopting)
Key success factors	Commitment of top management	n/a	n/a	System	Commitment of top management	Enforcement from holding	Commitment of top management
Aim of Industry 4.0 programs	Predictive maintenance thru big data	(1) Real-time data for quick decision making (2) Predictive maintenance	Accurate data for decision making	(1) Compliance and Traceability (2) Productivity (3) Predictive maintenance	Efficiency	(1) Faster response (2) Reduce losses (3) Paperless	Efficiency

Note(s): *Programs were observed through plant visits when applicable
**IT = Information and Technology; HR = Human Resources; QC = Quality Control

	Informant				
	H	I	J	K	L
Perception of Industry 4.0	Interconnection and integration of systems with less manual control	Creating a smart plant, not only automation but also big data to predict the future	Industry 3.0 plus internet-based, company-wide processes	Automation, internet of things, real-time data	Internet of things, web-based processes
Status of Industry 4.0 transformation*	Still in design state	Use of AI and big data on sales and marketing functions	Still in Industry 3.0 phase	Use of AR on marketing function, automation on warehousing and IoT on trucks	Installment of smart machines
Challenges	Human resources			Human resources	
Aim of Industry 4.0 transformation (if any)	Efficiency	Compliance and efficiency		Compliance and forecast accuracy	Efficiency and competitiveness
Would the transformation pay off?	Yes, for data control and review for decision making	Yes, especially for reducing errors	Yes and no. The investment is so huge. Rather skeptical	Yes, for production but not for transportation aspect	Yes, for customized products; but no for standard products

Table 3.
Results of focus group discussion

Note(s): *AI = Artificial Intelligence, AR = Augmented Reality

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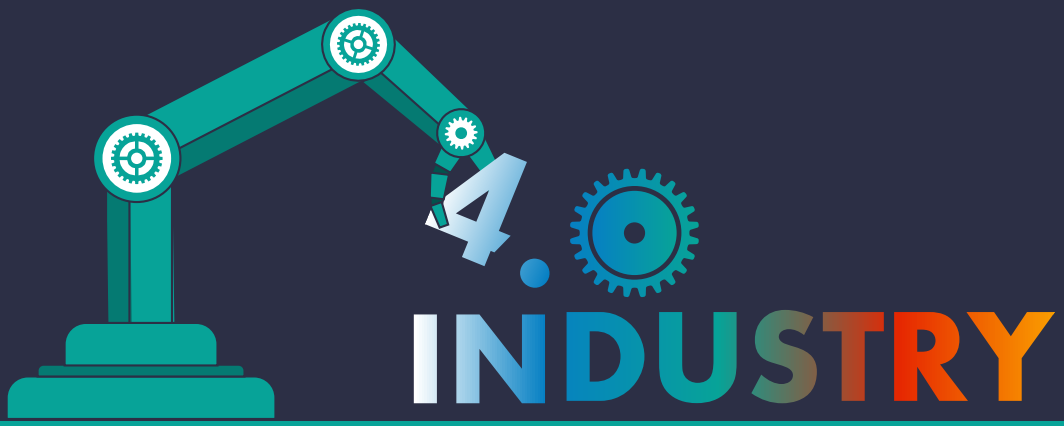
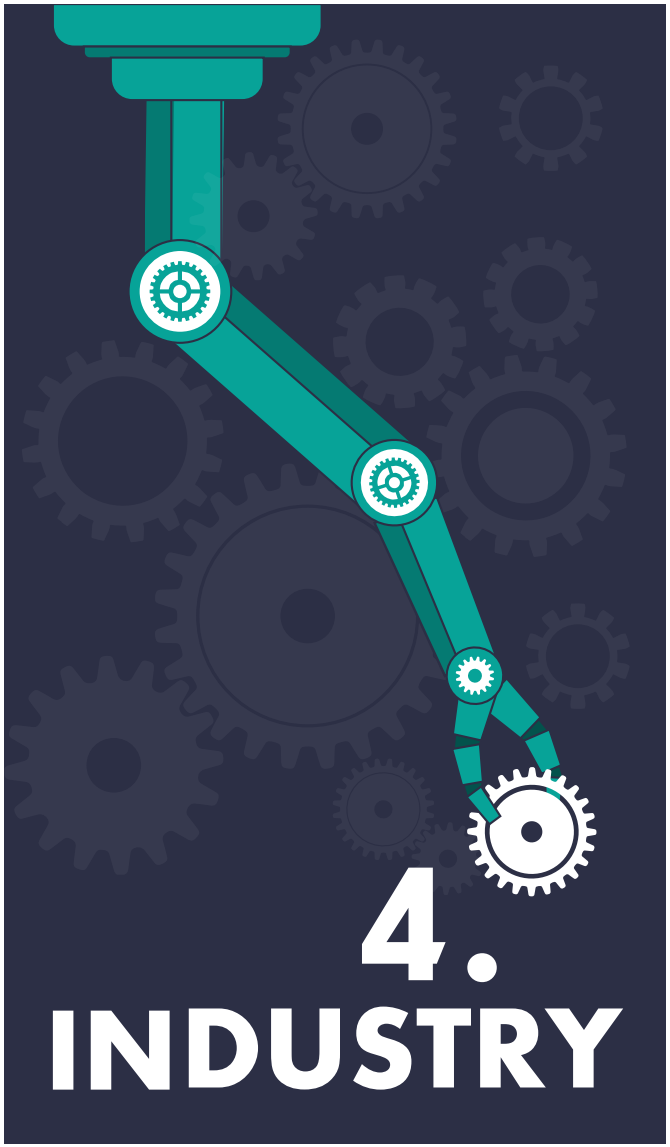


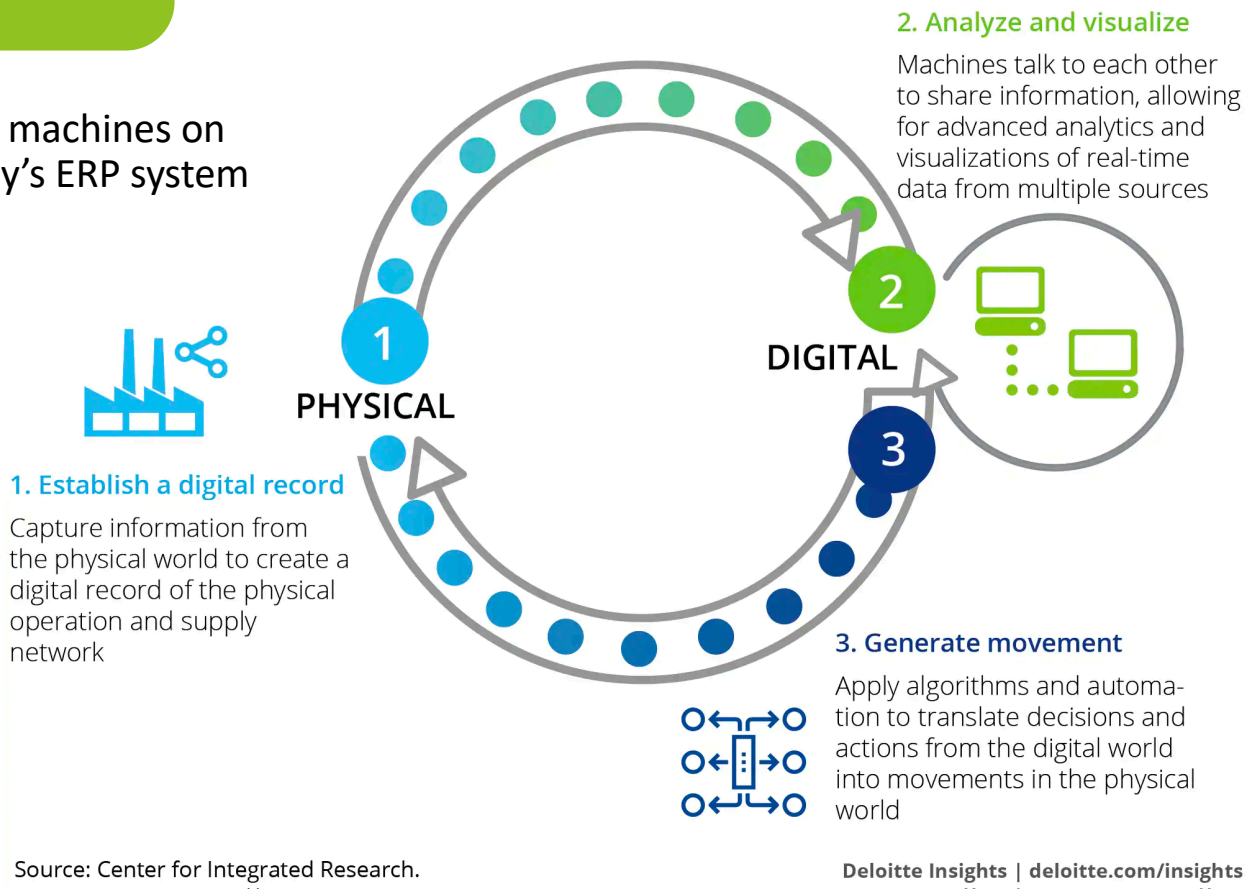
Discussion



- Industry 4.0 was adopted before the informants had even heard of the jargon.
- 10 of 12 are confident that transforming the operations function would lead the company toward a better position in the current market.
- Informants implemented a few Industry 4.0 technologies…

Cyber Physical System

- Informants B, C and D: integrating machines on their shop floors with the company's ERP system using IT infrastructure.



Internet of Things

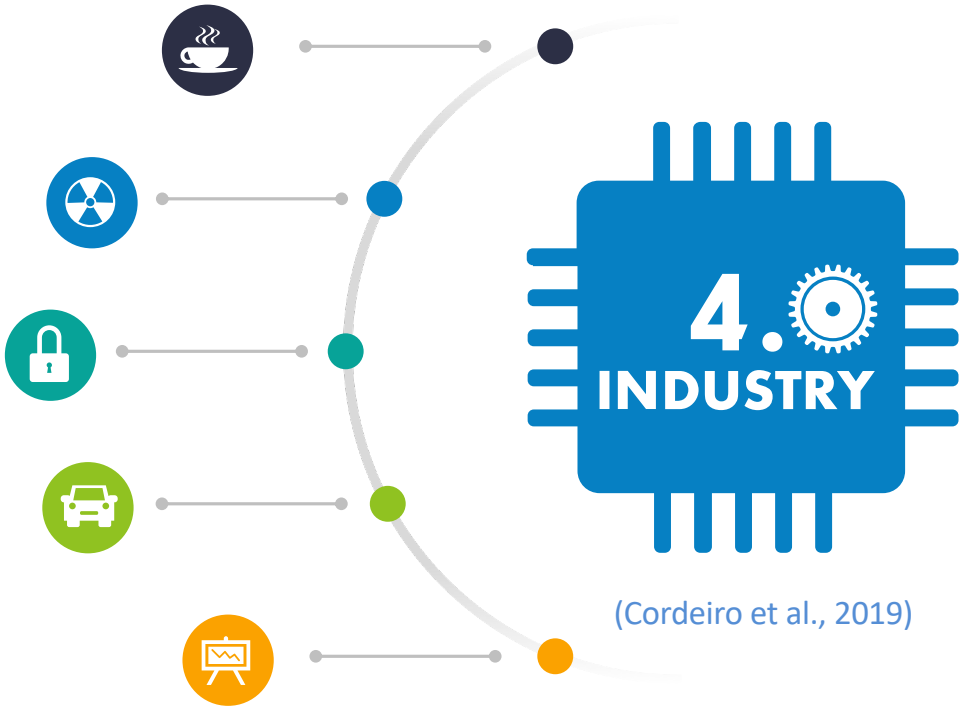
Informants → E: Robot, A: RFID, F: panel of trucks

Big Data

Informants A, D and G: gathering a large quantity of real-time data to help them with their decision-making processes

Cloud Computing

The company stores the data on a private server for easy access and distribution of information anywhere



(Cordeiro et al., 2019)

Interconnection between IoT, CPS and Big Data: enable a factory to be intelligent → it can learn from the accumulated data, analyze, fix issues as well as improve processes *(Cordeiro et al., 2019; Frank et al., 2019).*

(A qualitative interpretation using Culot *et al.*, 2020)

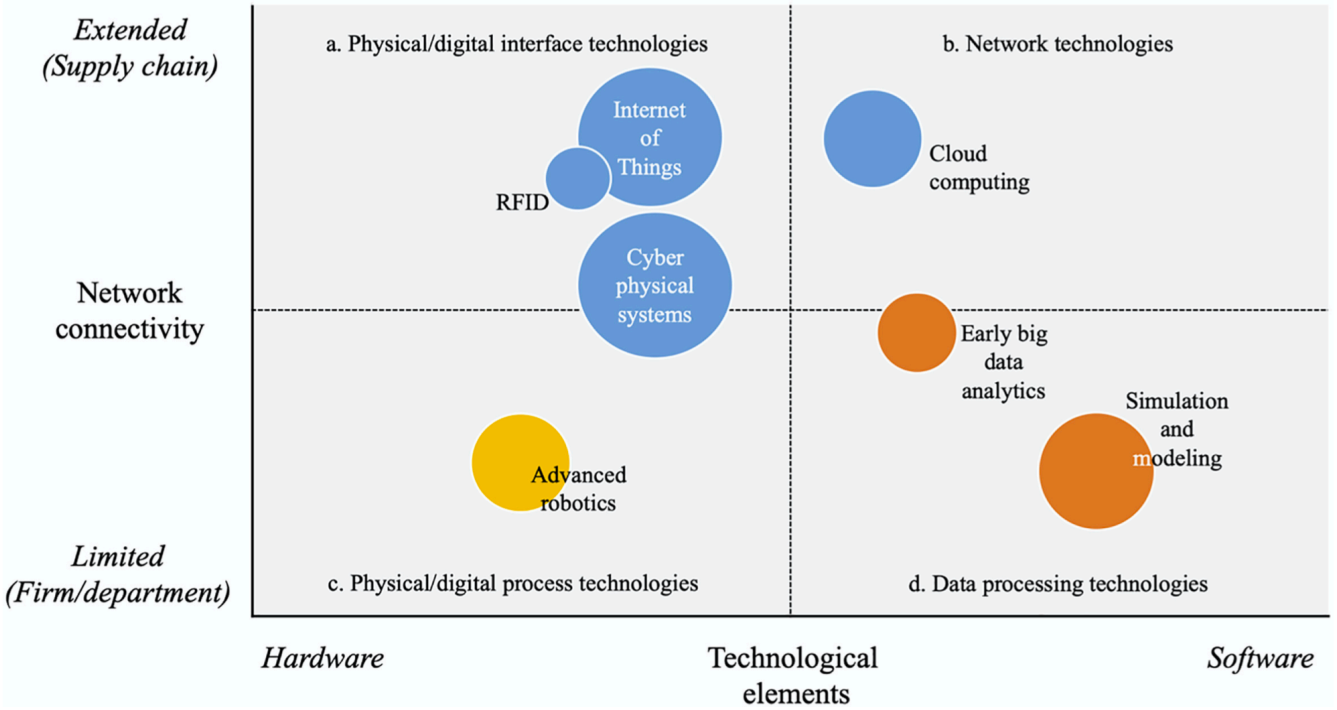


Figure 1.
The enabling technologies adopted by the companies of the current study

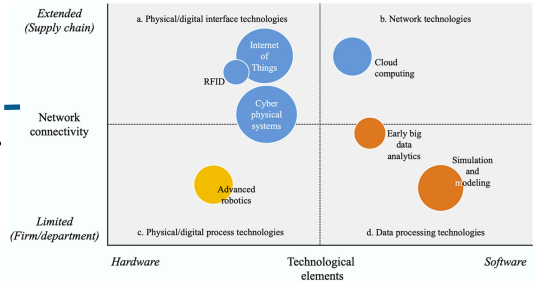


Figure 1.
The enabling technologies adopted by the companies of the current study

industry 4.0

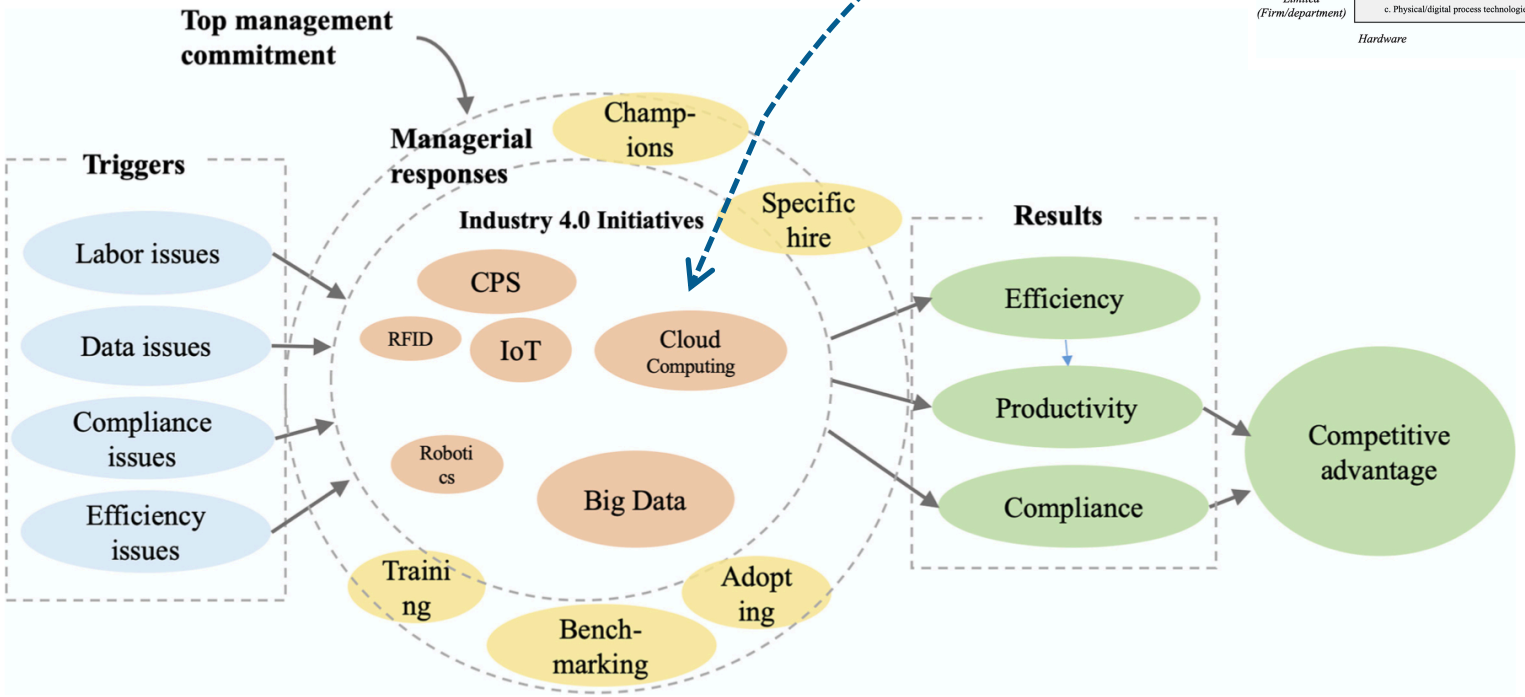


Figure 2.
Conceptual framework of managerial responses to industry 4.0 adoption

Implications for Practice

Considerable investment for technologies.

Right employee skills and competencies.

“Soft” competencies such as critical thinking, teamwork, creativity, effective communication and leadership

Limitations of the Study

Mainly examines the implementation of Industry 4.0 initiatives of medium-to-large manufacturing companies.

RESISTANCE → train and alter job specification.


4.0
INDUSTRY
Thank You

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RC-CCH Research Center and Case Clearing House

SERTIFIKAT APRESIASI

Nomor : 168/RC-CCH/STM-PPM/XI/2020

Diberikan kepada :

Erlinda N. Yunus, M.M., Ph.D.

Sebagai :

Pembicara

Researchers Bi-Monthly Meeting dengan tema
"The Mark of Industry 4.0: How Managers Respond to Key Revolutionary Changes"
sebagai kegiatan Pengabdian Kepada Masyarakat (PKM)
Jumat, 27 November 2020
09.00 - 10.30 WIB

Meeting ID : 996 7579 3587
Passcode : PPM
Link : https://zoom.us/j/99675793587?pwd=QzUycTU3cTZoNVJOUTZ1OGVRYTlxdz09

Jakarta, 7 Desember 2020

SEKOLAH TINGGI MANAJEMEN PPM

Rike Penta Sitio, M.M.
KEPALA UNIT RC-CCH


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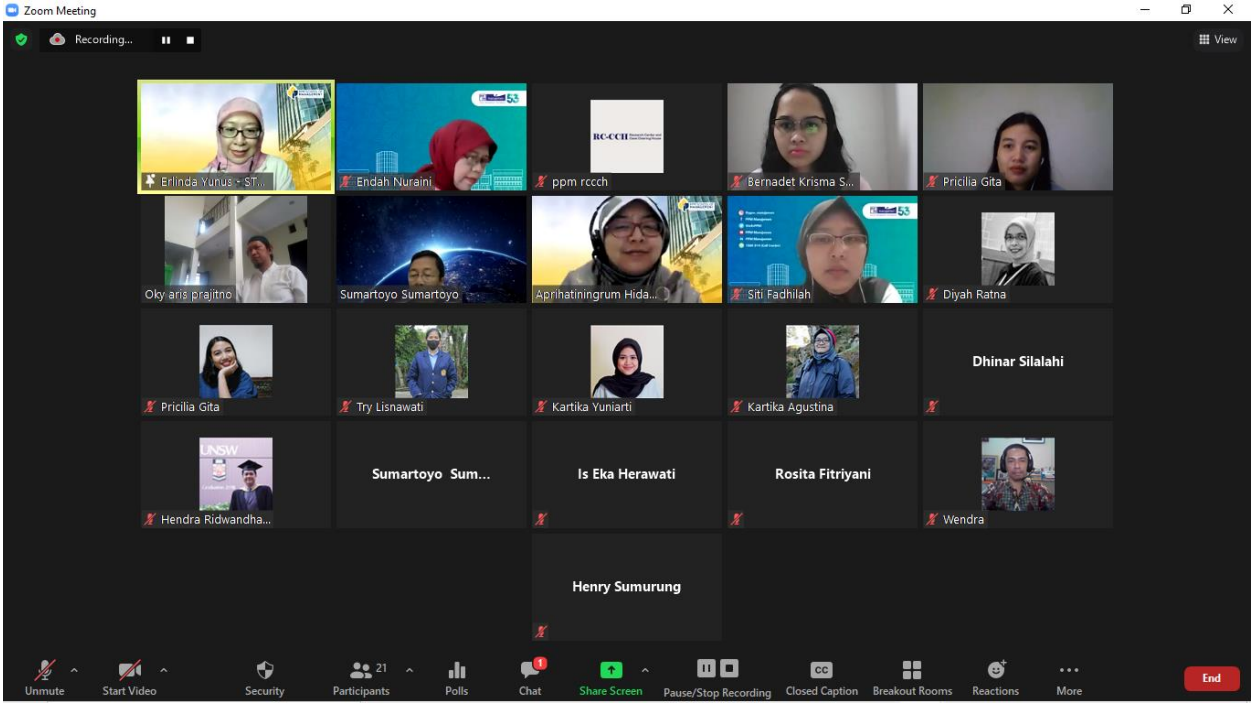
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INDUSTRY 4.0
How Managers Respond to Key Revolutionary Changes
Erlinda Nusron Yunus
Sekolah Tinggi Manajemen PPM
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Erlinda Yunus - STM PPM
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Breakout Rooms
Reactions
More
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The mark of industry 4.0: how managers respond to key revolutionary changes
Erlinda N. Yunus
Sekolah Tinggi Manajemen PPM, DKI Jakarta, Indonesia
Mark of industry 4.0
PPM SCHOOL OF MANAGEMENT
Inspiring Transformation
I NEVER LOSE. I EITHER WIN or LEARN.
–Nelson Mandela
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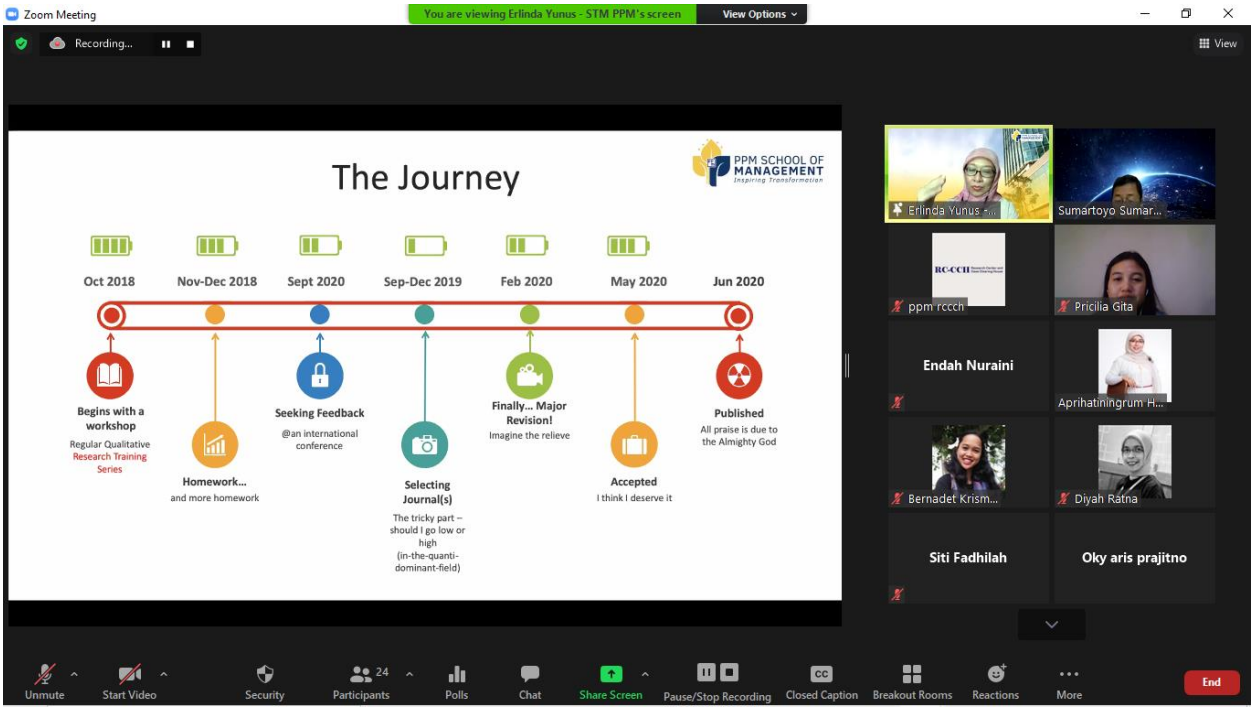
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The Journey
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Inspiring Transformation
Oct 2018
Nov-Dec 2018
Sept 2020
Sep-Dec 2019
Feb 2020
May 2020
Jun 2020
Begins with a workshop
Regular Qualitative Research Training Series
Homework...
and more homework
Seeking Feedback
@an international conference
Selecting Journal(s)
The tricky part – should I go low or high (in-the-quanti-dominant-field)
Finally... Major Revision!
Imagine the relieve
Accepted
I think I deserve it
Published
All praise is due to the Almighty God
Erlinda Yunus -...
Sumartoyo Sumar...
ppm rccch
Pricilia Gita
Endah Nuraini
Aprihatiningrum H...
Bernadet Krism...
Diyah Ratna
Siti Fadhilah
Oky aris prajitno
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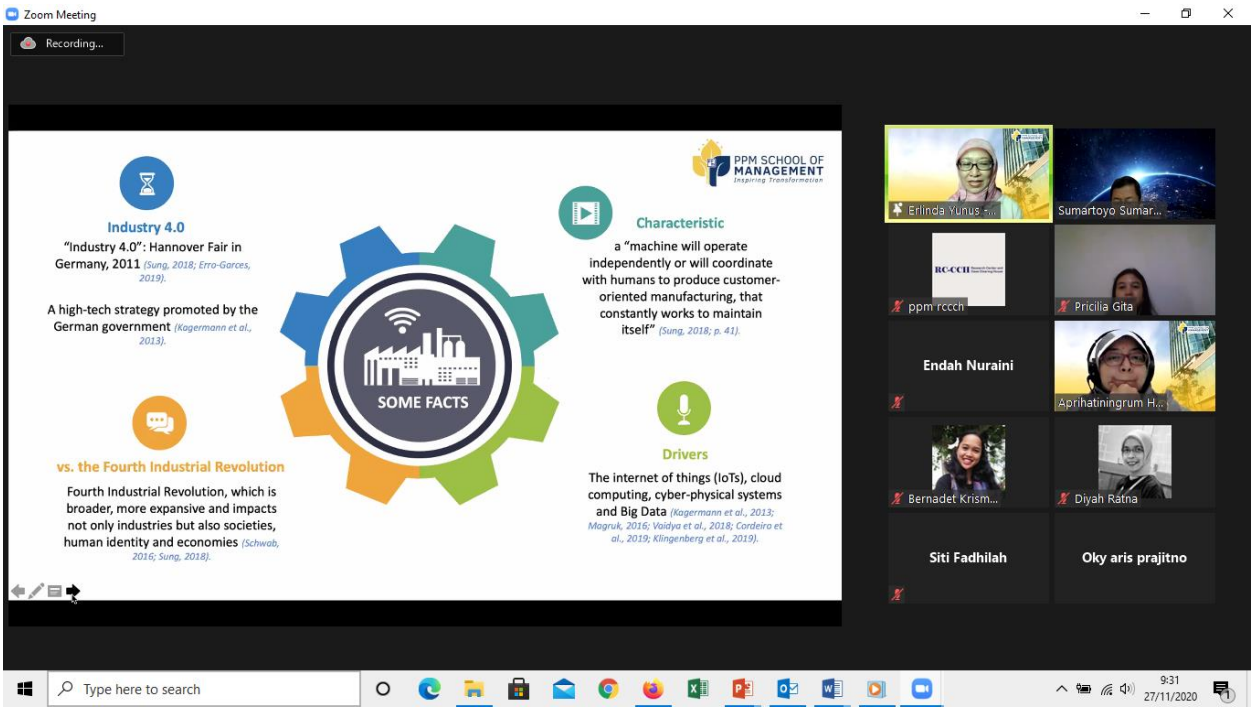
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Inspiring Transformation
Industry 4.0
"Industry 4.0": Hannover Fair in Germany, 2011 (Sung, 2018; Erro-Garces, 2019).
A high-tech strategy promoted by the German government (Kagermann et al., 2013).
SOME FACTS
Characteristic
a "machine will operate independently or will coordinate with humans to produce customer-oriented manufacturing, that constantly works to maintain itself" (Sung, 2018; p. 41).
vs. the Fourth Industrial Revolution
Fourth Industrial Revolution, which is broader, more expansive and impacts not only industries but also societies, human identity and economies (Schwab, 2016; Sung, 2018).
Drivers
The internet of things (IoTs), cloud computing, cyber-physical systems and Big Data (Kagermann et al., 2013; Magruk, 2016; Vaidya et al., 2018; Cordeiro et al., 2019; Klingenberg et al., 2019).
Erlinda Yunus -...
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ppm rccch
Pricilia Gita
Endah Nuraini
Aprihatiningrum H...
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Siti Fadhilah
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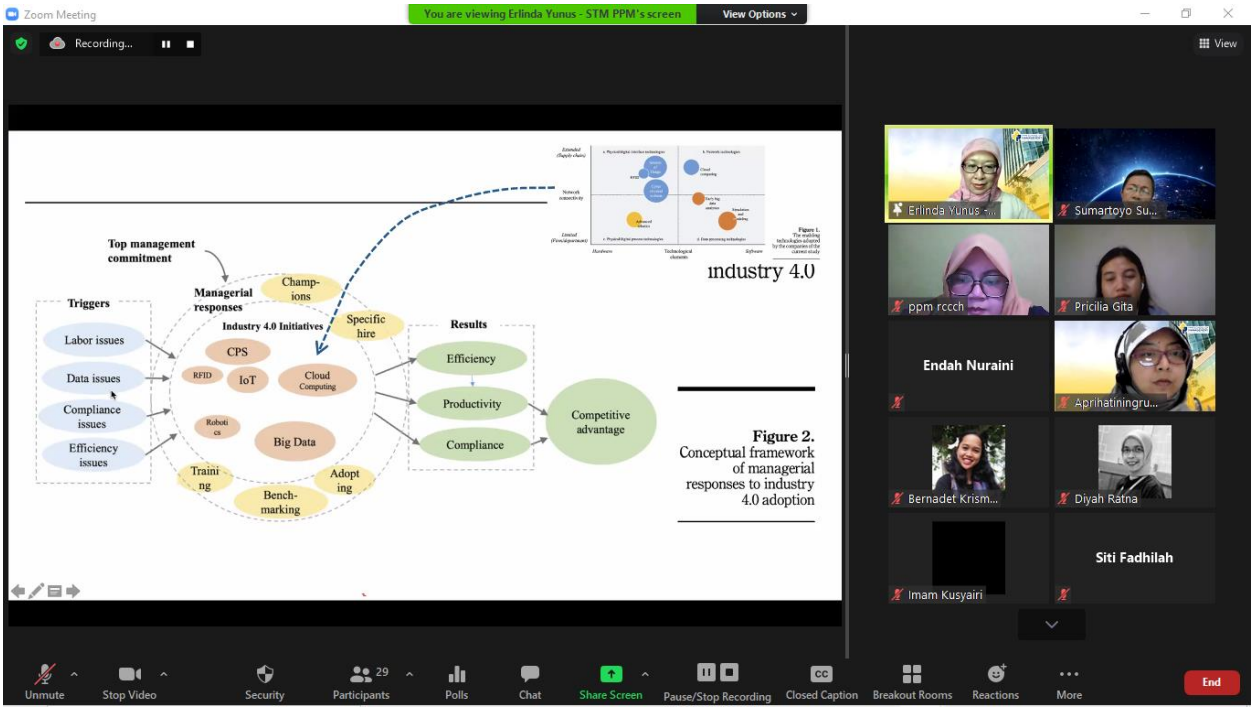
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industry 4.0
Top management commitment
Triggers
Labor issues
Data issues
Compliance issues
Efficiency issues
Managerial responses
Champ-ions
Specific hire
Industry 4.0 Initiatives
CPS
RFID
IoT
Cloud Computing
Roboti cs
Big Data
Traini ng
Bench-marking
Adopt ing
Results
Efficiency
Productivity
Compliance
Competitive advantage
Figure 2. Conceptual framework of managerial responses to industry 4.0 adoption
Erlinda Yunus -...
Sumartoyo Su...
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Pricilia Gita
Endah Nuraini
Aprihatiningru...
Bernadet Krism...
Diyah Ratna
Siti Fadhilah
Imam Kusyairi
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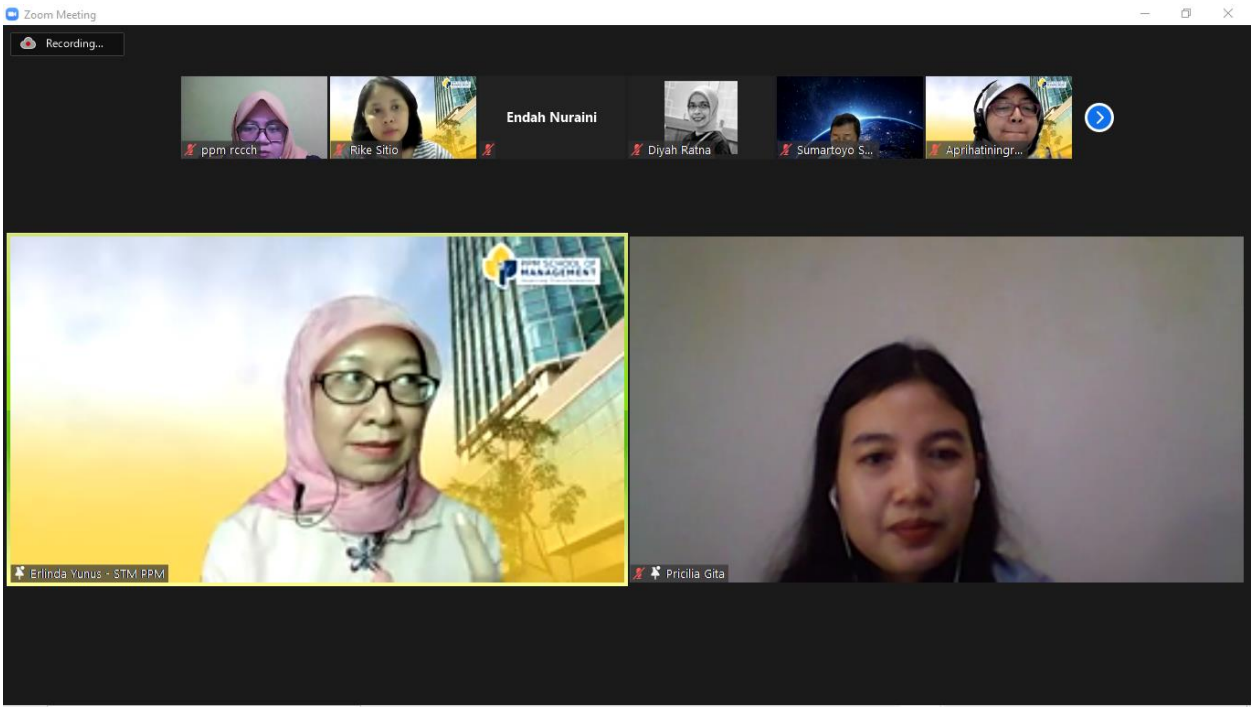
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Rike Sitio
Endah Nuraini
Diyah Ratna
Sumartoyo S...
Aprihatiningr...
Erlinda Yunus - STM PPM
Pricilia Gita


Zoom Meeting
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ppm rccch
Rike Sitio
Endah Nuraini
Sumartoyo S...
Imam Kusyairi
Bernadet Kris...
Erlinda Yunus - STM PPM
Pricilia Gita
Aprihatiningrum Hidayati
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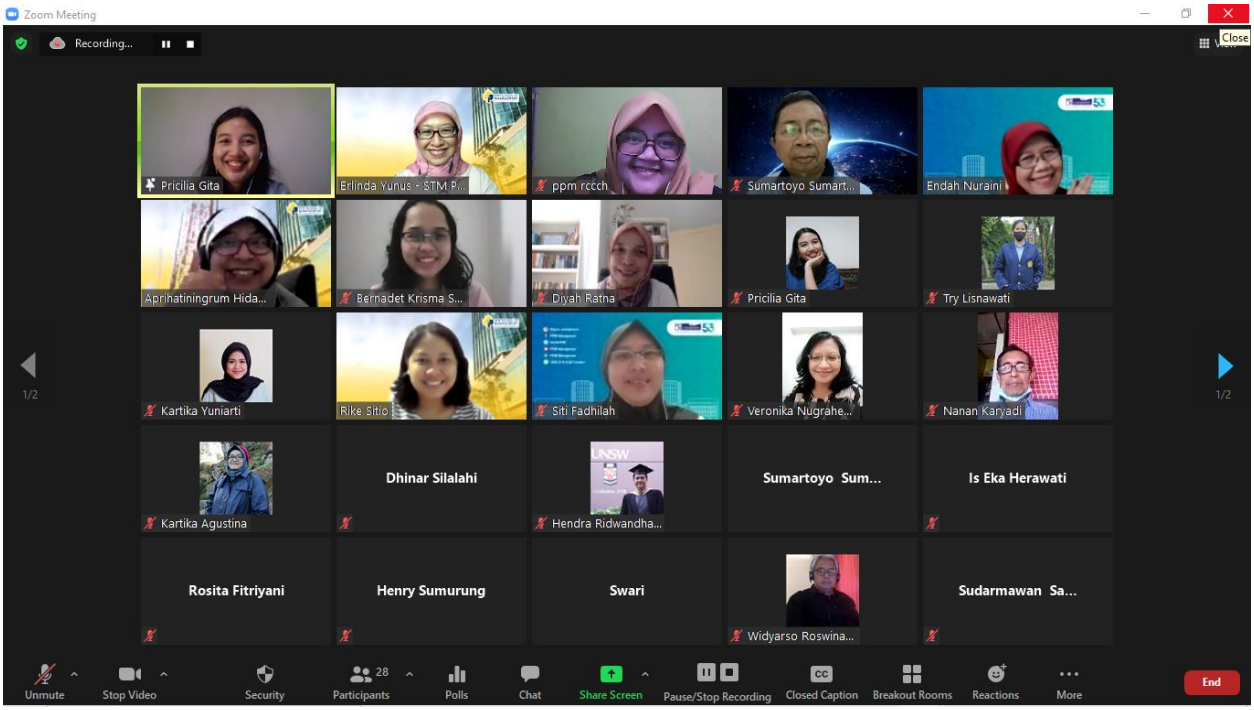
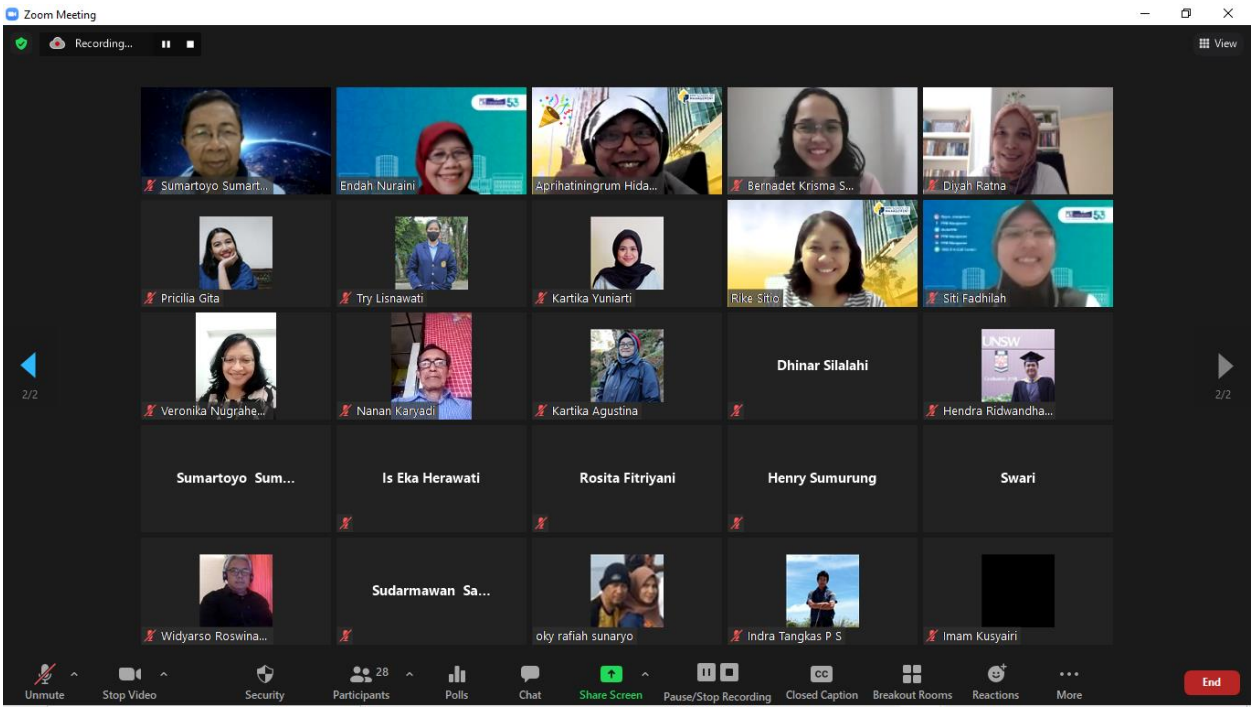
Berikut adalah Link absensi dan Evaluasi https://bit.ly/RBM-27Nov

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Endah Nuraini
Aprihatiningrum Hida...
Bernadet Krisma S...
Diyah Ratna
Pricilia Gita
Try Lisnawati
Kartika Yuniarti
Rike Sito
Siti Fadhilah
Veronika Nugrahe...
Nanan Karyadi
Kartika Agustina
Dhinar Silalahi
Hendra Ridwandha...
Sumartoyo Sum...
Is Eka Herawati
Rosita Fitriyani
Henry Sumurung
Swari
Widyarso Roswina...
Sudarmawan Sa...
oky rafiah sunaryo
Indra Tangkas P S
Imam Kusyairi
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