Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry -MSIE4.0

TASK 1.3 APPENDIX 1
(THAI+EU Industrial Questionnaire Analysis)

Chiang Mai University | 17th November 2018

Project Acronym	MSIE 4.0
Project full title	Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry
Project No.	586137-EPP-I-2017-I-TH-EPPKA2-CBHE-JP
Funding Scheme	Erasmus + KA2 - Capacity Building in the field of Higher Education
Coordinator	AIT
Work Package	WP1
Leader	WICHAI CHATTINNAWAT
Task Title	Task 1.3 INDUSTRIAL QUESTIONNAIRE ANALYSIS (THAI+EU COMPANY)
Task Leader	WICHAI CHATTINNAWAT
Last version date	17th November 2018
Status	Draft
Dissemination Level	Public

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Revision Sheet

Version	Date	Author (Partner/Person)	The revision reason
0.1	23/08/2018	Wichai Chattinnawat	First draft of WP1 Task1.3 on Company questionnaire analysis
0.2	4/10/2018	Wichai Chattinnawat	Second draft of WP1 Task1.3 on Company questionnaire analysis with more EU company added
1	17/11/2018	Wichai Chattinnawat	Final draft of WP1 Task1.3 on company questionnaire analysis with different classification on industrial clustering

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WP1

WP1 is aimed to provide comparative analysis of the actual situation concerning the MSc curricula in Industrial Engineering offered in Thai and EU partner countries universities, the identification of the gaps between the real needs of the industry, the student needs and the actual offered curricula. The recommendations for the new curriculum development, are the most important deliverable working elements for the first year of the project in WP1.

Throughout the entire first year the WP1 will

1) identify the strengths and weaknesses , the common points, the differences and the good practices concerning curricula, teaching methods and tools in Thai and EU universities
2) identify the gap between the needs of industry, for being ready for Thailand 4.0, especially in capacity building, and the competence of MSc graduates from current curricula offered by Thai and EU universities
3) Recommend the specifications and focus areas of the new proposed MSIE curriculum.

The WP1 will be led by CMU close collaboration with UMinho that will co-lead and be the WP1 coordinator for EU partners. All partners will also participate and be responsible for tasks related to their geographical regions.

This analysis working plan is now revised after the approval of PEC the project executive committee-PEC.

WP1-1.3: Assessing needs of industry

The comprehensive analysis of needs of industry and students (all partners will conduct a survey with companies assigned in their regions in the list and with the help of the Associated Partners. They will also conduct survey with prospective students in their regions. The outcome of this activity will be classified as following

- Task 1.3.1 Preparing a survey form for identifying the needs of industry for MSIE graduates to support their success in Thailand 4.0 and Industry 4.0
- Task 1.3.2 Preparing a survey form for the needs of prospective students for preparing them for Thailand 4.0 and Industry 4.0
- Task 1.3.3 Conducting survey for companies and organizations in the list
- Task 1.3.4 Conducting survey from students
- Task 1.3.5 Identifying the needs of industry and students

The finding of statistics shows that the total number of program being reviewed is 28. So the total estimation of student population is at least 375 for M.S. students from all 9 partners. Therefore to have minimal 10% error margin of error, the total sampling size to be 385. Then each partner should have at least 40 students for each partner.

The finding of statistics for SME company in Thailand shows that there are more than 30,000 SME. By assuming that the high impact SME in Thailand is at least 1,000, the sampling table of YAMANE indicates that the minimum of 91 companies shall be listed based on the 10% error.

The WP1 leader searches for the first and the new S-curves or new country competitive. The TL researcher decided to focus on only 4 groups of (First S-curve)

1) Next – Generation Automotive
2) Smart Electronics
3) Agriculture and Biotechnology
4) Food for the Future.

These classification the first S-curve in Thailand was consulted with CWPL and all partners. The specific names of the companies for all study group in Thailand were created and given to all partners for approval. The total of 72 companies are listed by the following clusters:

Tourism	Seafood Processing	Electronic
Agro Processing	Textile Industry	Construction/Manufacturing
Aerospace	Automotives	Logistic and Transport
Packaging and Commerce	Petro Chemical	Automation
IT	Wood/furniture	

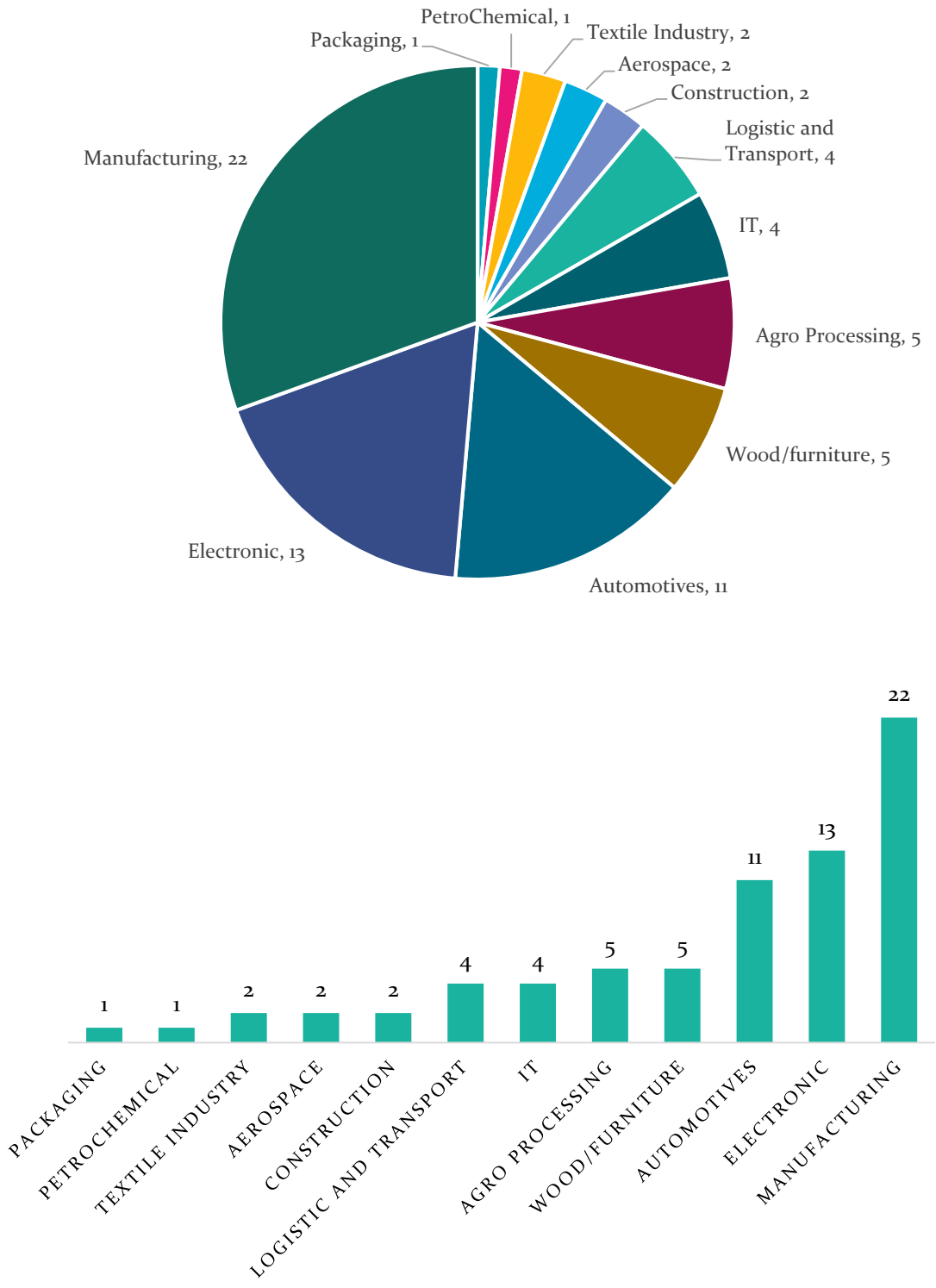


Figure 1 Classification of 72 companies by Sectors

The TL has adopted, modified the questionnaires from the "Industry 4.0 Readiness" study was commissioned by the IMPULS Foundation of the German Engineering Federation (VDMA) and conducted by IW Consult (a subsidiary of the Cologne Institute for Economic Research) and the Institute for Industrial Management (FIR) at RWTH Aachen University.

This questionnaires has 23 pages consists of 3 parts

1. Definitions of Industry 4.0, Industry 4.0 Adoption Scope and Readiness Scheme (p 1-4)

2. Business Background (p 5)

3. Part 1: Industry 4.0 Adoption Scope (page 6-11)

- 1. Business strategy, Business Models, Product & Service Portfolio
- 2. Transversal & Domain related Competences: Employee

4. Part 2 : Industry 4.0 Readiness Scheme (page 12-23)

1.Smart products & Co-created Design:

-To what extent can your products be controlled with IT, making it possible for them to communicate and interact with higher-level systems along the value chain?

2. Smart factory (Intelligence Manufacturing System):

-To what extent does your company have digitally integrated and automated production based on cyber-physical systems?

3. Smart operations (Controlling, Adjusting & Monitoring Process Real Time):

-To what extent are the processes and products in your company digitally modeled and capable of being controlled through ICT systems and algorithms in a virtual world?

4. Data driven services (Integrated Business & Operational Data Management):

-To what extent do you offer data-driven services that are possible only through the integration of products, production, and customers?

Table 1 List of Industry and Company for Industry Assessment

University	Industry Type	Company Name
AIT	Packaging	Bangkok Glass Public Company Limited
AIT	Electronic	Western Digital (Thailand) Co,Ltd.
Chiang Mai University (CMU)	Aerospace	Zodiac Commercial Inserts Thailand
Chiang Mai University (CMU)	Agro Processing	Four T Co., Ltd.
Chiang Mai University (CMU)	Agro Processing	Betagro
Chiang Mai University (CMU)	Automotives	TSM
Chiang Mai University (CMU)	Automotives	Mitsubishi Corp LT
Chiang Mai University (CMU)	Automotives	Toyota Daihatau Engineering and Manufacturing
Chiang Mai University (CMU)	Electronic	Hoya optics
Chiang Mai University (CMU)	Electronic	Tokyo Coil Engineer (Thailand) Co., Ltd.
Chiang Mai University (CMU)	Electronic	Fujikura Electronics (Thailand) Ltd.
Chiang Mai University (CMU)	Electronic	Schaffner EMC Co., Ltd
Chiang Mai University (CMU)	Logistic and Transport	CP all Distribution
Chiang Mai University (CMU)	Manufacturing	DATAMARS (Thailand) Ltd.
Chiang Mai University (CMU)	Manufacturing	Princess Foods Co.,Ltd.
Chiang Mai University (CMU)	Manufacturing	Siam Wire Netting
Chiang Mai University (CMU)	Manufacturing	Meshtec Internationnal
Chiang Mai University (CMU)	Textile Industry	Performance manufacturing Ltd. (Thailand) - Lamphun
Chiang Mai University (CMU)	Wood/furniture	Suksawad
Khon Kaen University (KKU)	Agro Processing	MitrpholSugar co ltd (by KKU)
Khon Kaen University (KKU)	Electronic	Seagate Technology (by KKU)
Khon Kaen University (KKU)	Electronic	Panasonic Manufacturing (Thailand) Co,Ltd. (by KKU)
Khon Kaen University (KKU)	Logistic and Transport	Thaibeverage Logistics (by KKU)
Khon Kaen University (KKU)	Manufacturing	CP RAM co th (by KKU)
Khon Kaen University (KKU)	Textile Industry	NK Apparel (by KKU)
King Mongkut's University of Technology North	Automotives	DENSO(Thailand) Co.LTD.
King Mongkut's University of Technology North	Automotives	Thai Summit Harness Co,Ltd.
King Mongkut's University of Technology North	Automotives	Misuibishi Motor Thailand Co, Ltd.

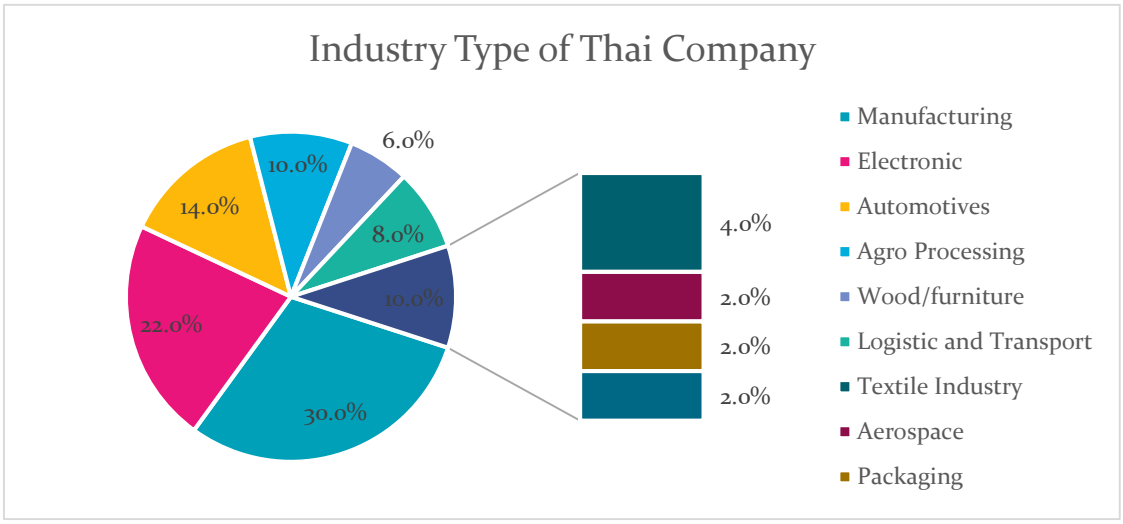
University	Industry Type	Company Name
King Mongkut's University of Technology North	Electronic	DKSH Thailand Co,Ltd.
King Mongkut's University of Technology North	Electronic	Segate Technology Thailand
King Mongkut's University of Technology North	Electronic	Ronda Thailand
King Mongkut's University of Technology North	Logistic and Transport	Yusen Logistics (Thailand) Co. Ltd.
King Mongkut's University of Technology North	Logistic and Transport	Grand Home Mart Co,Ltd.
King Mongkut's University of Technology North	Manufacturing	President Bakery Public Company Limited
King Mongkut's University of Technology North	Manufacturing	Triple A Mechanies Co,Ltd.
Prince of Songkla University (PSU)	Agro Processing	Stitrangglove
Prince of Songkla University (PSU)	Agro Processing	APK Furnishing
Prince of Songkla University (PSU)	Manufacturing	Southland Rubber Co.,Ltd
Prince of Songkla University (PSU)	Manufacturing	Wonnatech
Prince of Songkla University (PSU)	Manufacturing	Honda Company
Prince of Songkla University (PSU)	Manufacturing	rubbers innotech co.,ltd
Prince of Songkla University (PSU)	Manufacturing	Juthamarth Marketing Co.,Ltd
Prince of Songkla University (PSU)	Wood/furniture	Xunthai Parawood Co., Ltd.
Thammasat University (TU)	Automotives	Schavakon Co.,Ltd
Thammasat University (TU)	Electronic	Mitsubishi Electric Asia (Thailand) Co.,Ltd.
Thammasat University (TU)	IT	Symphony Communications
Thammasat University (TU)	Manufacturing	JCY HDD TECHNOLOGY COMPANY LIMITED
Thammasat University (TU)	Manufacturing	The CPAC Roof Tile CO.,Ltd
Thammasat University (TU)	Manufacturing	M&R LABORATORY CO., LTD.
Thammasat University (TU)	Wood/furniture	S.B. Furniture Industry Co.,Ltd
Thammasat University (TU)	Wood/furniture	S.B. Furniture Industry Co.,Ltd
Thammasat University (TU)	Wood/furniture	S.B. Furniture Industry Co.,Ltd
CUT	Automotives	Wielton Group

University	Industry Type	Company Name
CUT	Automotives	Nexteer
CUT	Automotives	ZF - PDPQ IT
CUT	Electronic	Electrolux Poland Sp. z o.o.
CUT	Manufacturing	Whirpool Polska
CUT	Manufacturing	KLER
CUT	Wood/furniture	RC DESIGN S. z o.o.
CUT	Wood/furniture	Opakowania Eksportowe
Uminho	Automotives	Bosch Car Multimedia S.A.
UPB	Aerospace	INCD Turbomotoare COMOTI
UPB	Construction	Alumil ROM Industry SA
UPB	Construction	NORD TECH SRL
UPB	Electronic	SC ARCTIC SA
UPB	IT	Vegra Info SRL
UPB	IT	Archibus Solution Center SRL
UPB	IT	BIM Consultant SRL
UPB	Manufacturing	Bekaert Slatina SRL
UPB	Manufacturing	UNISON ENGINE COMPONENTS BUCHAREST SA
UPB	Manufacturing	DUAL MAN SRL
UPB	Manufacturing	Thermoconcept Systems SRL
UPB	PetroChemical	PETROM SA
	Manufacturing	Jeremias

The details of survey were presented as follows:

Industry Type

☐ Electronic	☐ Agro Processing	☐ Textile Industry
☐ Manufacturing	☐ Aerospace	☐ Automotives
☐ Automation	☐ IT	☐ Petro Chemical
☐ Seafood Processing	☐ Wood/furniture	☐ Construction
☐ Logistic and Transport	☐ Commerce & Tourism	☐ Packaging



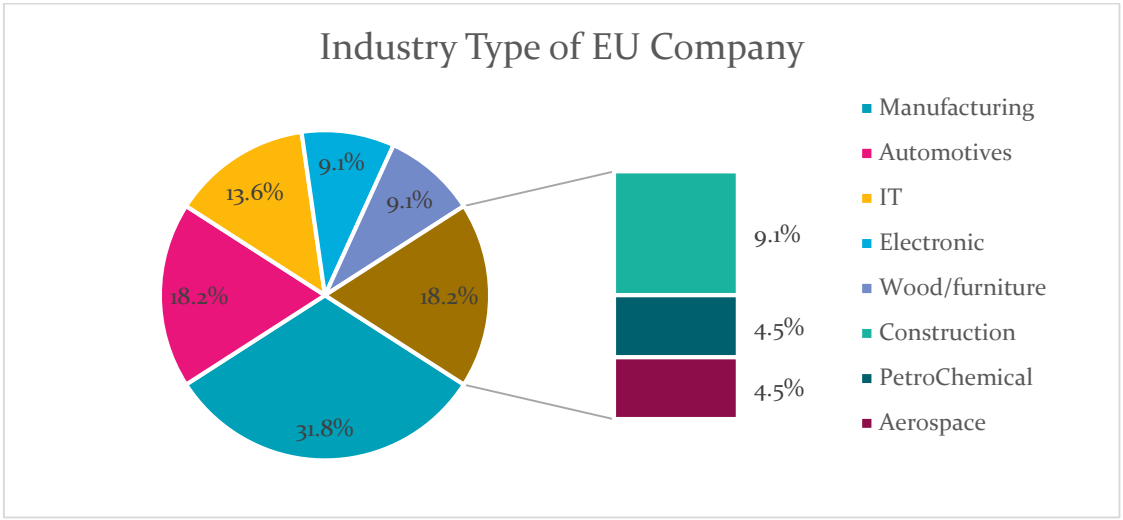


Figure 2 Industry Type

Please estimate the size of your company's domestic workforce.

☐ Up to 19 employees ☐ 20 to 99 employees ☐ 100 to 249 employees
☐ 250 to 499 employees ☐ 500 or more employees

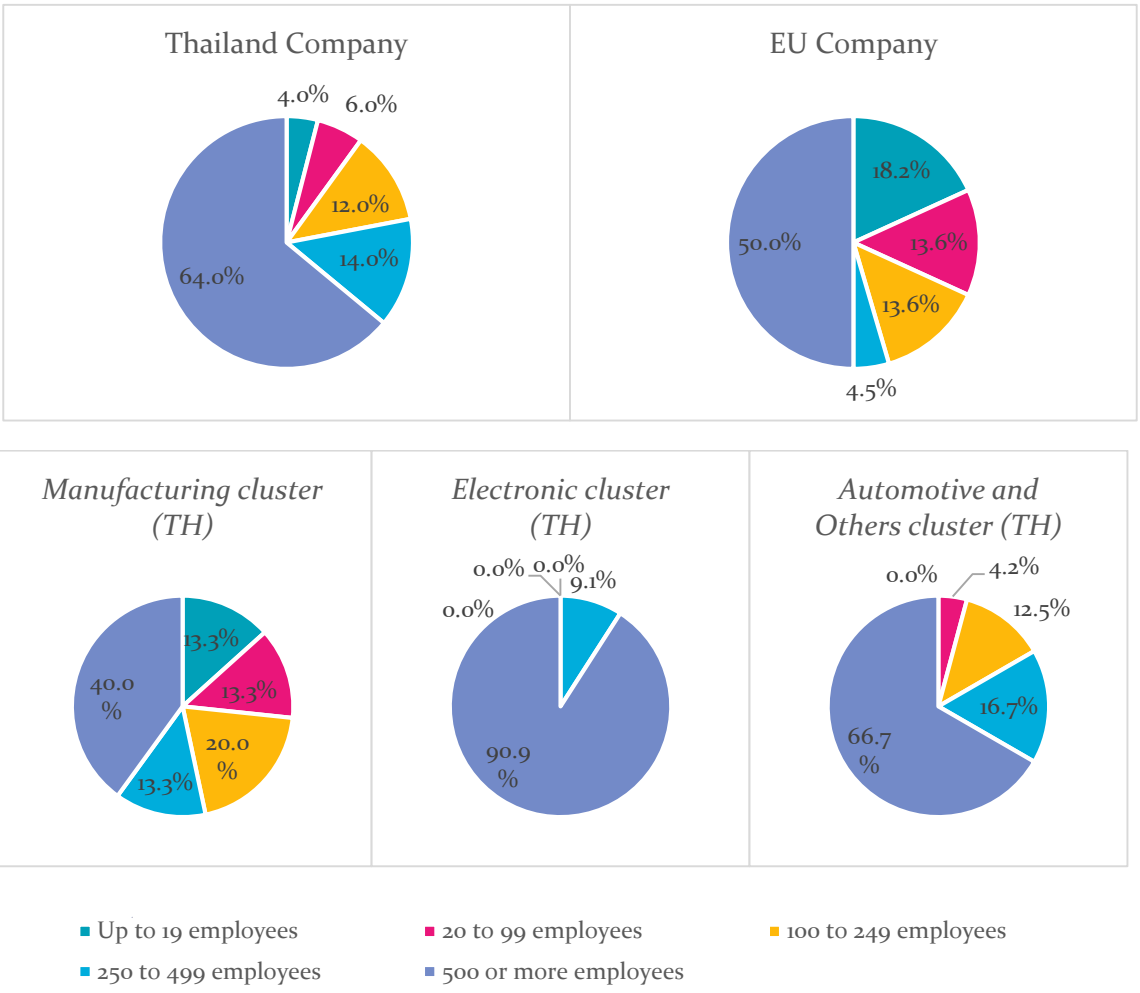


Figure 3 The size of company's domestic workforce.

Please estimate your 2017 revenues (THB/Euros)

☐ Under 1 million
☐ 1 million to under 10 million
☐ 10 million to under 50 million
☐ 50 million to under 100 million
☐ 100 million to under 250 million
☐ 250 million to under 500 million
☐ 500 million

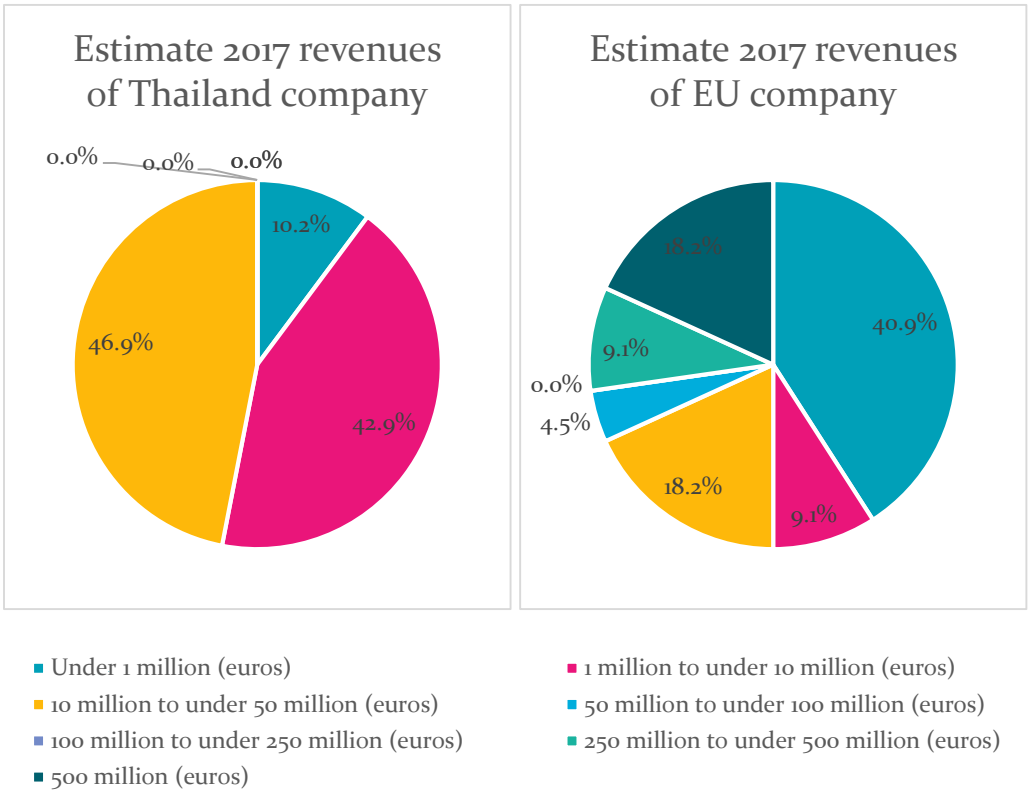


Figure 4 The estimate revenues.

Company category

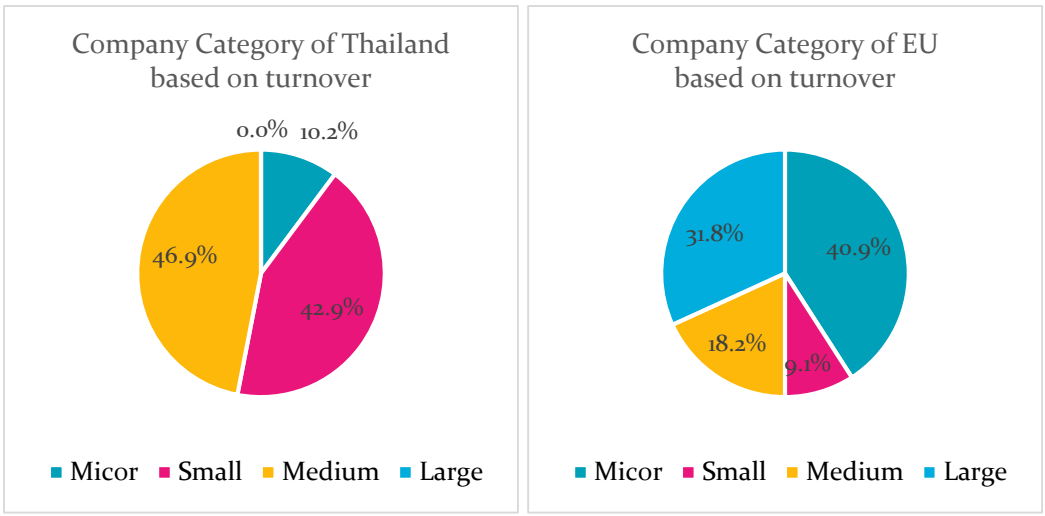


Figure 5 Company Category of Thailand based on turnover

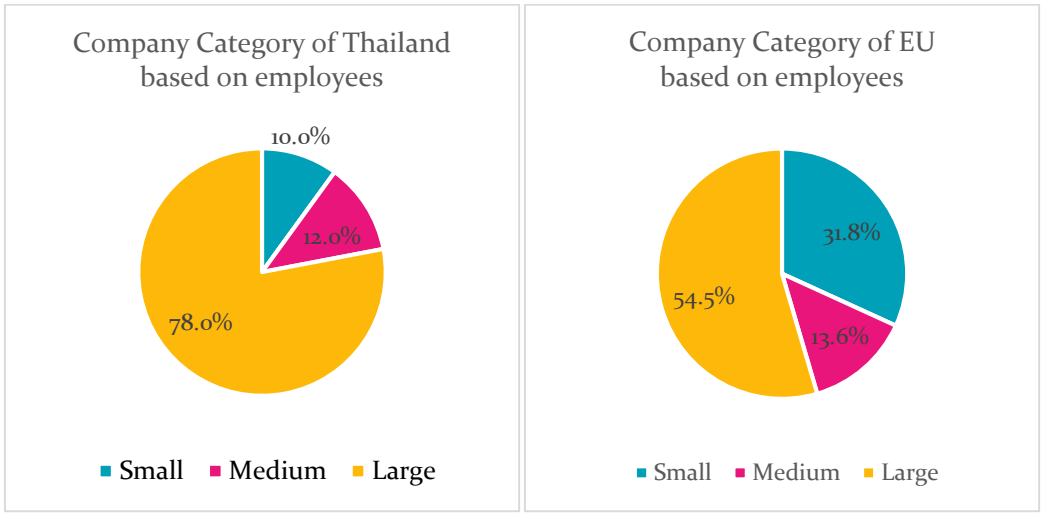


Figure 6 Company Category of Thailand based on employees

Part1: Strategy Level

1. STRATEGY AND ORGANIZATION

Q1.1 Industry 4.0 is about more than just improving existing products or processes through the use of digital technologies – it actually offers the opportunity to develop entirely new business models. For this reason, its implementation is of great strategic importance.

- ☐ No strategy exists
- ☐ Pilot initiatives launched
- ☐ Strategy in development
- ☐ Strategy formulated
- ☐ Strategy in implementation
- ☐ Strategy implemented

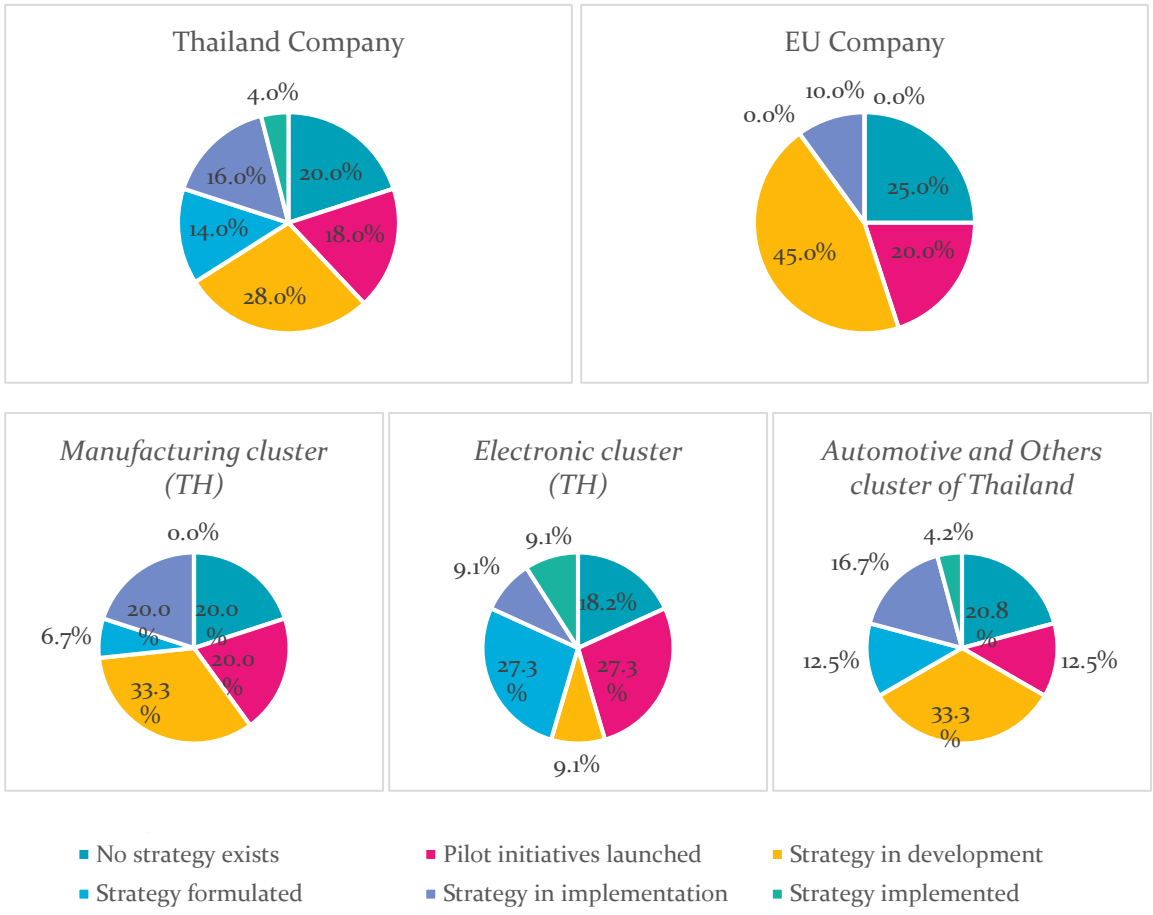


Figure 7 *Q1.1 Industry 4.0 is about more than just improving existing products or processes through the use of digital technologies – it actually offers the opportunity to develop entirely new business models. For this reason, its implementation is of great strategic importance.*

Q1.2 Do you use indicators to track the implementation status of your Industry 4.0 strategy?

☐ Yes, we have a system of indicators that we consider appropriate
☐ Yes, we have a system of indicators that gives us some orientation
☐ No, our approach is not yet that clearly defined

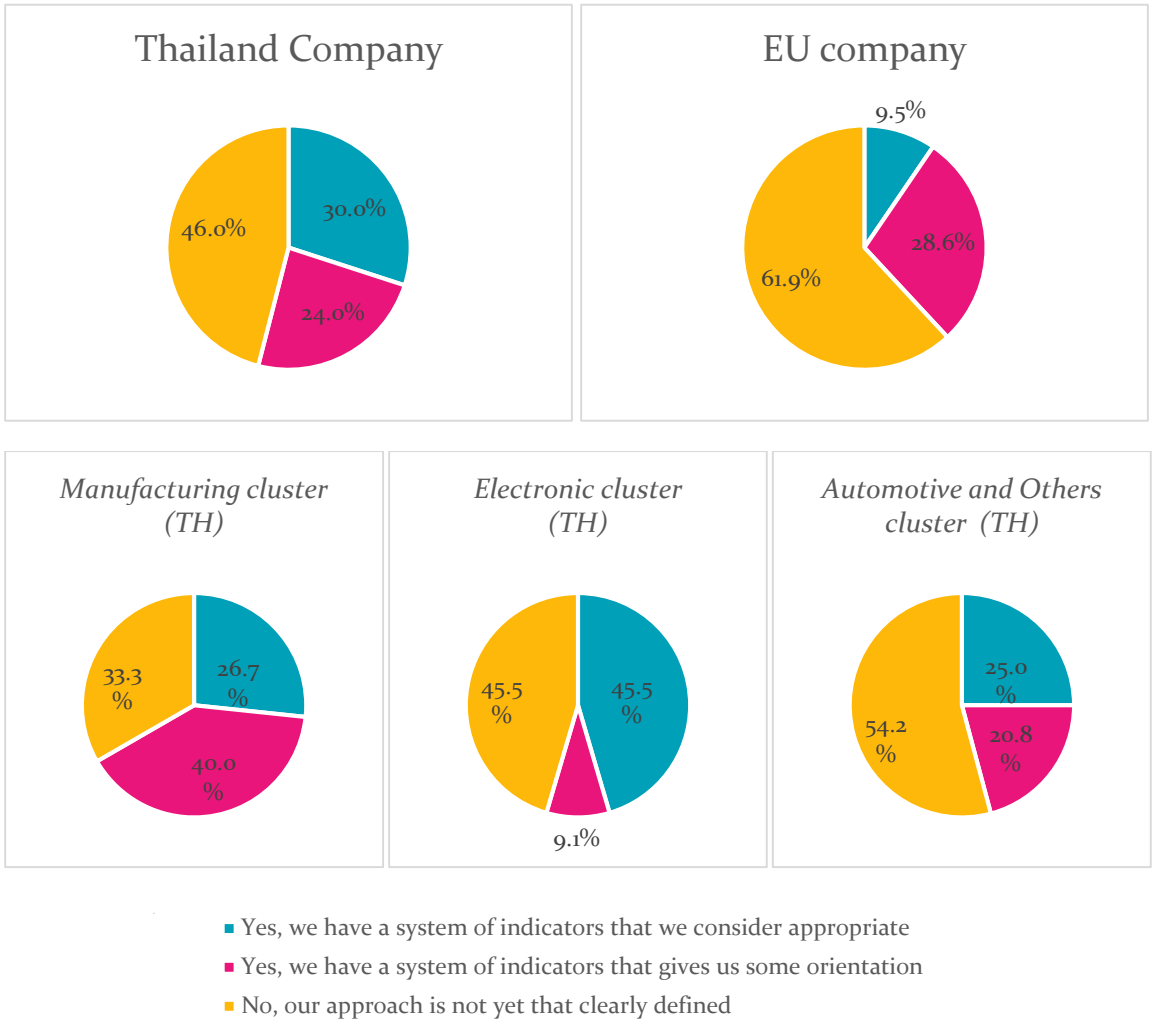
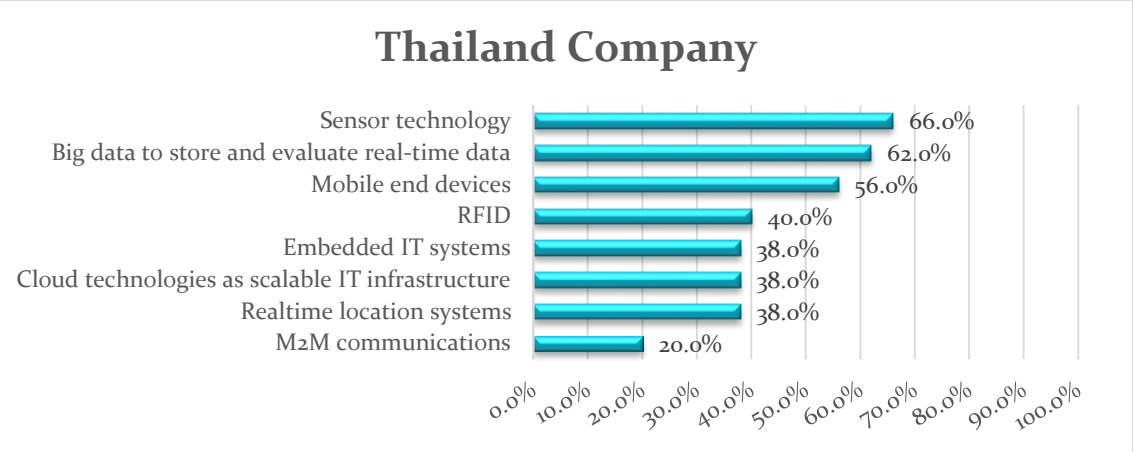
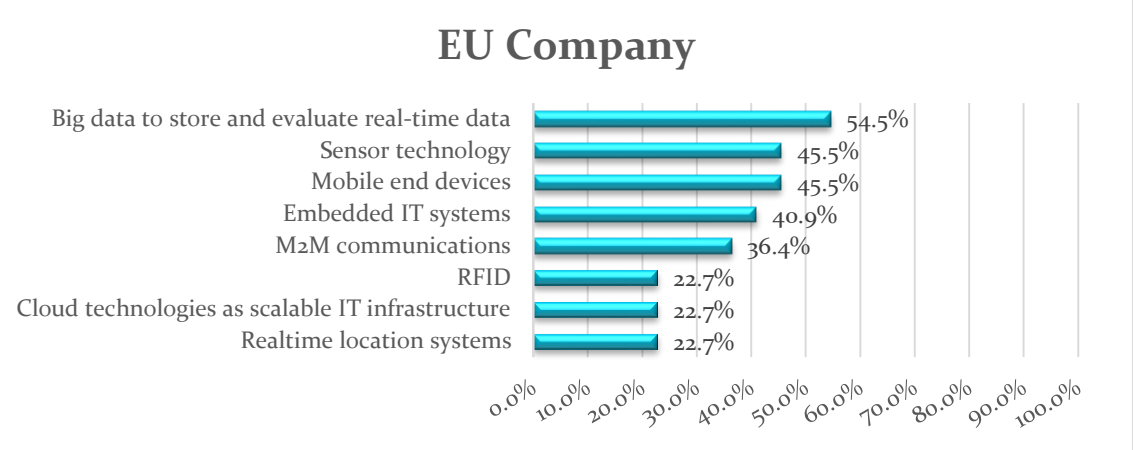


Figure 8 Q1.2 Do you use indicators to track the implementation status of your Industry 4.0 strategy?

Q1.3a Which technologies do you need in your company to enhance business competitiveness? (Can answer more than 1)

- ☐ Sensor technology
- ☐ Mobile end devices
- ☐ RFID
- ☐ Real-time location systems
- ☐ Big data to store and evaluate real-time data
- ☐ Cloud technologies as scalable IT infrastructure
- ☐ Embedded IT systems
- ☐ M2M communications





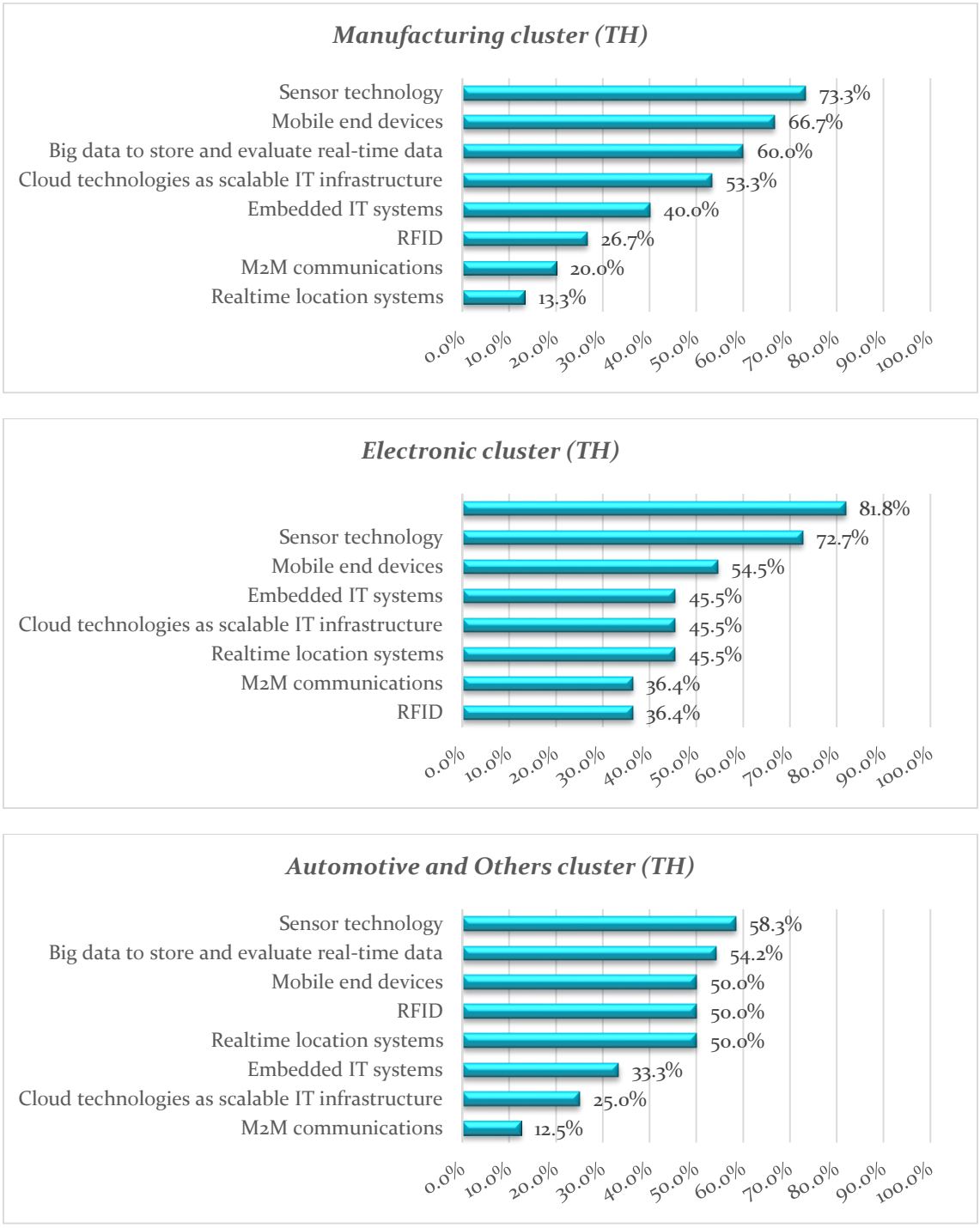
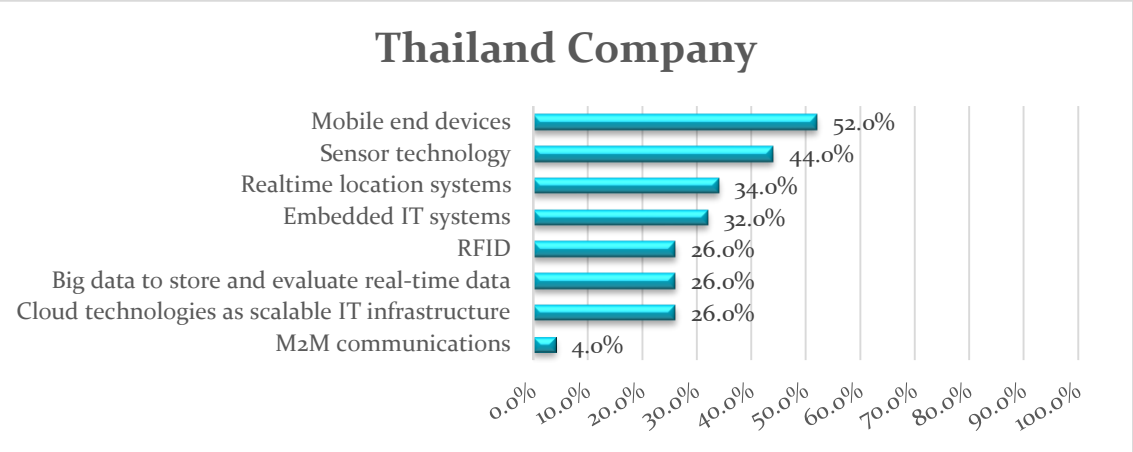
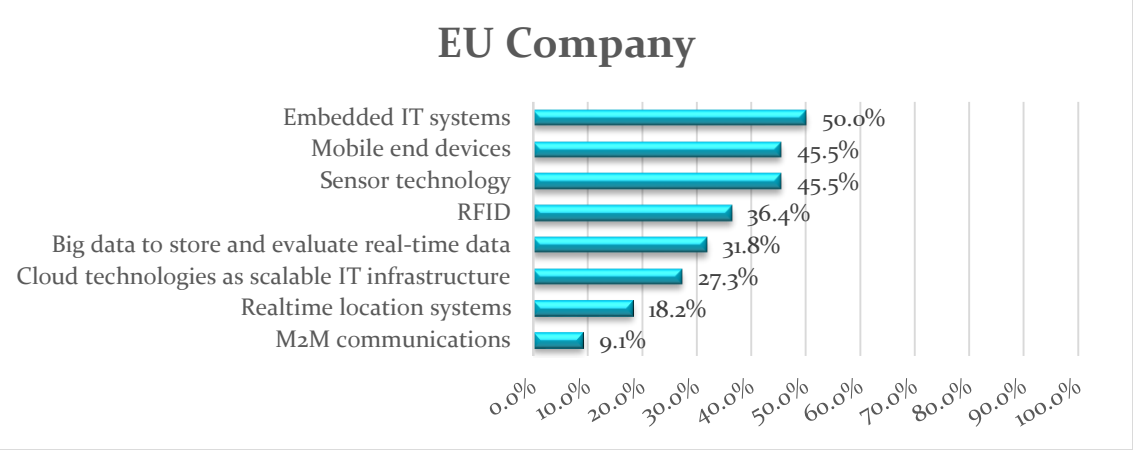


Figure 9 Q1.3a Which technologies do you need in your company to enhance business competitiveness?

Q1.3b Which technologies do you currently using in your company? (Can answer more than 1)

- ☐ Sensor technology
- ☐ Mobile end devices
- ☐ RFID
- ☐ Realtime location systems
- ☐ Big data to store and evaluate real-time data
- ☐ Cloud technologies as scalable IT infrastructure
- ☐ Embedded IT systems
- ☐ M2M communications





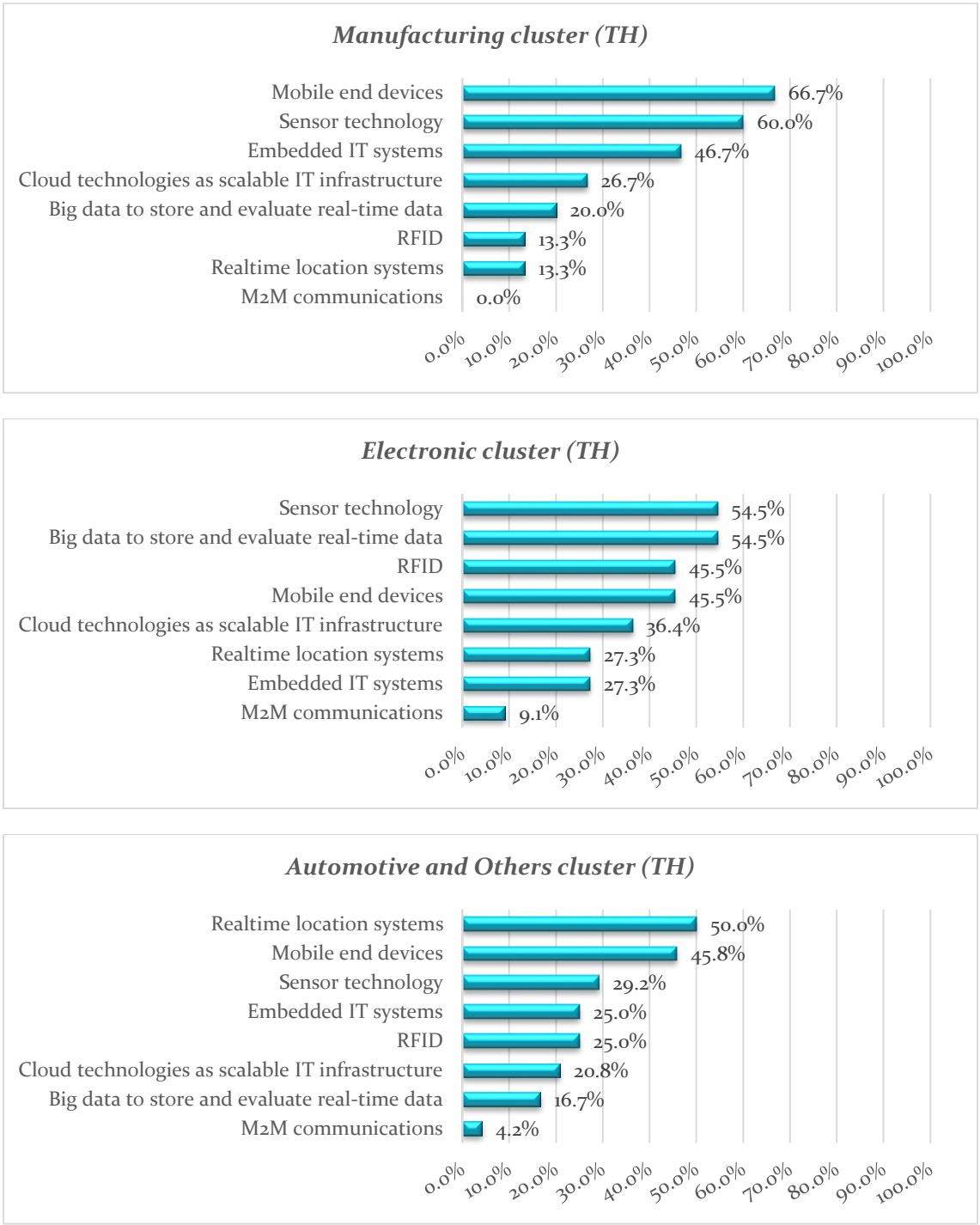


Figure 10 Q1.3b Which technologies do you currently using in your company?

Q1.4 In which parts of your company have you invested in the implementation of Industry 4.0 in the past two years, and what are your plans for the future?

Table 2 Investments in the past 2 years

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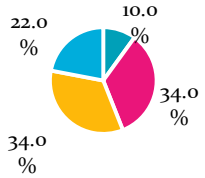
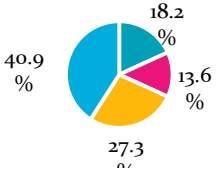
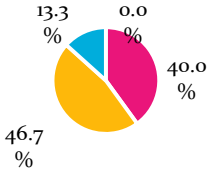
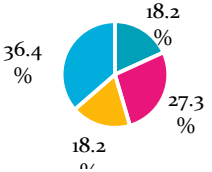
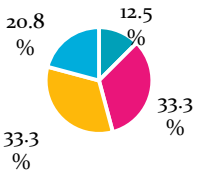
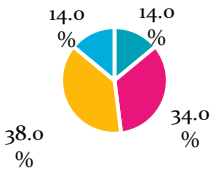
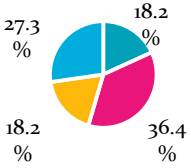
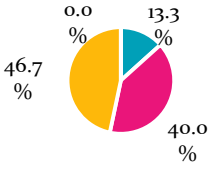
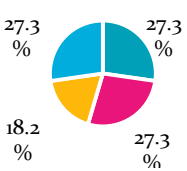
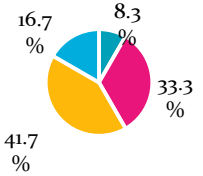
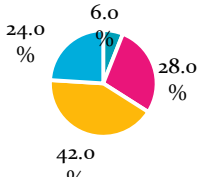
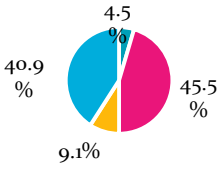
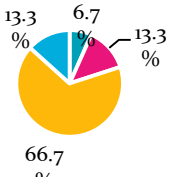
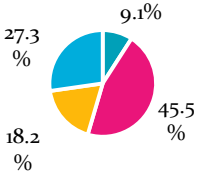
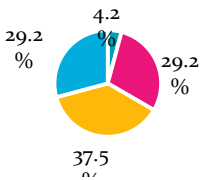
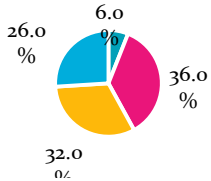
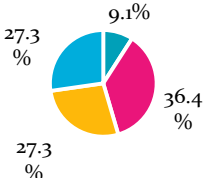
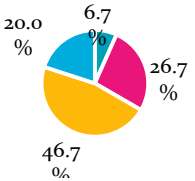
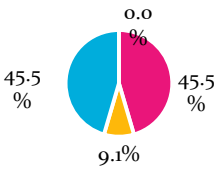
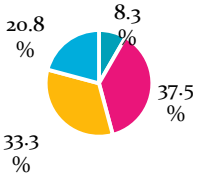
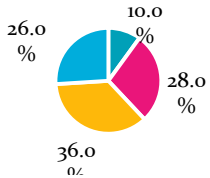
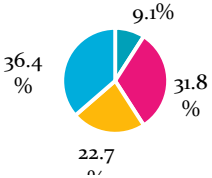
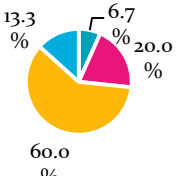
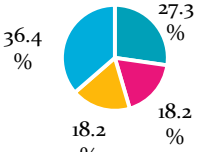
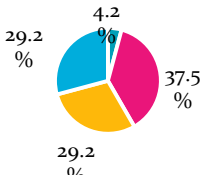
Research and development					
Production/Manufacturing					
Purchasing					
Logistics					
Sales					

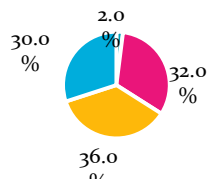
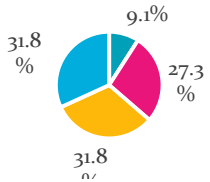
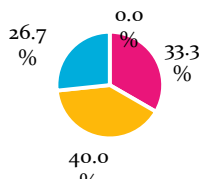
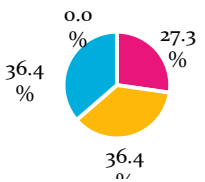
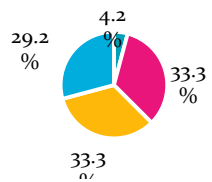
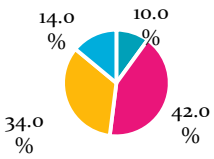
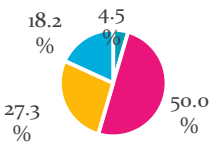
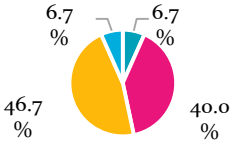
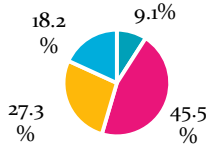
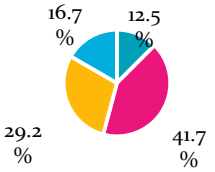
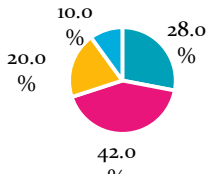
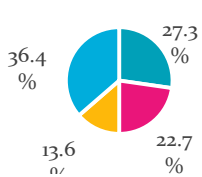
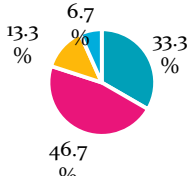
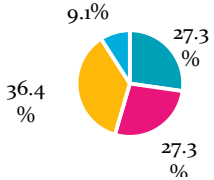
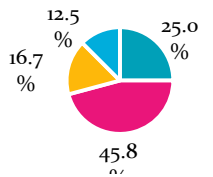
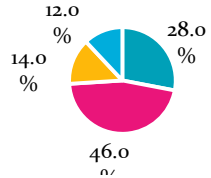
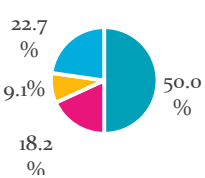
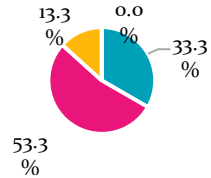
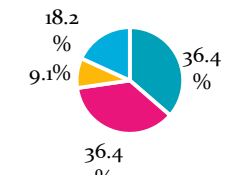
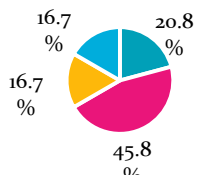
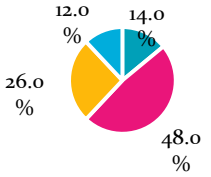
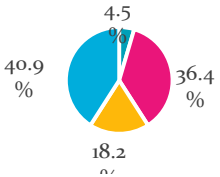
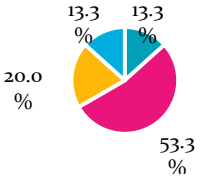
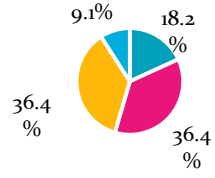
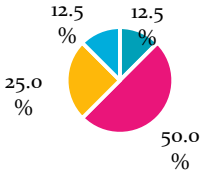
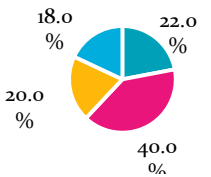
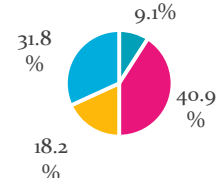
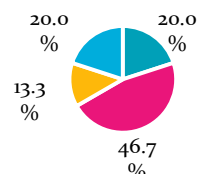
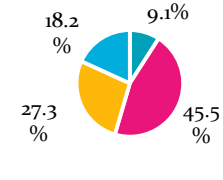
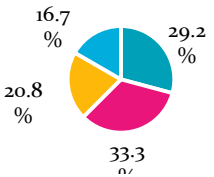
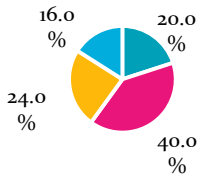
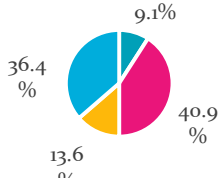
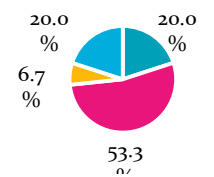
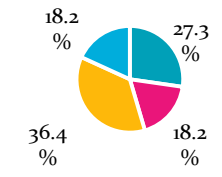
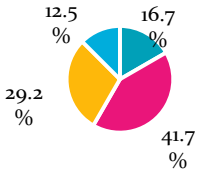
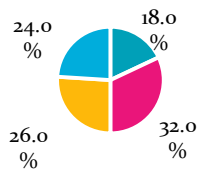
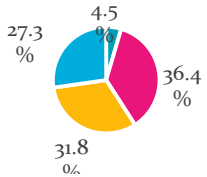
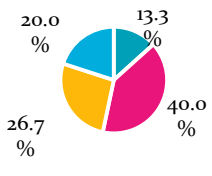
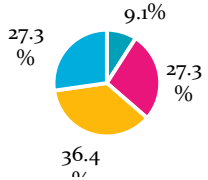
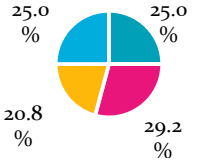
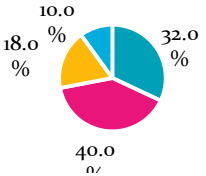
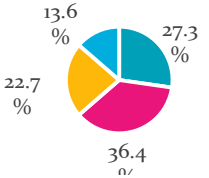
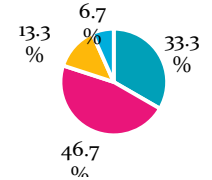
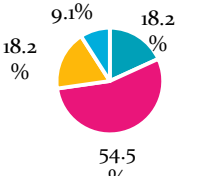
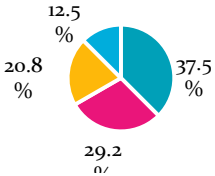
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Services					
IT					
Note:	■ Large ■ Medium ■ Small ■ None				

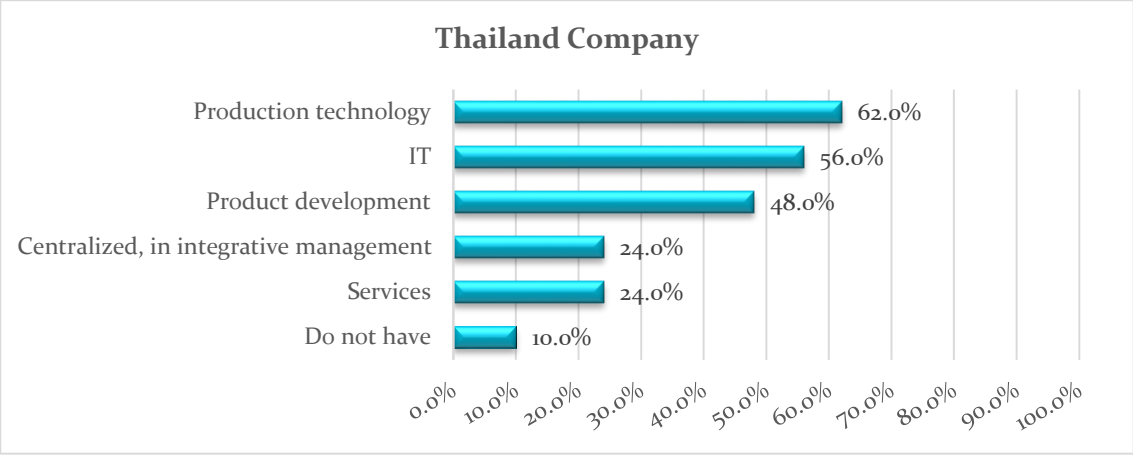
Table 3 Investments in the next 5 years

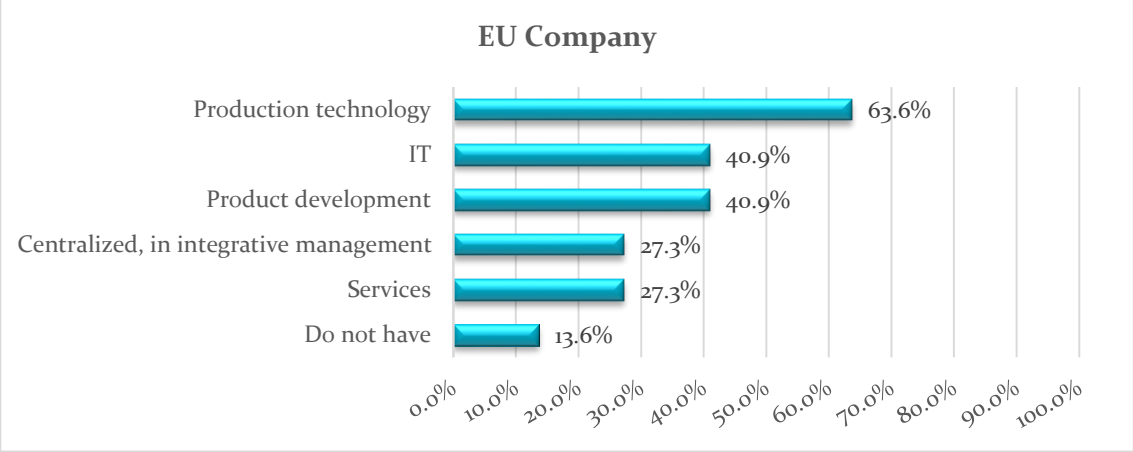
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Research and development					
Production/Manufacturing					
Purchasing					
Logistics					
Sales					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Services					
IT					
Note:	■ Large ■ Medium ■ Small ■ None				

Q1.5 In which areas does your company have systematic technology and innovation management? (Can answer more than 1)

- ☐ IT
- ☐ Production technology
- ☐ Product development
- ☐ Services
- ☐ Centralized, in integrative management
- ☐ Do not have





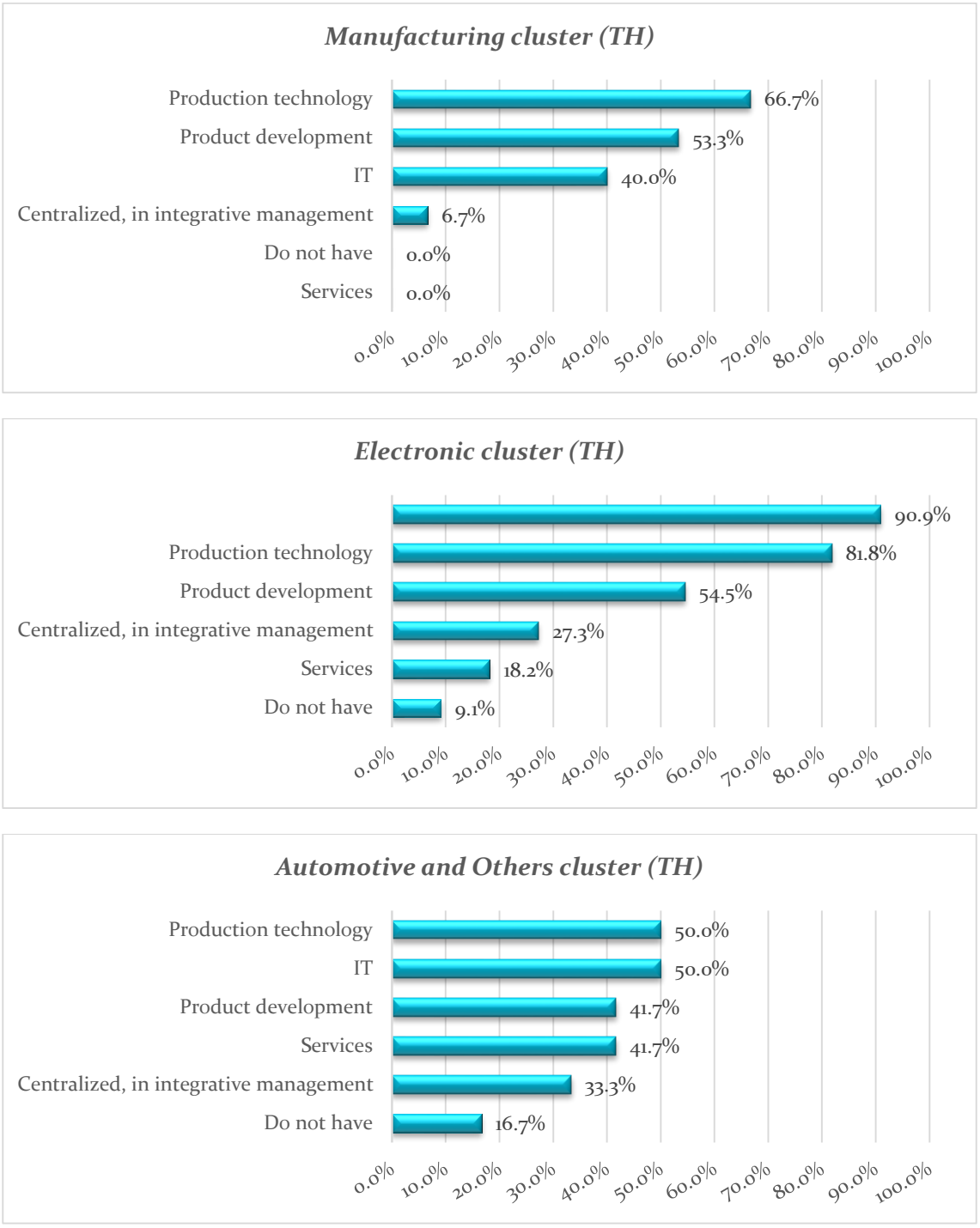


Figure 11 Q1.5 In which areas does your company have systematic technology and innovation management?

TO ENHANCE BUSINESS MODELS, PRODUCT & SERVICE

Q1.6a What is the level of contribution of Industry4.0 that your organization need in order to increase the competitiveness, overall value creation of your products & service?

☐ 1 (Industry4.0 is **not** relevance to business and we are not need to adopt it in next 5 years)

☐ 2 (Industry4.0 is **somewhat** relevance to business and we will need to adopt it in next 3 years)
☐ 3 (Industry4.0 is relevance to business and we are will need to adopt it in next 3 years)
☐ 4 (Industry4.0 is **very** relevance to business and we will need to adopt since past 3 years)
☐ 5 (Industry4.0 is **strongly** relevance to business and we are need to adopt it since past 5 years)

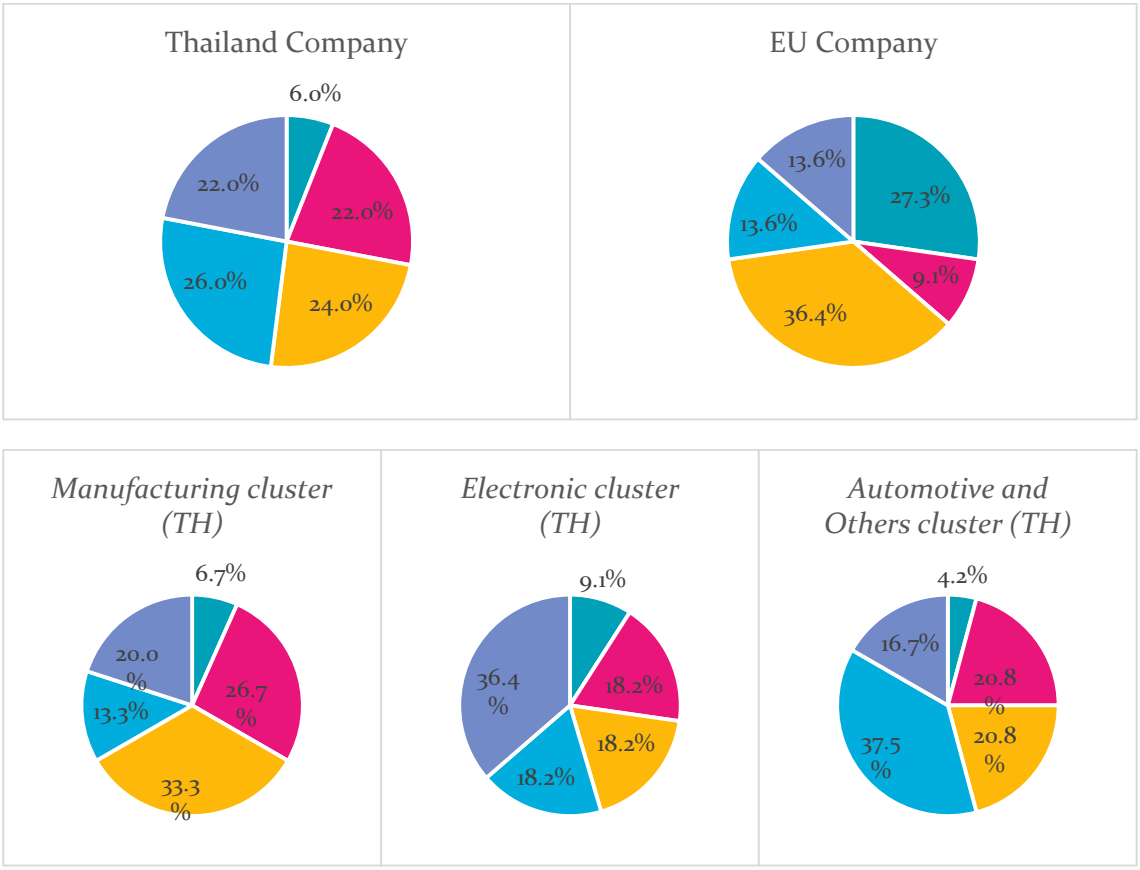


Figure 12 Q1.6a What is the level of contribution of Industry4.0 that your organization need in order to increase the competitiveness, overall value creation of your products & service?

Q1.6b What is the actual level of Industry4.0 that your organization is currently employing?

☐ 1 (We are not currently employing any of Industry4.0 because it is **not** relevance to business)
☐ 2 (We have adopted part of Industry4.0 because it is **somewhat** relevance to business)
☐ 3 (We have adopted part of Industry4.0 in the past 2 years because it is relevance to business)
☐ 4 (We have using Industry4.0 in the past 3 years because it is **very** relevance to business)

☐ 5 (We have fully employing Industry4.0 in the past 5 years because it is **strongly** relevance to business)

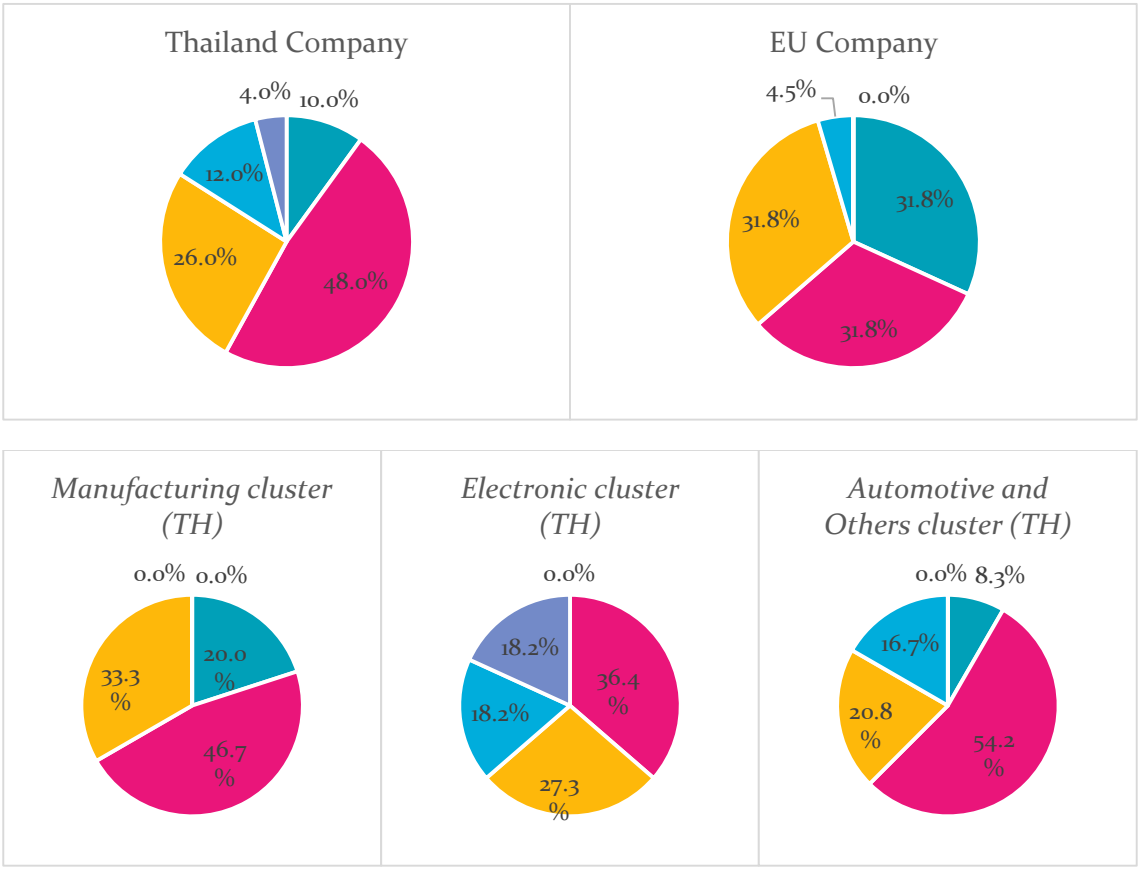


Figure 13 Q1.6b What is the actual level of Industry4.0 that your organization is currently employing?

Q1.7 To which degree is the average product in your portfolio digitized (e.g. RFID for identification, sensors, IoT connection, smart products etc.)?

☐ 1 (All our product and services are completely digitized and our portfolio is **never** based solely on digitized serviced/product)
☐ 2 (at least 25% of our product and services are digitized and our portfolio is **somewhat** based on digitized serviced/product)
☐ 3 (at least 50% of our product and services are digitized and our portfolio is based on digitized serviced/product)
☐ 4 (at least 75% of our product and services are digitized and our portfolio is **strongly** based on digitized serviced/product)
☐ 5 (All our product and services are **completely** digitized and our portfolio is **completely** based on digitized serviced/product)

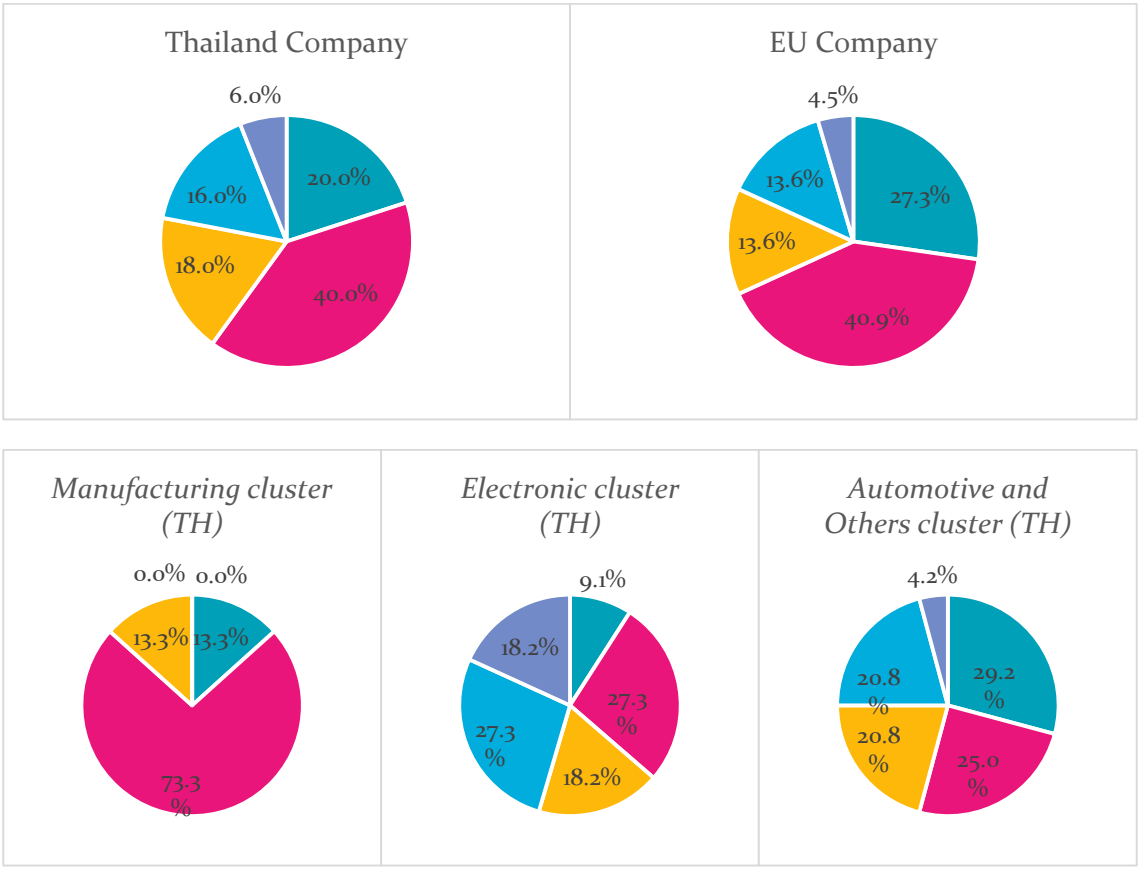


Figure 14 Q1.7 To which degree is the average product in your portfolio digitized (e.g. RFID for identification, sensors, IoT connection, smart products etc.)?

Q1.8 To which degree can your customers individualize the products they order?

☐ 1 (All our product and services are standardized mass production, cannot be defined by customer via configuration tools)
☐ 2 (at least 25% of our product and services can be defined by customer via configuration tools depending on lot size)
☐ 3 (at least 50% of our product and services can be defined by customer via configuration tools but cannot have lot size of 1)
☐ 4 (at least 75% of our product and services are defined by customer via configuration tools for customers, can have lot size of 1)
☐ 5 (All our product and services are **completely** defined customer by via configuration tools for customers, can have lot size of 1)

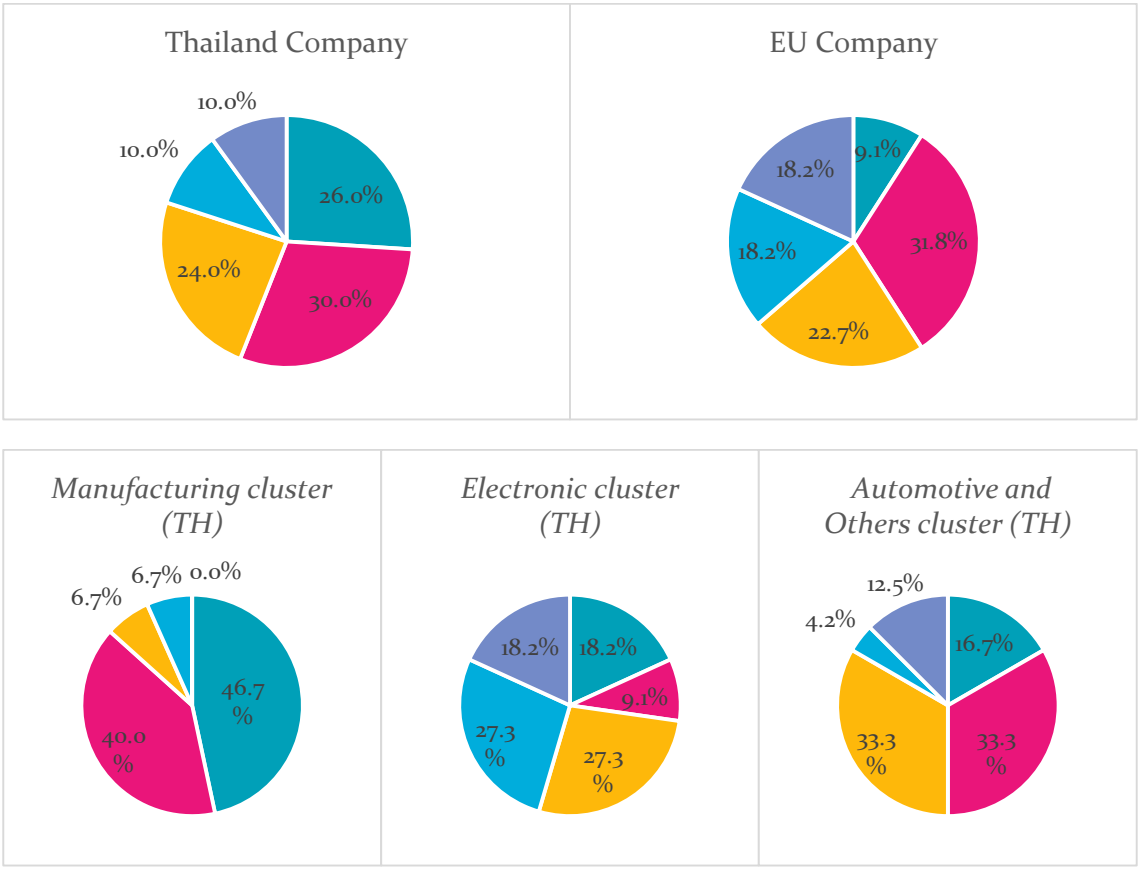


Figure 15 Q1.8 To which degree can your customers individualize the products they order?

Q1.9 To which degree are the life cycle phases of your products digitized (digitization and integration of design, planning, engineering, production, services & recycling)?

☐ 1 (No digitization & integration – None of any phases are digitized or using any IoT/IT as our basis operation
☐ 2 (Low digitization & integration – Only some phases such as design, planning, engineering are partly digitized for basis operation (e.g., using IT and software designed specifically for company operation)
☐ 3 (Medium digitization & integration – Only design, planning, engineering phases are digitized (e.g., producibility can directly be evaluated via virtual prototyping, virtual design)

☐ 4 (High digitization & integration – All phases in the product life cycle are **mostly** digitized from design, planning, engineering, production, services & recycling (e.g., producibility can directly be tested during product development via virtual prototyping)
☐ 5 (Complete digitization & integration - All phases in the product life cycle are **completely** digitized from design, planning, engineering, production, services & recycling (e.g., Quality, Producibility, Productivity can directly be tested during product development via virtual prototyping, virtual process)

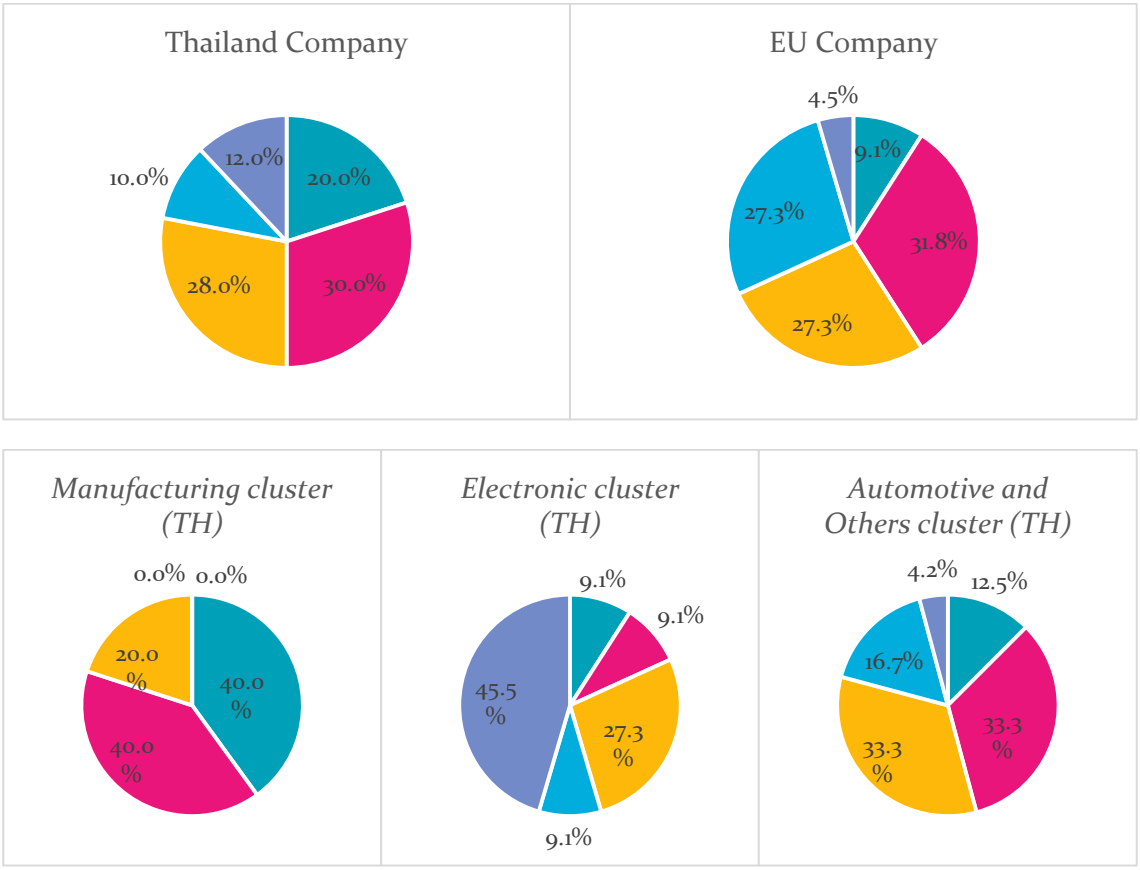


Figure 16 Q1.9 To which degree are the life cycle phases of your products digitized (digitization and integration of design, planning, engineering, production, services & recycling)?

Q1.10 How important is the usage and analysis of data (customer data, product or machine generated data) for your business model?

☐ 1 (No data analytics are relevant or leveraged to our business model. Customer data, product or machine data are not relevance to our operation. We plan to analyze and monitor those data in the next 3-5 years)
☐ 2 (Customer data, product or machine generated data is **somewhat** relevance to business, can be value driver of the business model and we will analyzed and monitored these generated data in the next 1-3 years)
☐ 3 (Customer data, product or machine generated data is relevance to business, the value driver of the business model and we have analyzed and monitored these generated data in the past 1-3 years)
☐ 4 (All customer data, product or machine generated data is **very** relevance to business, the main value driver of the business model and we have analyzed and monitored these generated data in the past 2-3 years)
☐ 5 (Crucial - Data is the main value driver of the business model. All customer data, product or machine generated data is **strongly** relevance to business and we are continuously analyzing and monitoring these generated data in the past 3-5 years)

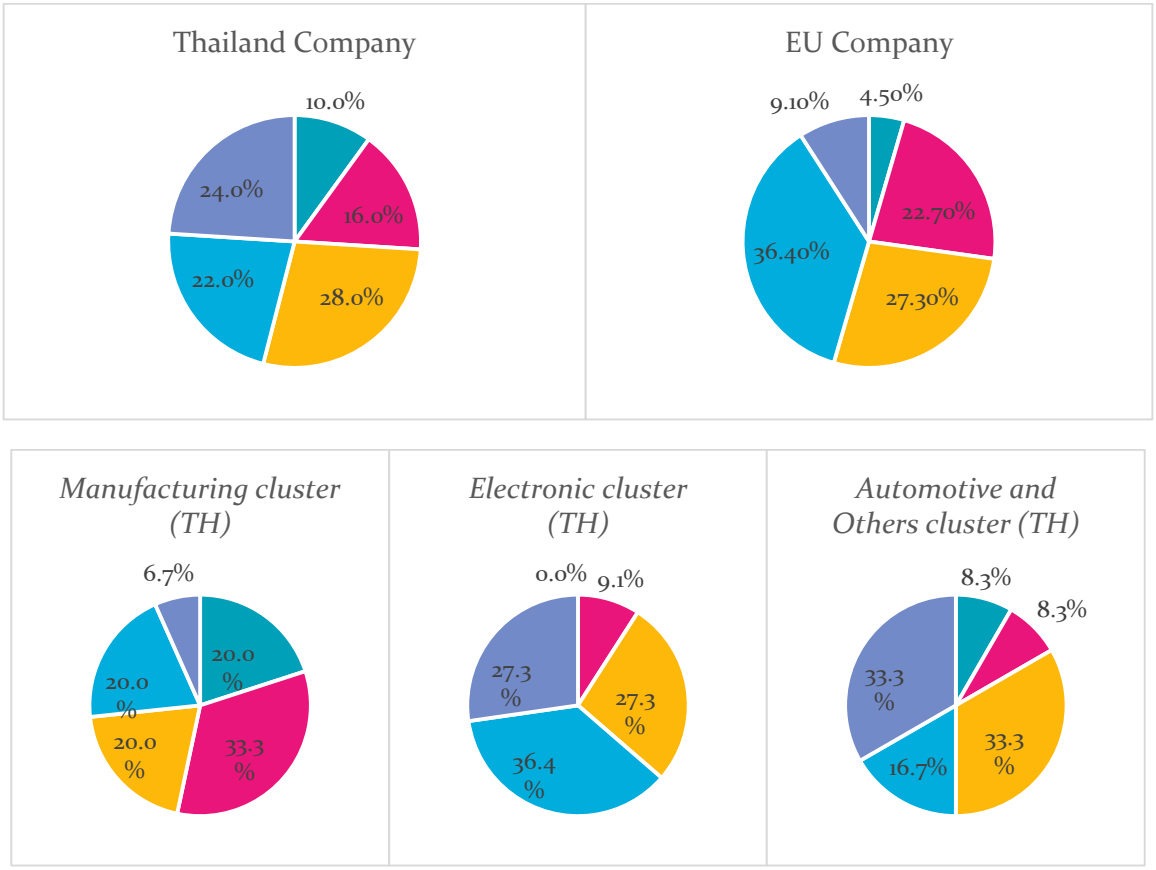


Figure 17 Q1.10 How important is the usage and analysis of data (customer data, product or machine generated data) for your business model?

Q1.11 How intense is your collaboration with partners, suppliers and clients for development of products and services?

☐ 1 (No Collaboration - Product development is done completely in-house without any exchange of information with partners, suppliers or customers)
☐ 2 (Low - collaboration - Collaborative development of products together with partners are low in our supply chain networks, can be communicated but cannot be integrated)
☐ 3 (Medium - collaboration - Collaborative development of products together with partners has been employed our supply chain networks, but are not integrated, transparent for the customers)
☐ 4 (High - collaboration - Collaborative development of products together with partners has been employed throughout our supply chain networks, and are transparent for the customers in the past 1-3 years)
☐ 5 (Crucial - collaboration - Collaborative development of products together with partners has been employed throughout our supply chain networks, and are transparent for the customers in the past 3-5 years)

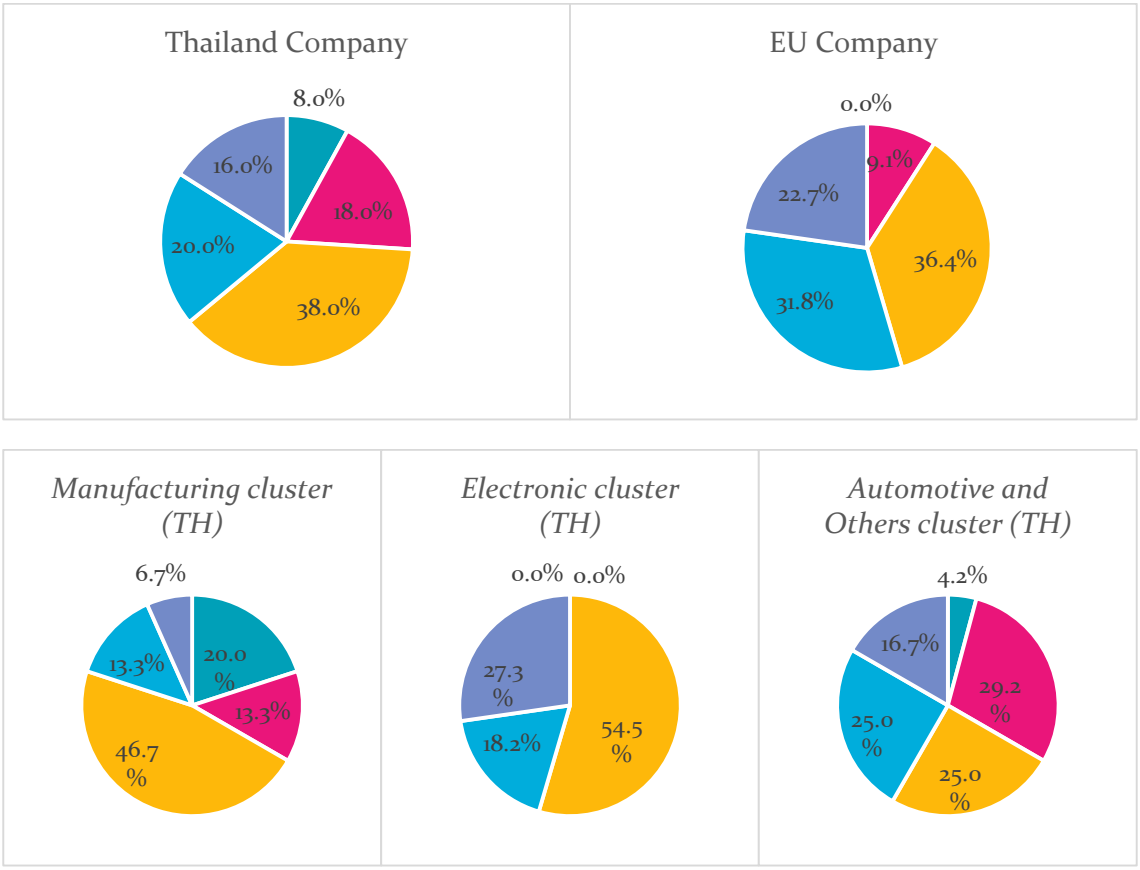


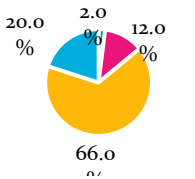
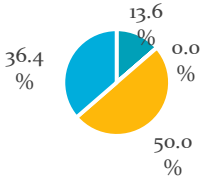
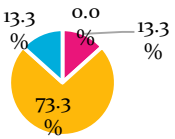
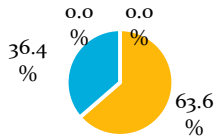
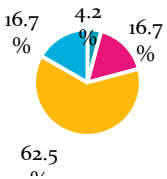
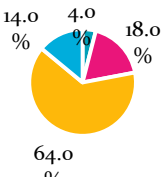
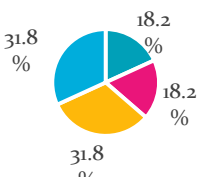
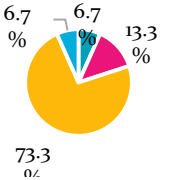
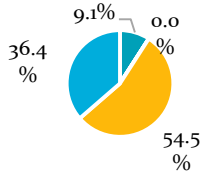
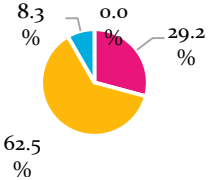
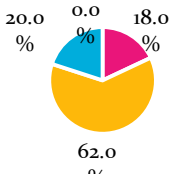
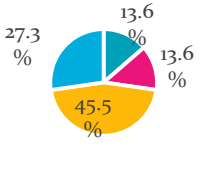
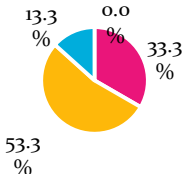
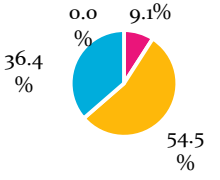
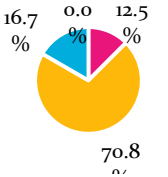
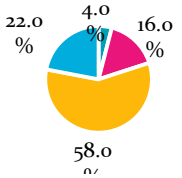
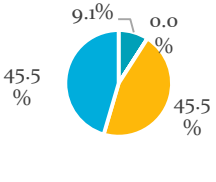
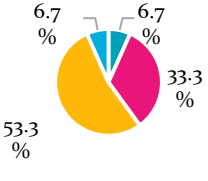
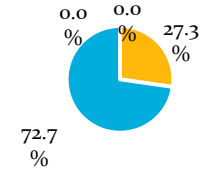
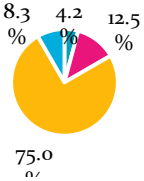
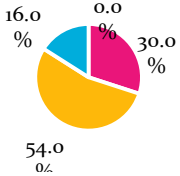
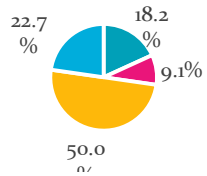
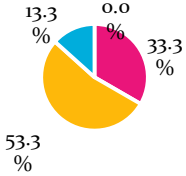
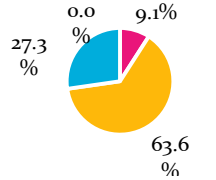
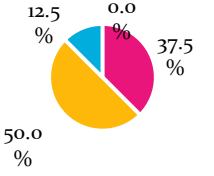
Figure 18 Q1.11 How intense is your collaboration with partners, suppliers and clients for development of products and services?

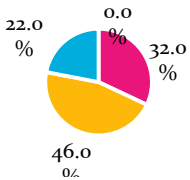
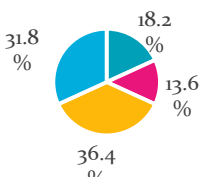
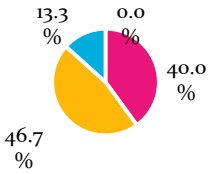
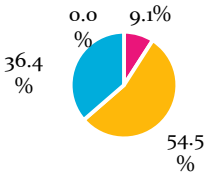
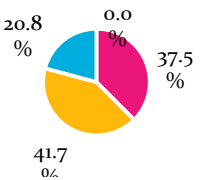
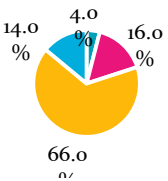
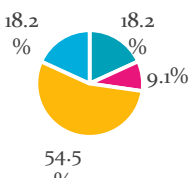
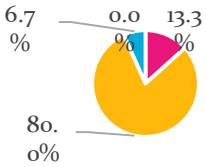
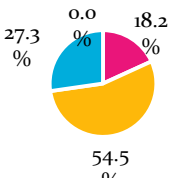
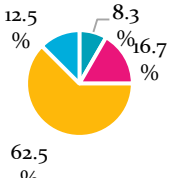
2. TRANSVERSAL&DOMAIN RELATED COMPETENCES: EMPLOYEES

Employees help companies realize their digital transformation and are the ones most affected by the changes of the digital workplace. Their direct working environment is altered, requiring them to acquire new skills and qualifications. This makes it more and more critical that companies prepare their employees for these changes through appropriate training and continuing education.

Q2.1 How do you assess the skills of your employees when it comes to the future requirements under Industry 4.0?

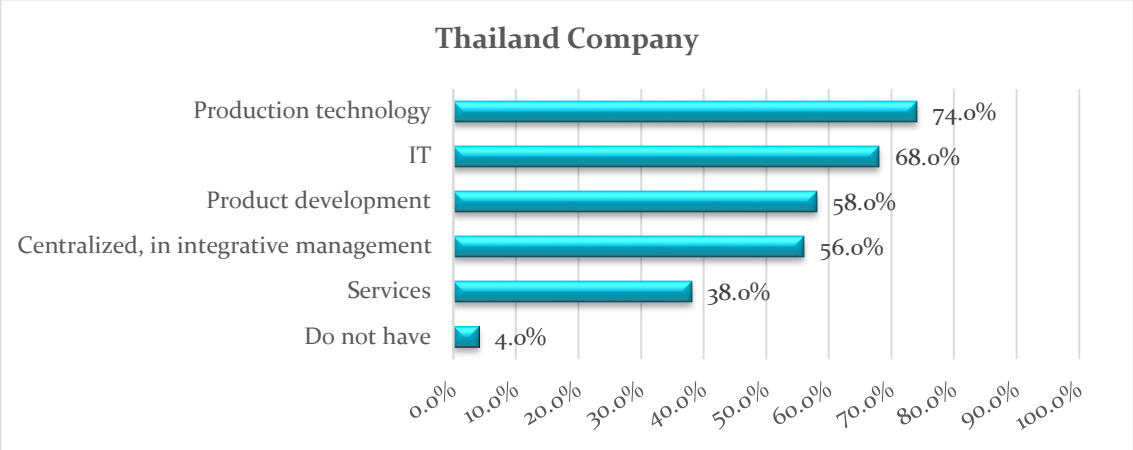
Table 4 Q2.1 How do you assess the skills of your employees when it comes to the future requirements under Industry 4.0?

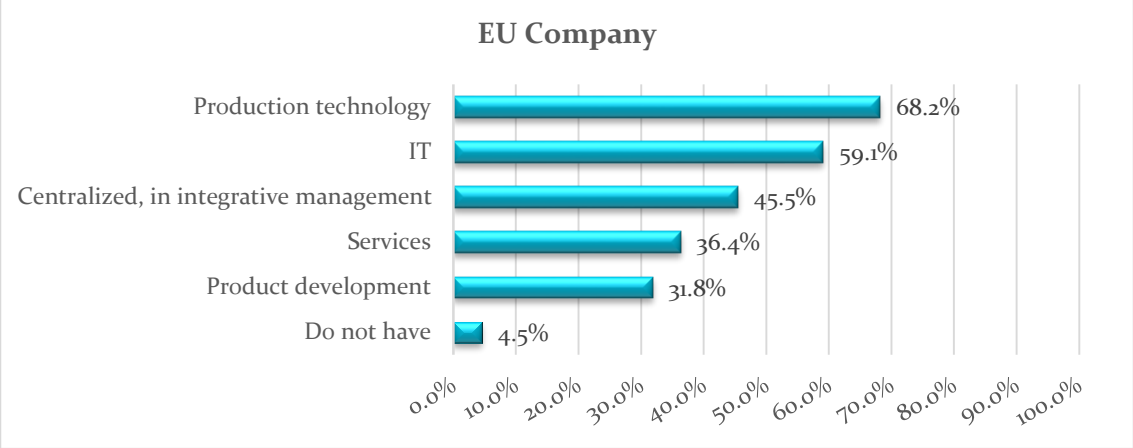
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
IT infrastructure					
Automation technology					
Data analytics					
Data security / communications security					
Development or application of assistance systems					

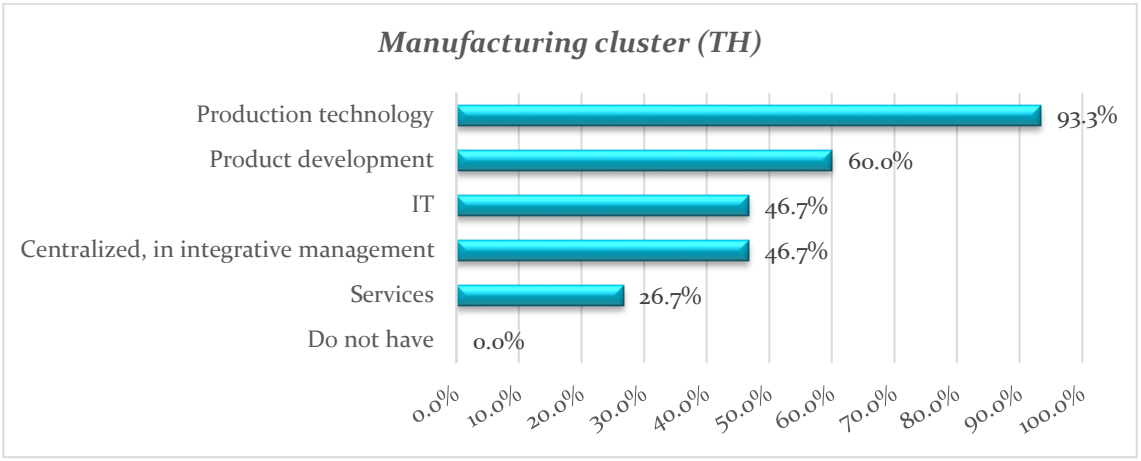
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Collaboration software					
Non-technical skills such as systems thinking and process understanding					
Note:	■ Not relevant ■ Non-existent ■ Existent, but inadequate ■ Adequate				

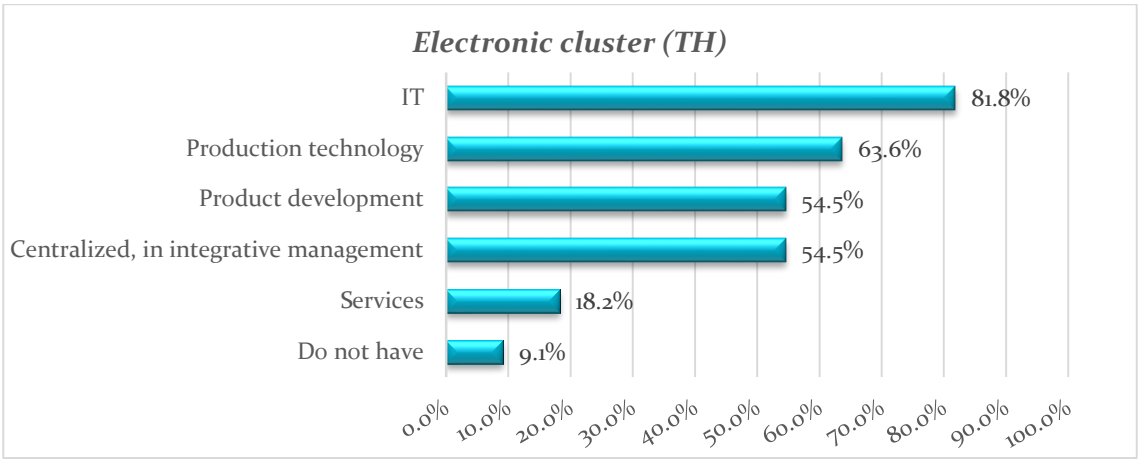
Q2.2 In which areas does your company need to have to attain Industry4.0?
(Can answer more than 1)

- ☐ IT
- ☐ Production technology
- ☐ Product development
- ☐ Services
- ☐ Centralized, in integrative management
- ☐ Do not have









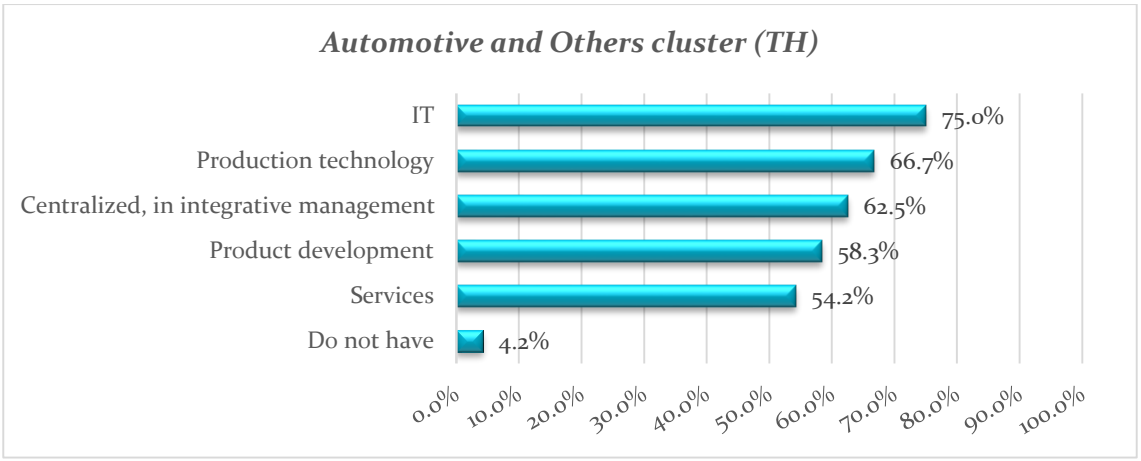
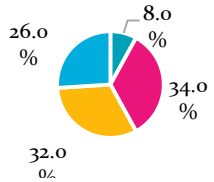
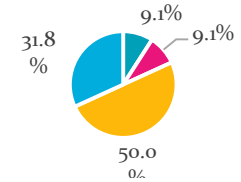
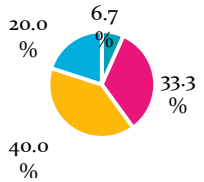
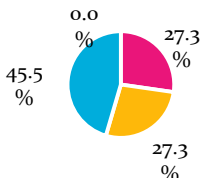
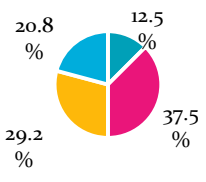
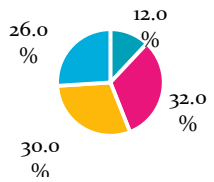
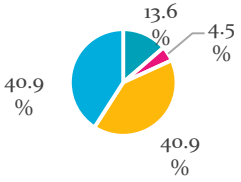
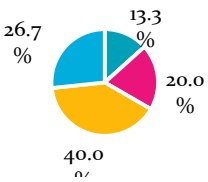
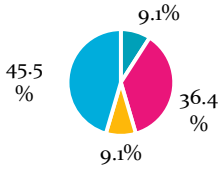
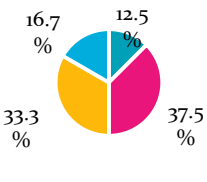
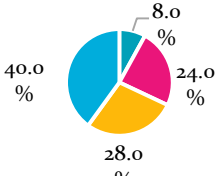
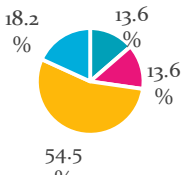
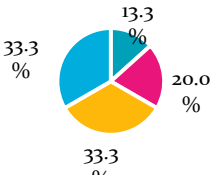
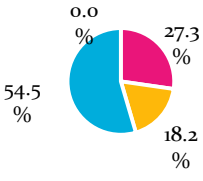
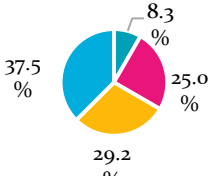
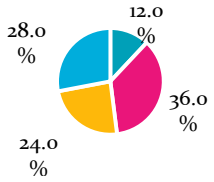
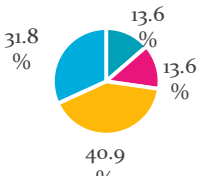
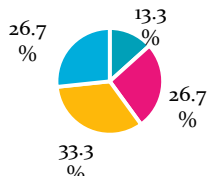
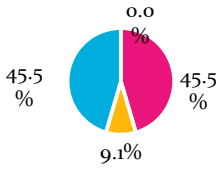
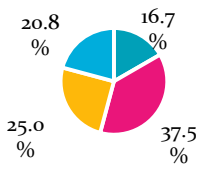
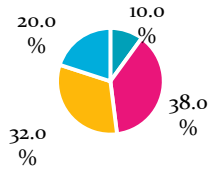
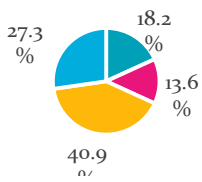
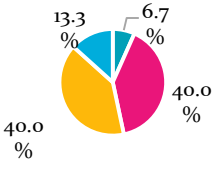
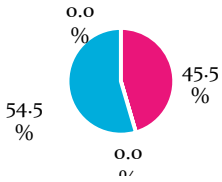
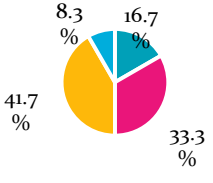
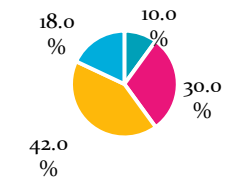
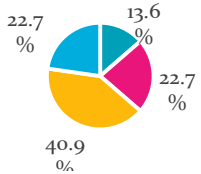
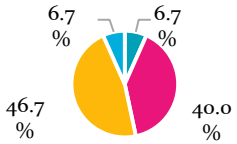
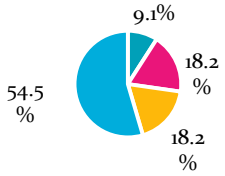
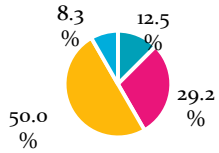
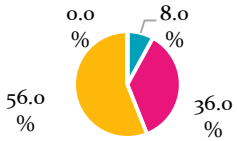
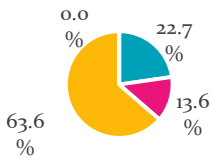
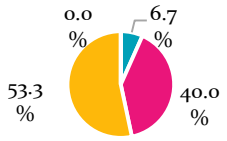
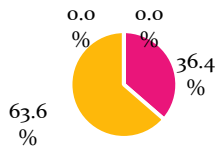
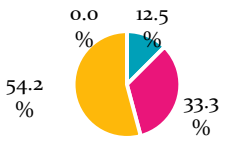


Figure 19 Q2.2 In which areas does your company need to have to attain Industry4.0?

Q2.3 What kind and level of competence that your company will need for new employees when it comes to the Industry 4.0?

Table 5 Q2.3 What kind and level of competence that your company will need for new employees when it comes to the Industry 4.0?

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
IT infrastructure					
Automation technology					
Data analytics					
Data security / communications security					
Development or application of assistance systems					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Collaboration software					
Non-technical skills such as systems thinking and process understanding					
Note:	■ Not relevant ■ Non-existent ■ Existent, but inadequate ■ Adequate				

Q2.4 Are you making efforts to acquire the skills that are lacking? Through special training seminars, knowledge transfer systems, coaching, etc.

☐ Yes
☐ No

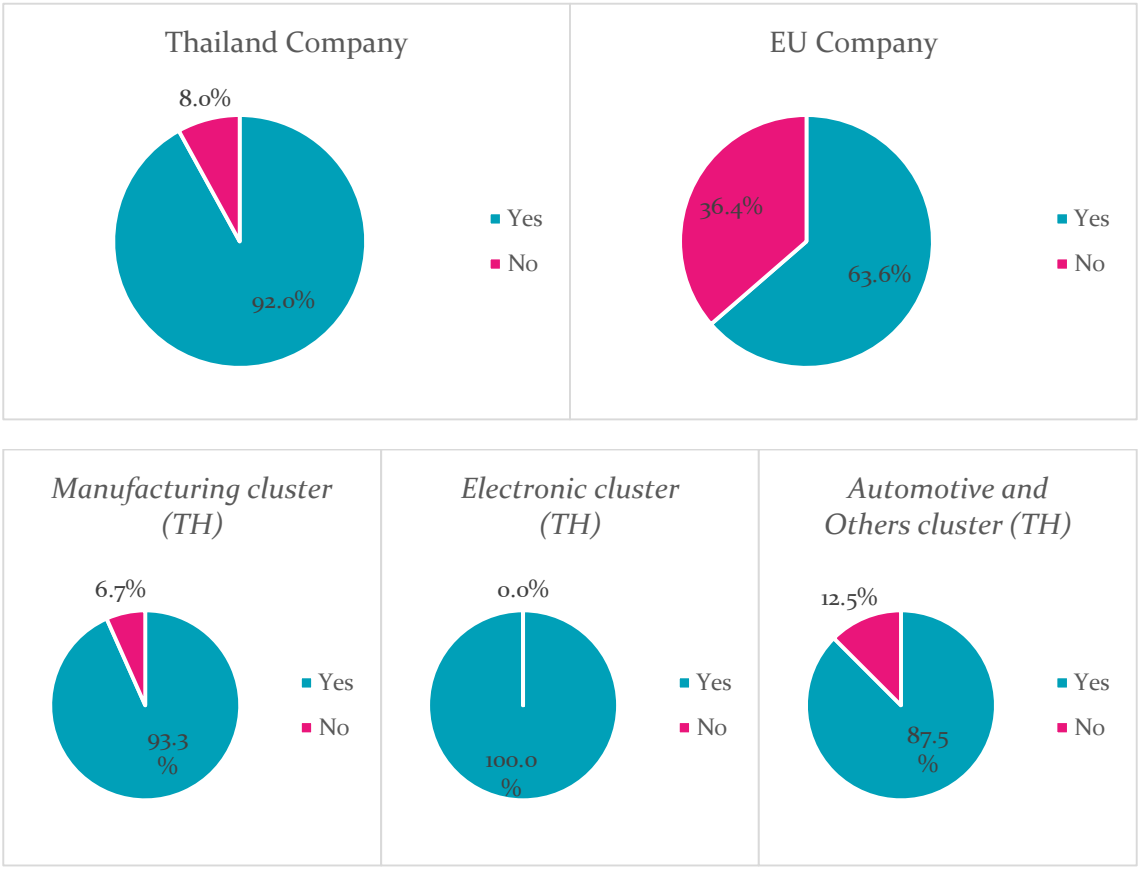
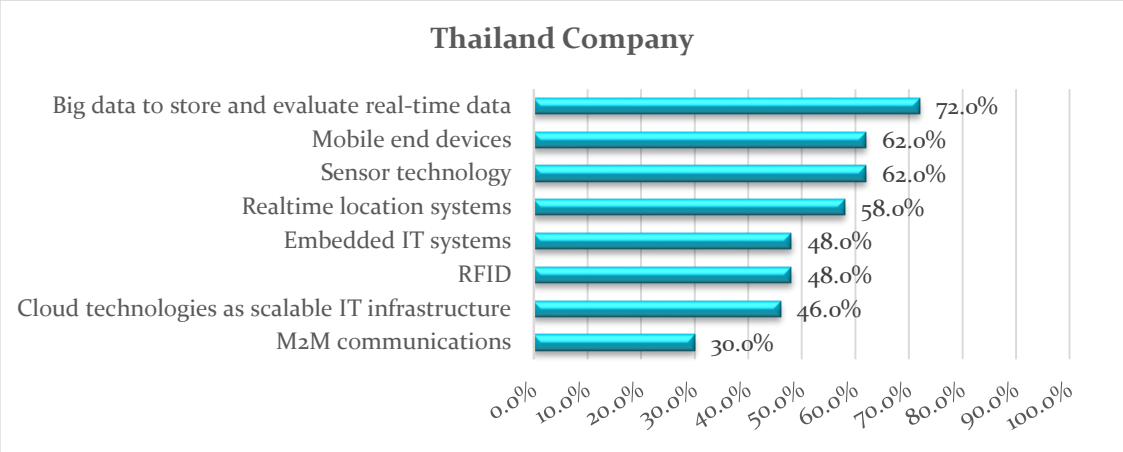
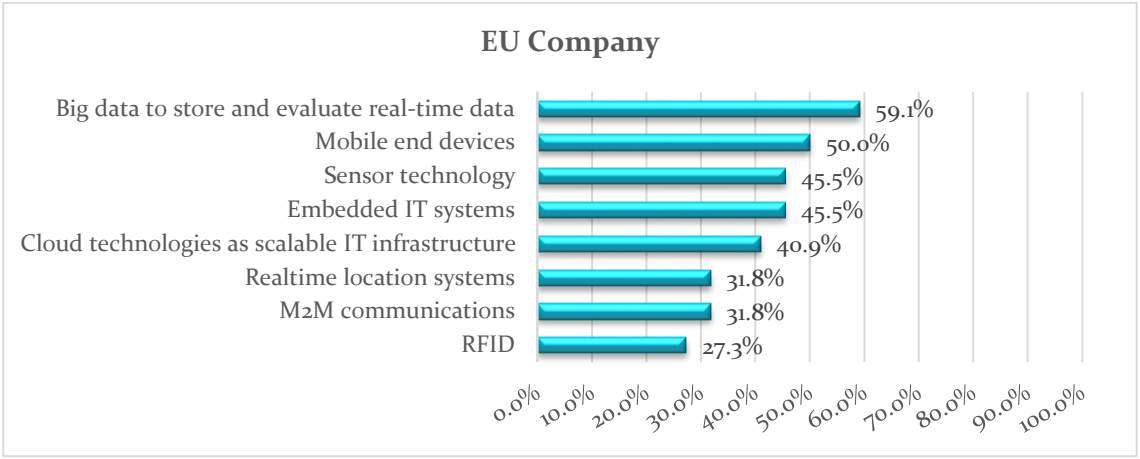


Figure 20 Q2.4 Are you making efforts to acquire the skills that are lacking? Through special training seminars, knowledge transfer systems, coaching, etc.

Q2.5 Which of the following technological competence do you need for employee to enhance business operation? (Can answer more than 1)

- ☐ Sensor technology
- ☐ Mobile end devices
- ☐ RFID
- ☐ Realtime location systems
- ☐ Big data to store and evaluate real-time data
- ☐ Cloud technologies as scalable IT infrastructure
- ☐ Embedded IT systems
- ☐ M2M communications





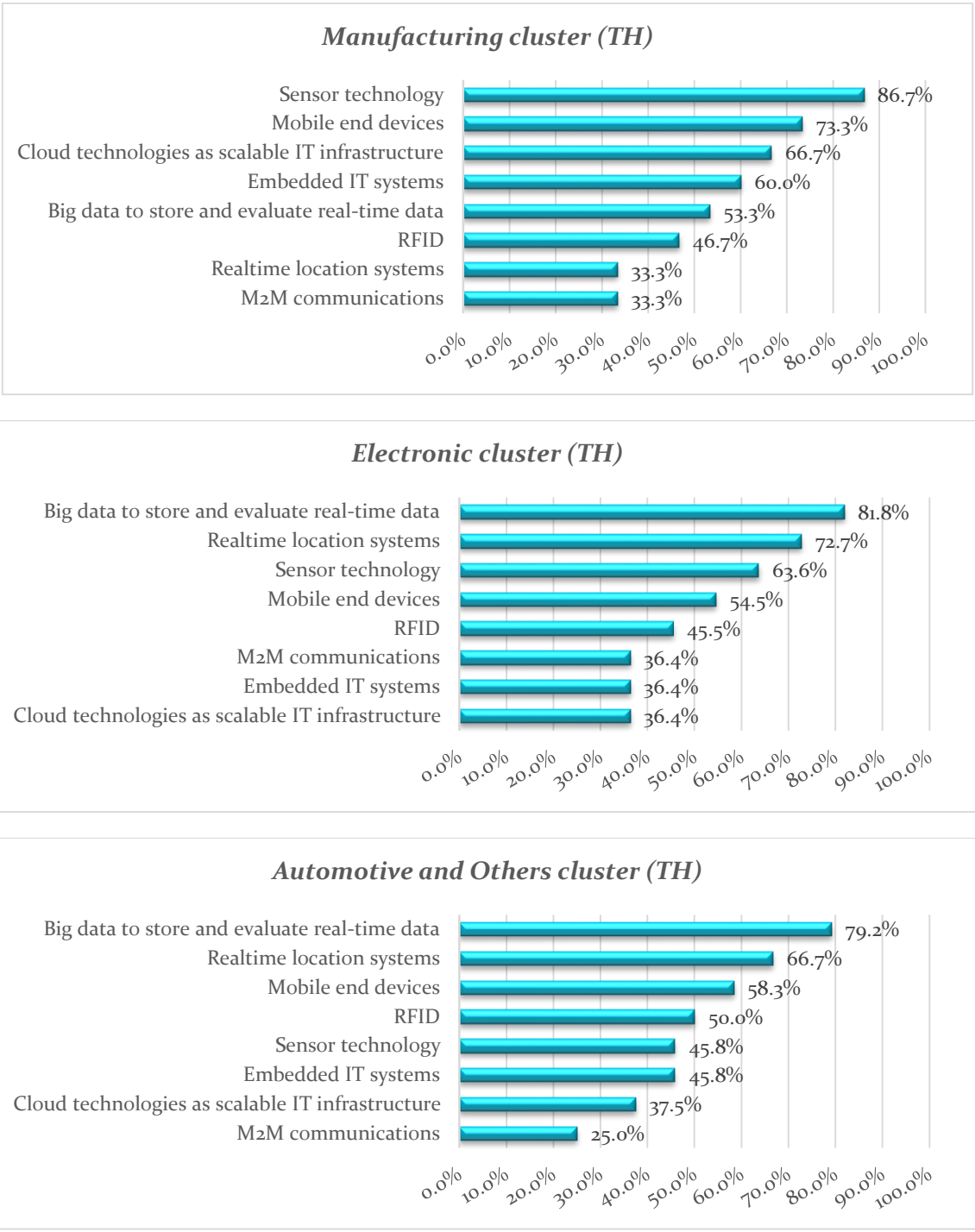


Figure 21 Q2.5 Which of the following technological competence do you need for employee to enhance business operation?

Part 2: Adoption Level

This is broken down into four dimensions of Industry 4.0, each containing questions on a different set of issues:

1. SMART PRODUCTS - CO-CREATED DESIGN CONCEPTS

The smart co-created design product are a vital value of the company and the customer by allowing the customer to co-construct the service experience to suit their context. This requires value-based collaboration between stakeholders and users, in contrast to standard market research. The Co-design is the process where stakeholders (business or customers) can involve and participate during the design development process to ensure the results meet their needs and are usable.

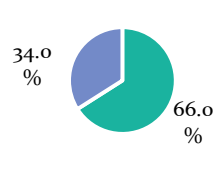
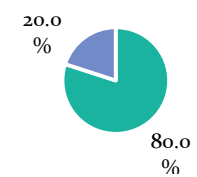
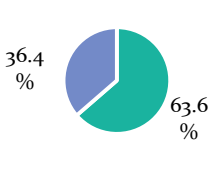
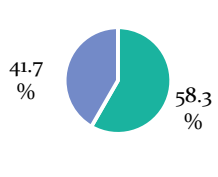
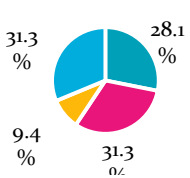
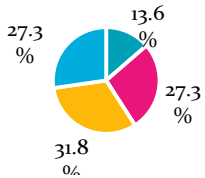
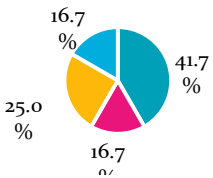
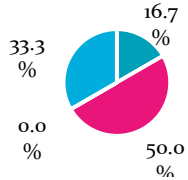
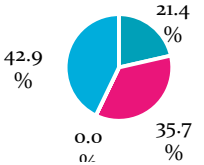
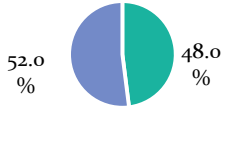
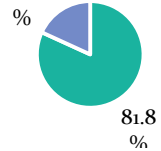
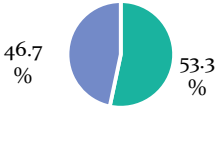
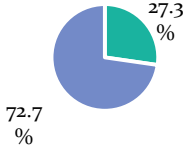
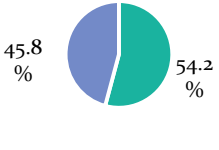
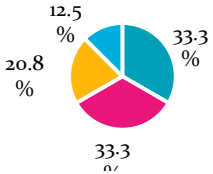
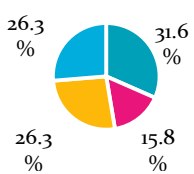
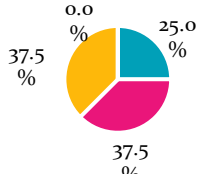
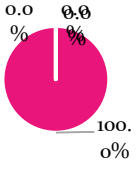
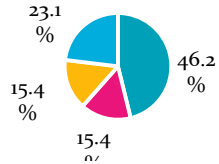
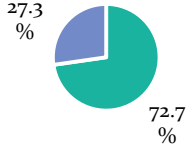
Smart Product where physical products are equipped with ICT components (sensors, RFID, communications interface, etc.) to collect data on their environment and their own status. Only when products gather data, know their way through production, and communicate with the higher-level systems can production processes be improved and guided autonomously and in real time. It also becomes possible to monitor and optimize the status of the individual products. This has potential applications beyond production alone. Using smart products during the usage phase makes new services possible in the first place – through communications between customers and manufacturers, for example.

Q1.1 Does your company allowing the customer to co design the product or service experience to suit their context?

Q1.2 Does your company allowing the customer to co-construct the product or service experience to suit their context?

Q1.3 Does your company offer products equipped with the following add-on functionalities based on information and communications technology?

Table 6 Q1.1 Does your company allowing the customer to co-design the product or service experience to suit their context?

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Product					
If yes					
Service					
If yes					
Product/ Service					

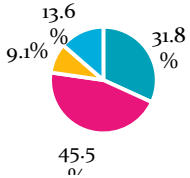
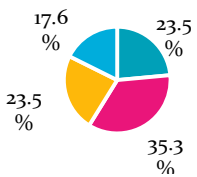
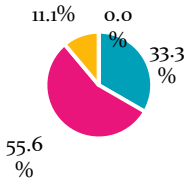
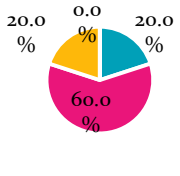
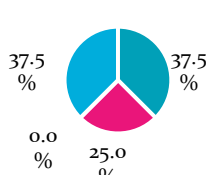
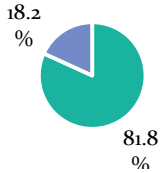
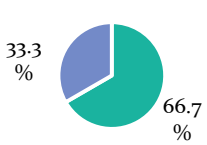
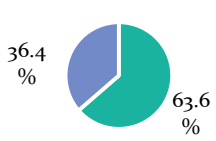
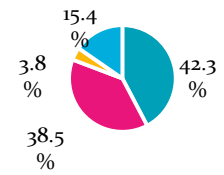
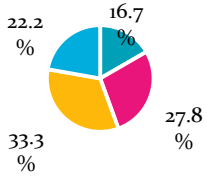
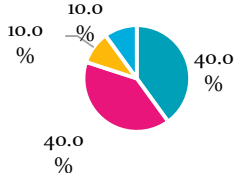
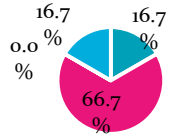
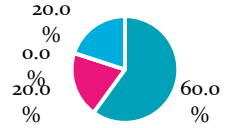
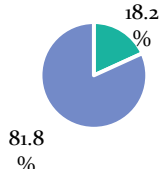
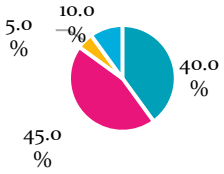
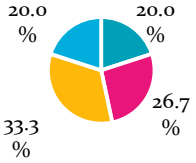
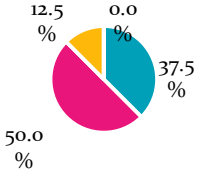
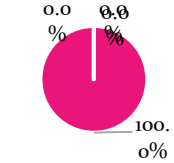
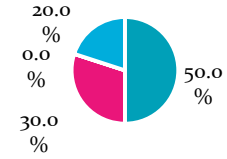
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
If yes					
Note:		Yes No	<25% 25-50% 51-75% >75%		

Table 7 Q1.2 Does your company allowing the customer to co-construct the product or service experience to suit their context?

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Product					
If yes					
Service					
If yes					
Product/ Service					

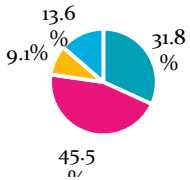
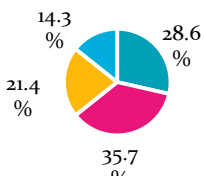
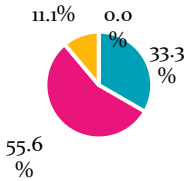
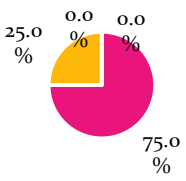
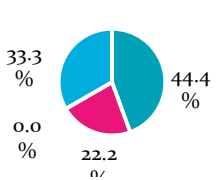
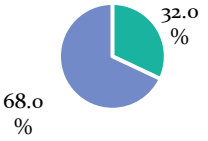
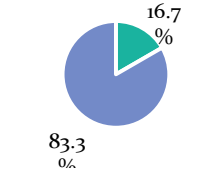
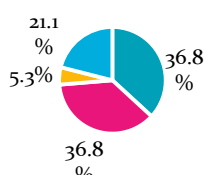
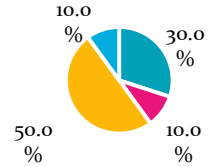
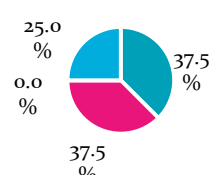
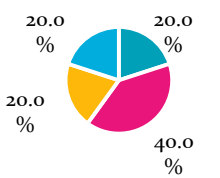
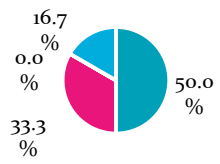
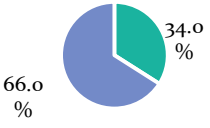
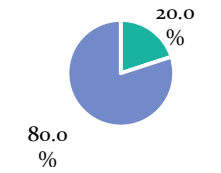
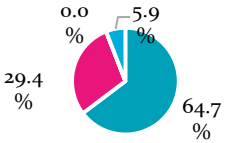
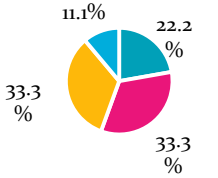
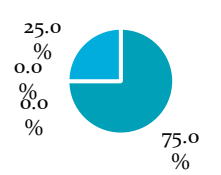
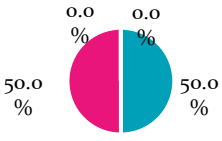
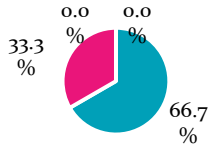
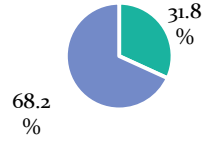
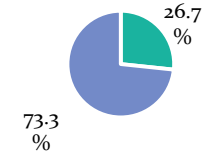
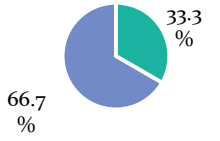
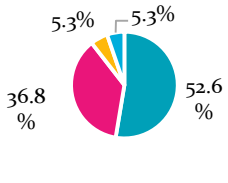
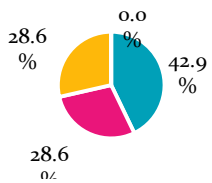
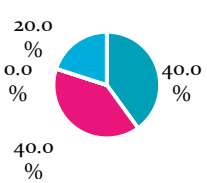
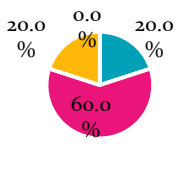
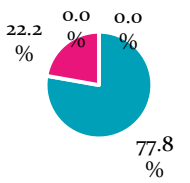
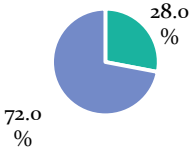
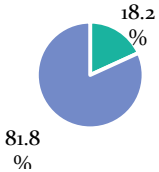
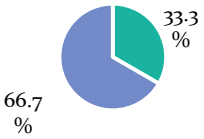
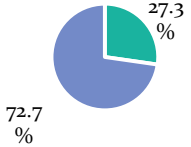
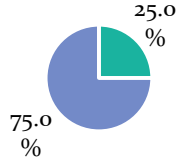
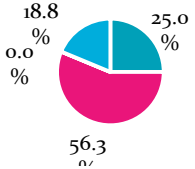
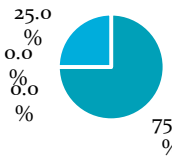
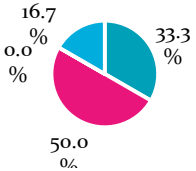
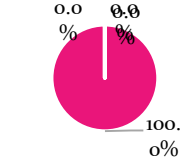
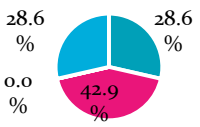
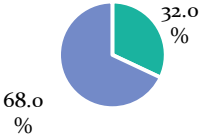
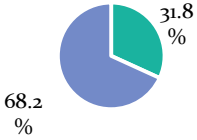
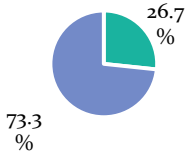
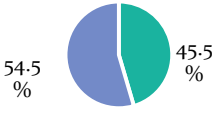
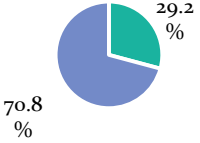
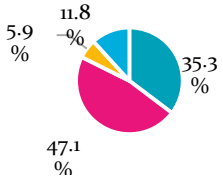
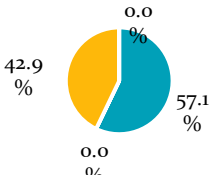
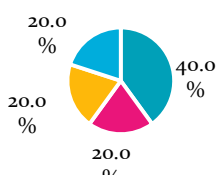
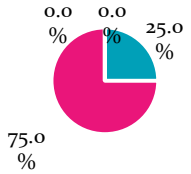
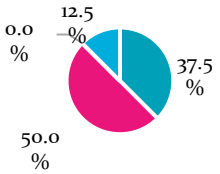
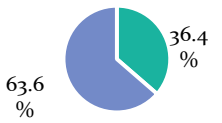
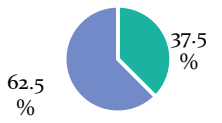
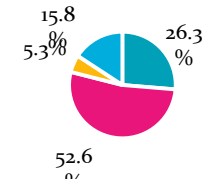
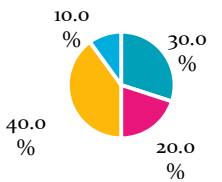
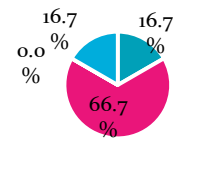
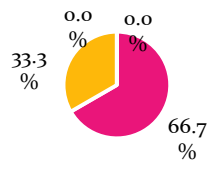
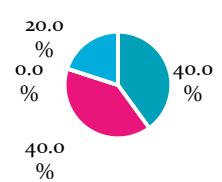
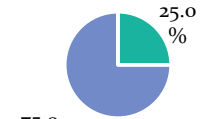
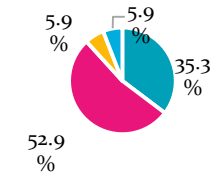
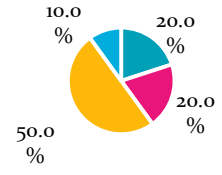
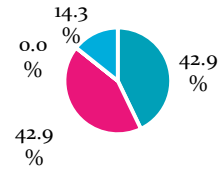
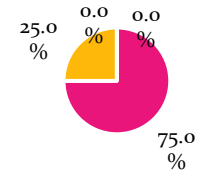
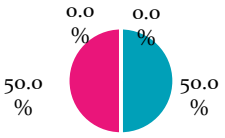
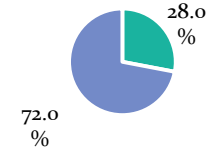
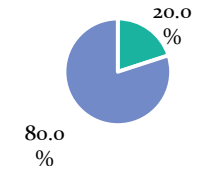
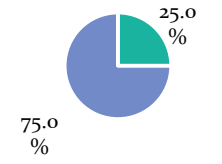
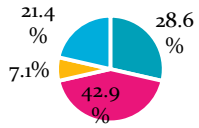
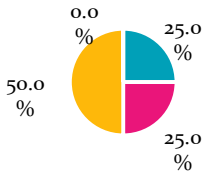
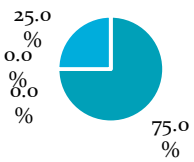
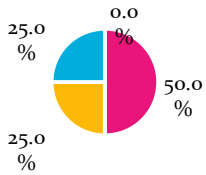
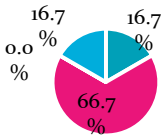
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
If yes					
Note:		Yes No	<25% 25-50% 51-75% >75%		

Table 8 Q1.3 Does your company offer products equipped with the following add-on functionalities based on information and communications technology?

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Product memory					
If yes					
Self-reporting					
If yes					
Integration					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
If yes					
Localization					
If yes					
Assistance system					
If yes					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Monitoring					
If yes					
Object information					
If yes					
Automatic identification					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
If yes					
Note:		Yes No	<25% 25-50% 51-75% >75%		

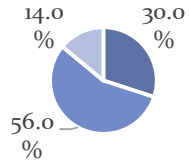
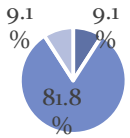
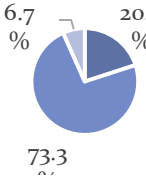
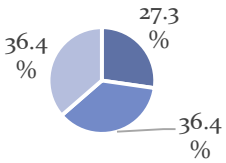
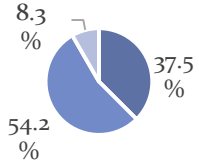
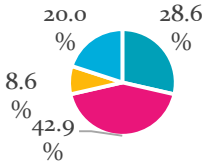
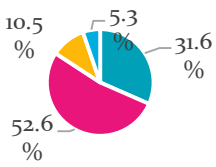
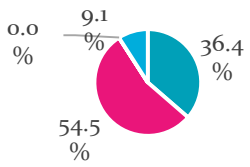
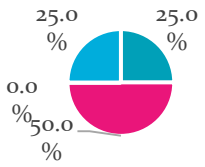
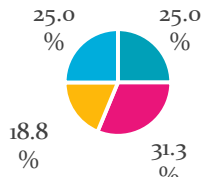
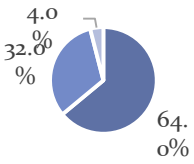
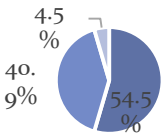
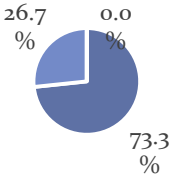
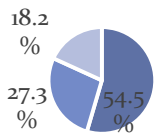
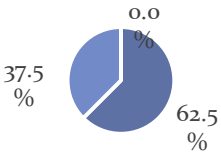
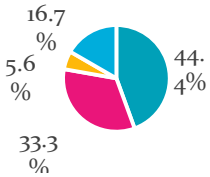
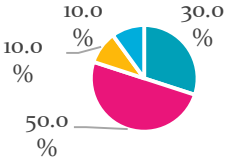
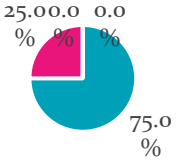
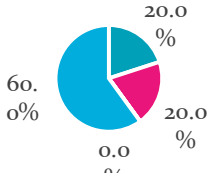
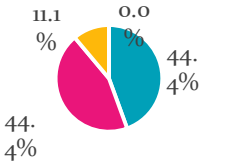
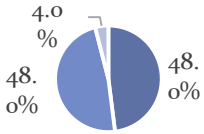
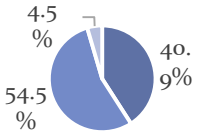
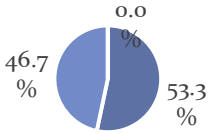
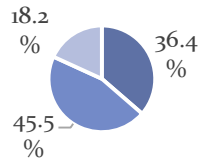
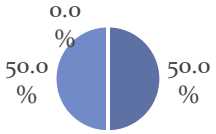
2. SMART FACTORY -INTELLIGENCE MANUFACTURING SYSTEM

A smart factory is a production environment in which the production systems and logistics systems largely organize themselves without human intervention. The smart factory relies on cyber-physical systems (CPS), which link the physical and virtual worlds by communicating through an IT infrastructure, the Internet of Things.
Industry 4.0 also involves digital modeling through the smart collection, storage, and processing of data. In this way, the smart factory concept ensures that information is delivered and resources are used more efficiently. This requires the real-time, cross-enterprise collaboration between production systems, information systems, and people.

EQUIPMENT INFRASTRUCTURE

Q2.1 How would you evaluate your equipment infrastructure when it comes to the following functionalities?
Q2.2 How would you evaluate the adaptability of your equipment infrastructure when it comes to the following functionalities?

Table 9 Q2.1 How would you evaluate your equipment infrastructure when it comes to the following functionalities?

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Machines/ systems can be controlled through IT					
If yes					
M2M: machine-to-machine communications					
If yes					
Interoperability: integration and collaboration with other machines/systems possible					

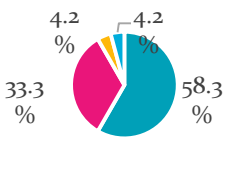
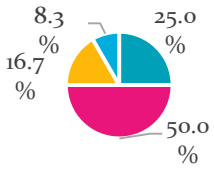
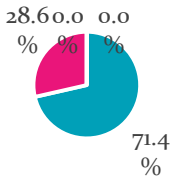
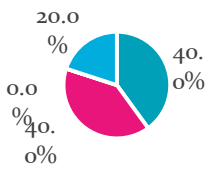
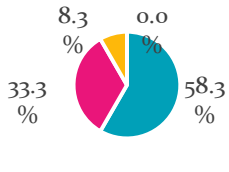
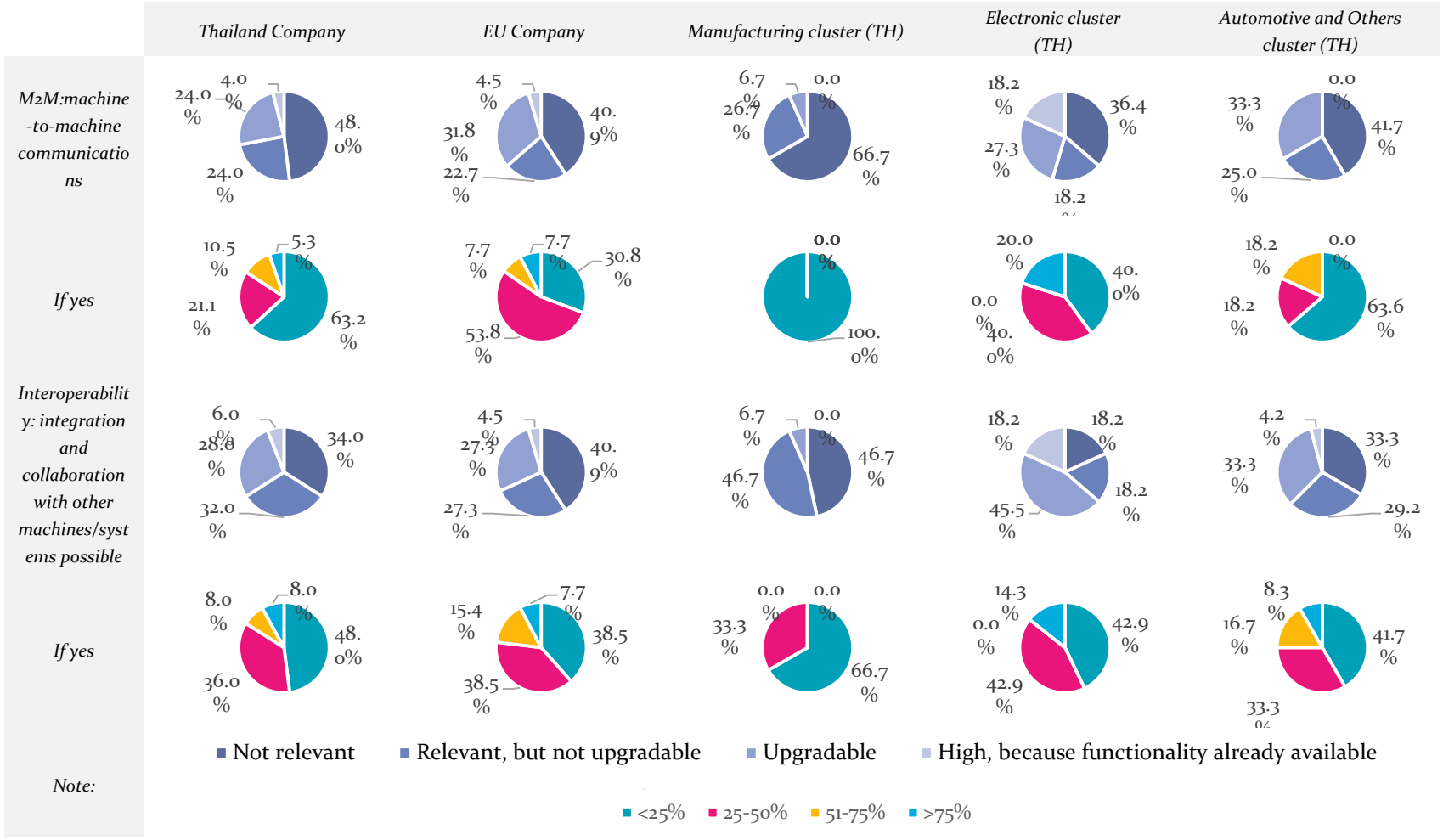
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
If yes					
Note:	■ No, not available ■ Yes, to some extent ■ Yes, completely			■ <25% ■ 25-50% ■ 51-75% ■ >75%	

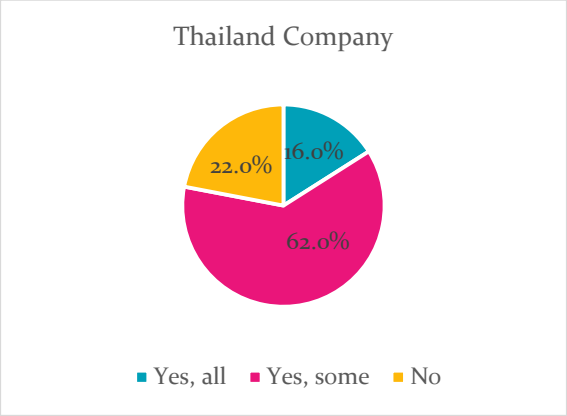
Table 10 Q2.2 How would you evaluate the adaptability of your equipment infrastructure when it comes to the following functionalities?

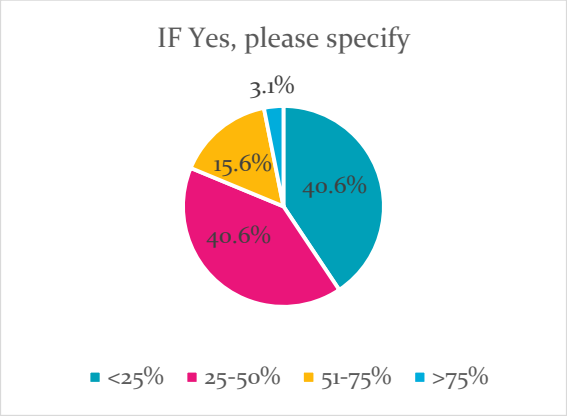


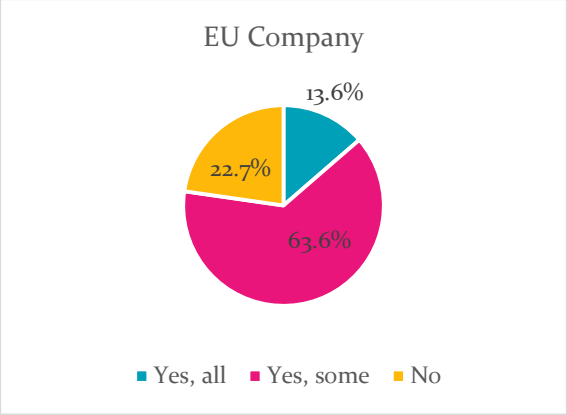
DIGITAL MODEL OF FACTORY

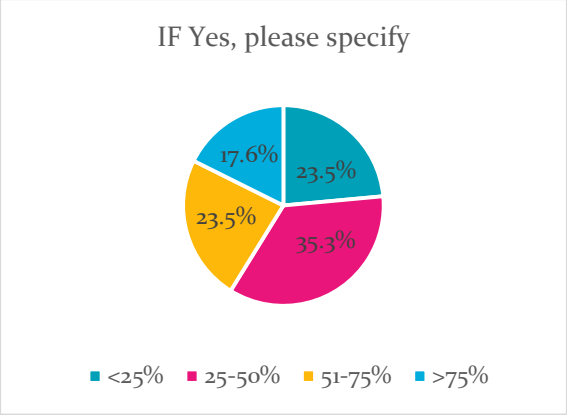
Q2.3 The digitization of factories makes it possible to create a digital model of the factory. Are you already collecting machine and process data during production?

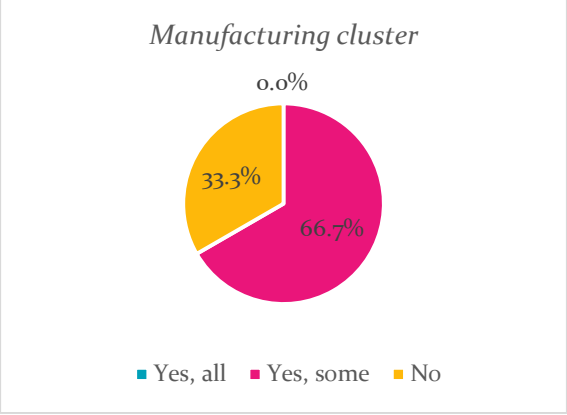
- ☐ Yes, all
- ☐ Yes, some
- ☐ No

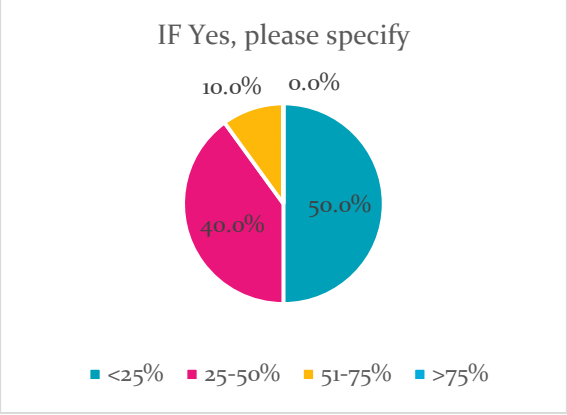












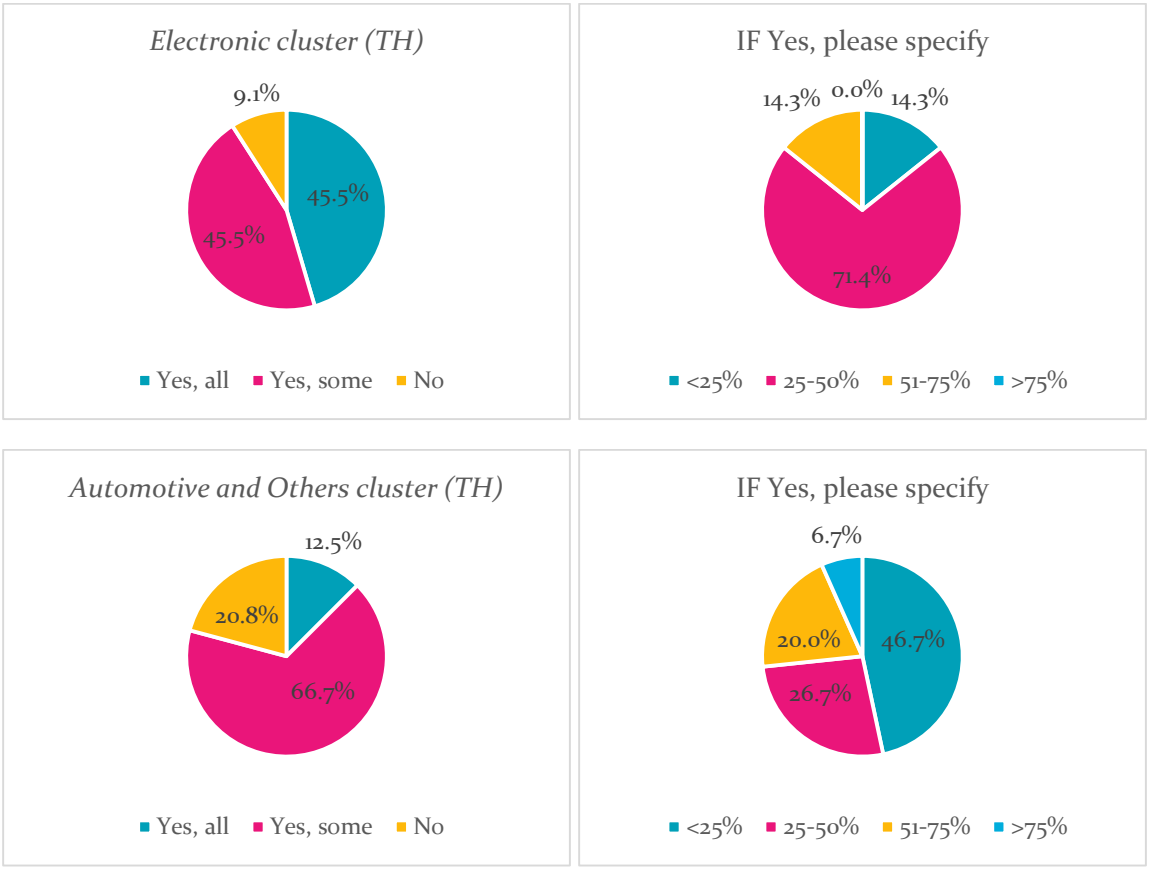
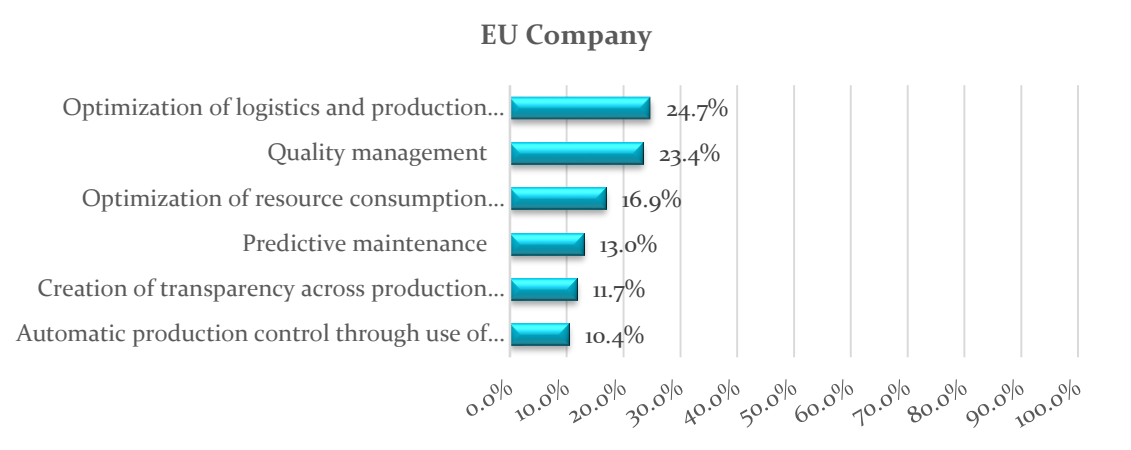


Figure 22 Q2.3 The digitization of factories makes it possible to create a digital model of the factory. Are you already collecting machine and process data during production?

Q2.4 How is the data you collect used? (Can answer more than 1)

- ☐ Predictive maintenance
- ☐ Optimization of logistics and production processes
- ☐ Creation of transparency across production process
- ☐ Quality management
- ☐ Automatic production control through use of real-time data
- ☐ Optimization of resource consumption (material, energy)



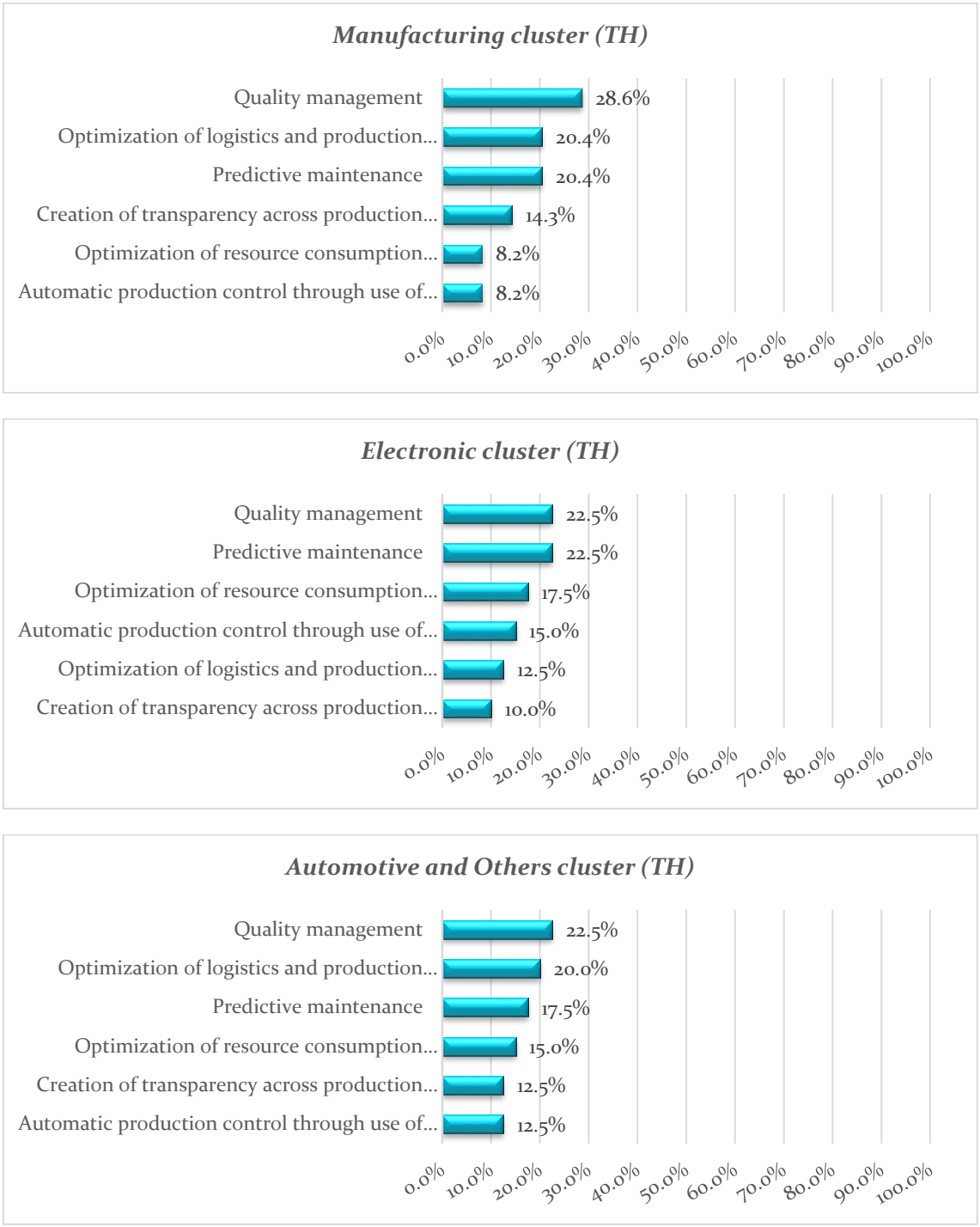
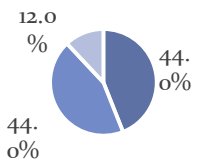
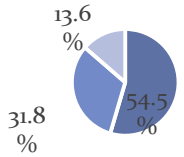
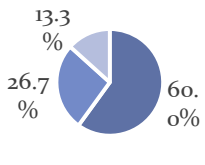
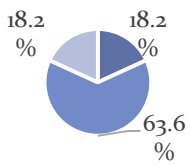
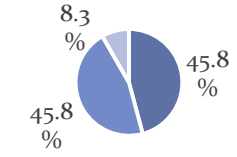
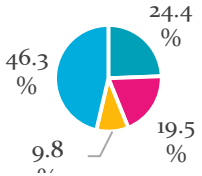
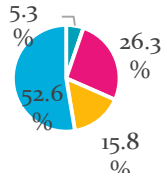
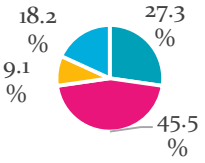
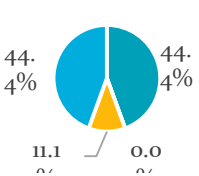
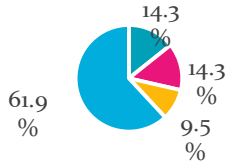
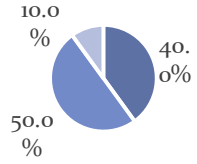
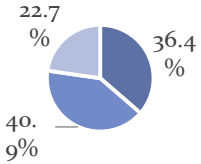
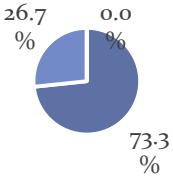
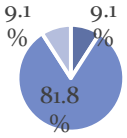
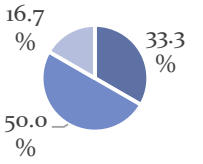
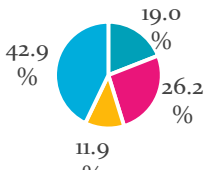
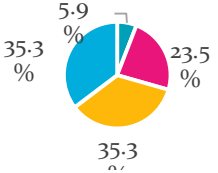
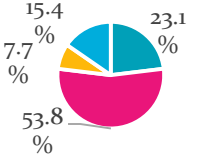
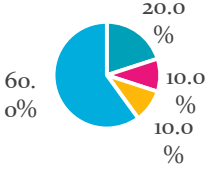
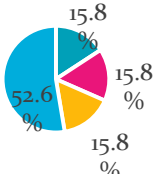
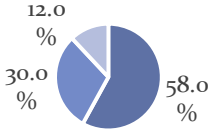
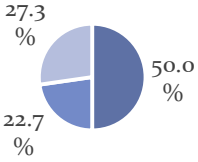
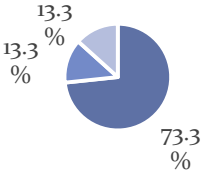
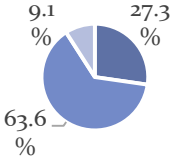
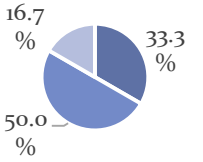


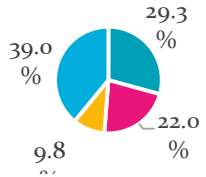
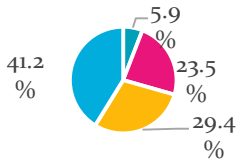
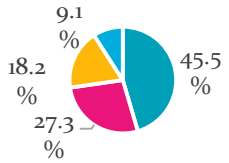
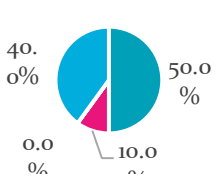
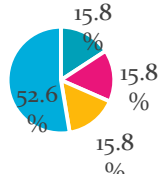
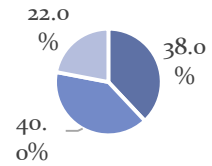
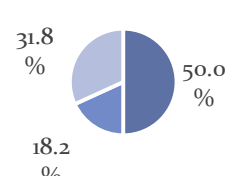
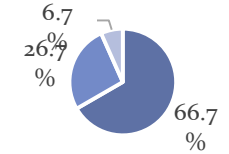
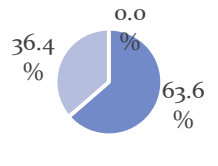
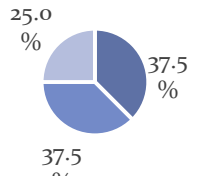
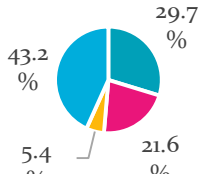
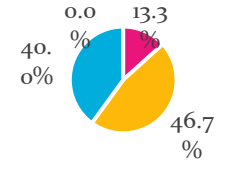
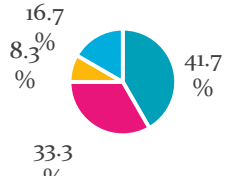
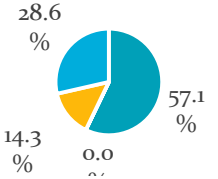
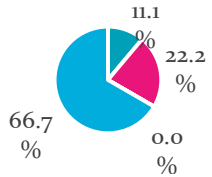
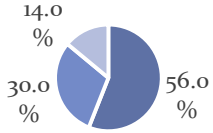
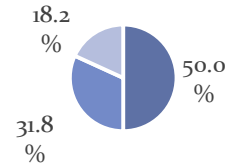
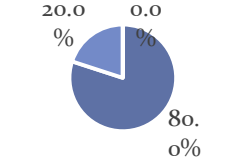
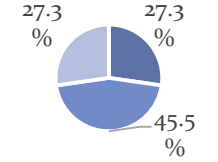
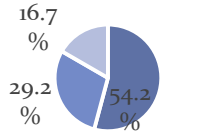
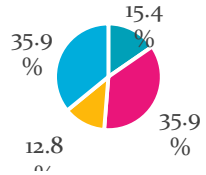
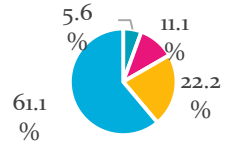
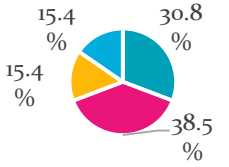
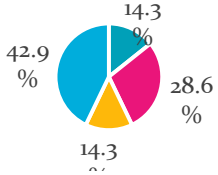
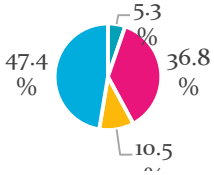
Figure 23 Q2.4 How is the data you collect used?

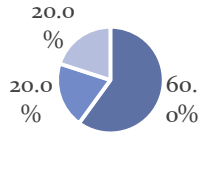
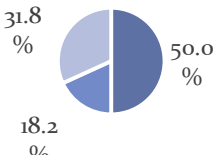
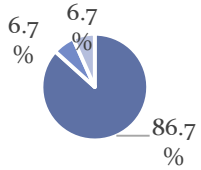
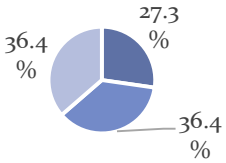
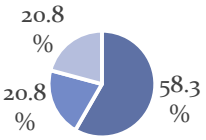
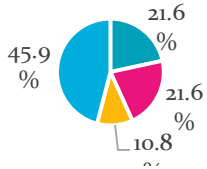
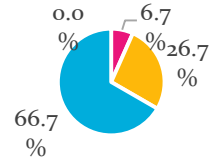
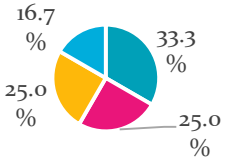
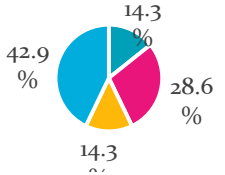
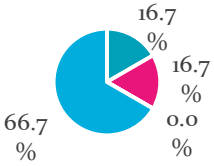
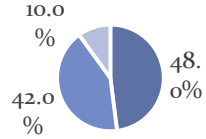
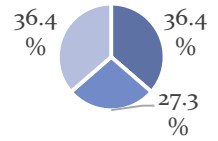
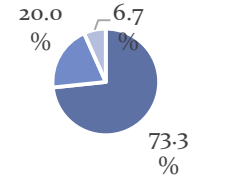
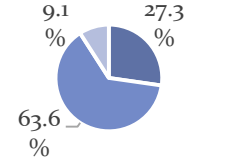
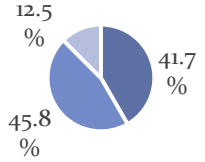
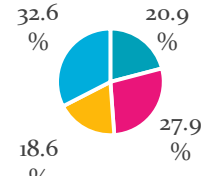
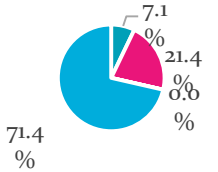
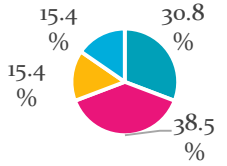
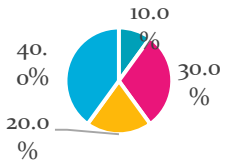
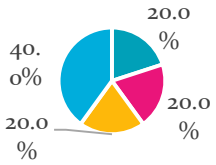
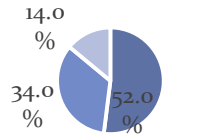
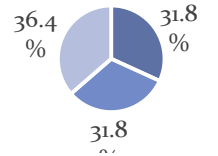
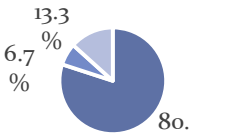
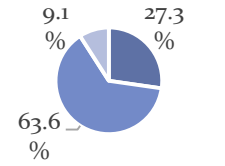
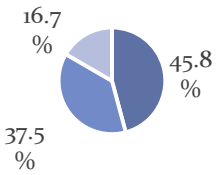
Q2.5 Which data about your machinery, processes, and products as well as malfunctions and their causes is collected during production, and how is it collected?

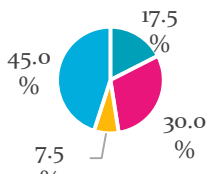
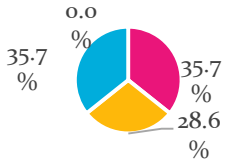
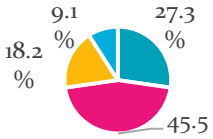
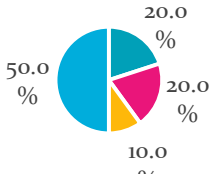
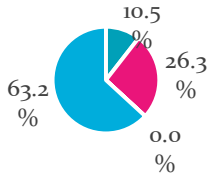
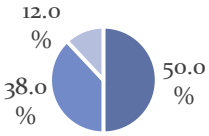
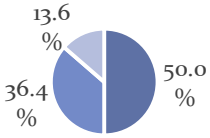
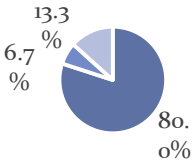
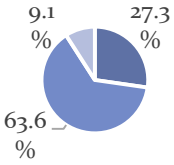
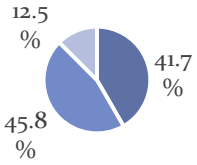
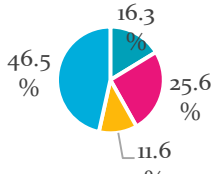
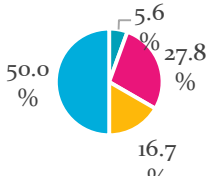
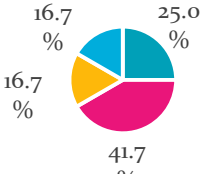
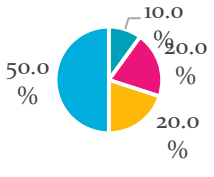
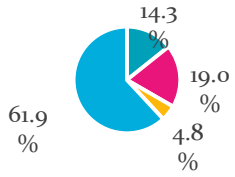
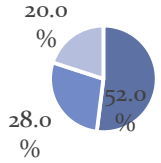
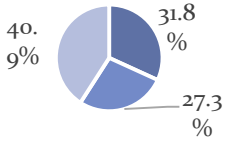
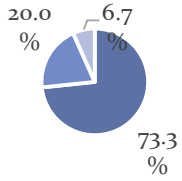
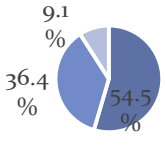
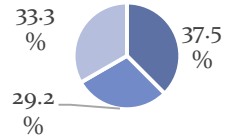
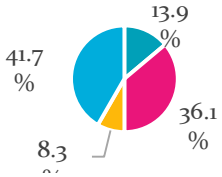
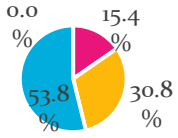
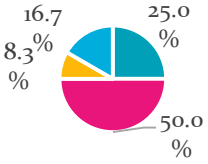
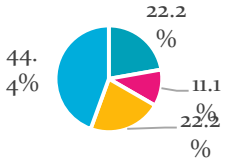
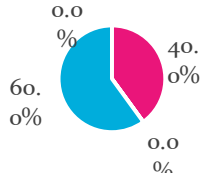
Q2.6 Which of the following systems do you use? Does the system have an interface to the leading system?

Table 11 Q2.5 Which data about your machinery, processes, and products as well as malfunctions and their causes is collected during production, and how is it collected?

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Inventory data					
If yes					
Manufacturing throughput times					
If yes					
Equipment capacity utilization					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
If yes					
Production residues/waste /WIP					
If yes					
Quality MGMT					
If yes					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Employee utilization					
If yes					
Quality Control data					
If yes					
Data about processing, process condition					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
If yes					
Production times					
If yes					
Overall equipment effectiveness (OEE)					
If yes					

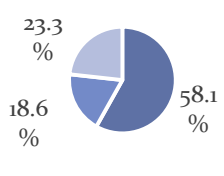
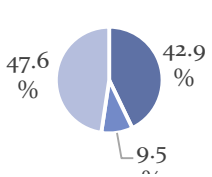
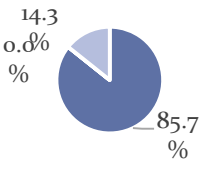
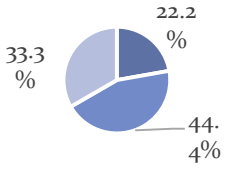
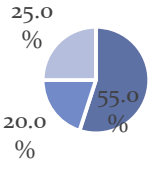
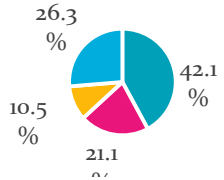
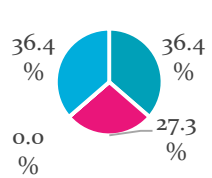
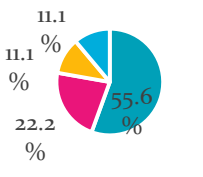
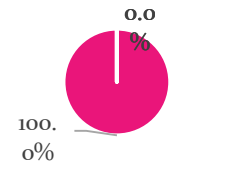
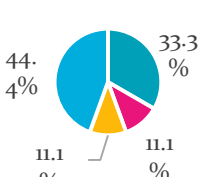
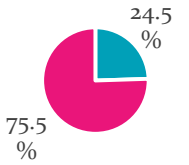
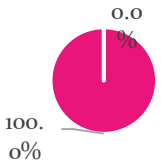
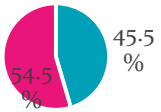
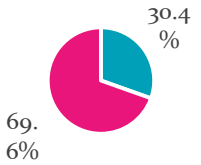
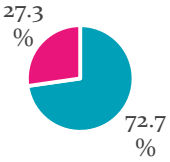
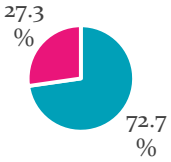
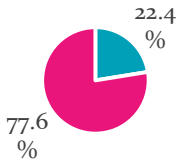
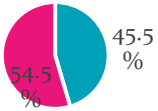
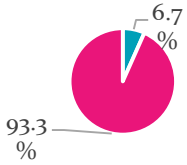
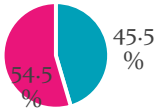
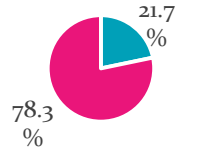
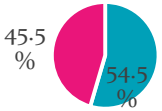
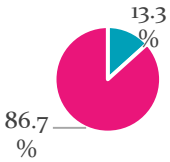
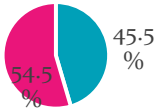
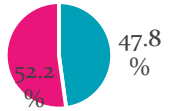
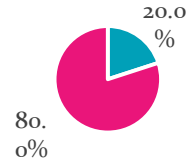
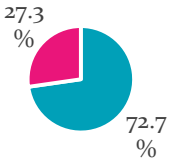
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Other					
If yes					
Note:	■ Yes, manually ■ Yes, automatically ■ No			■ <25% ■ 25-50% ■ 51-75% ■ >75%	

Table 12 Q2.6 Which of the following systems do you use? Does the system have an interface to the leading system? (In use)

	Thailand Company	EU Company	Manufacturing cluster (TH)	Electronic cluster (TH)	Automotive and Others cluster (TH)
MES					
ERP					
PLM					
PDM					
PPS					

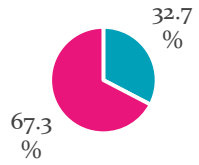
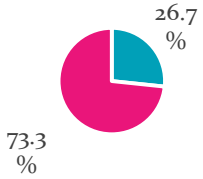
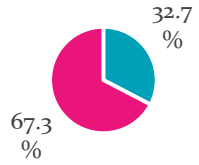
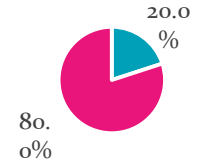
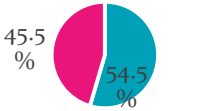
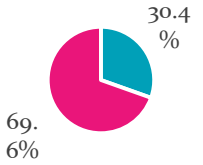
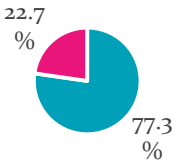
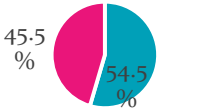
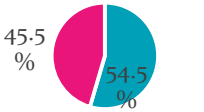
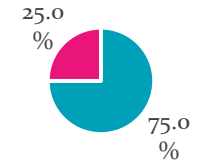
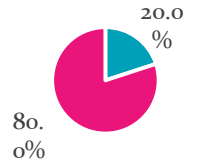
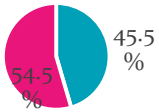
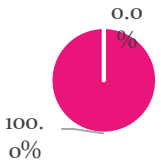
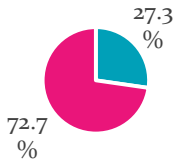
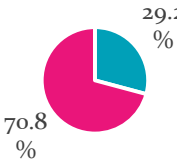
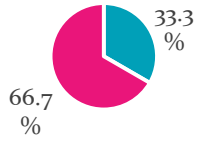
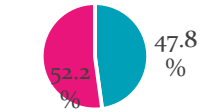
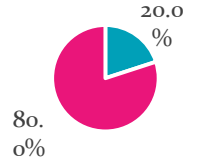
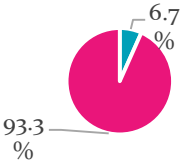
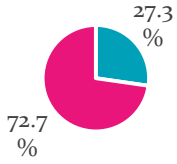
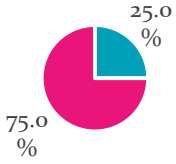
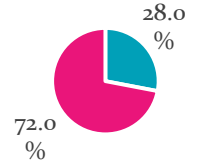
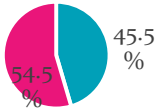
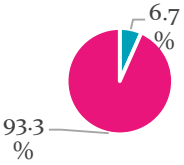
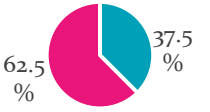
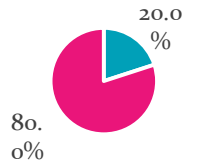
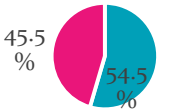
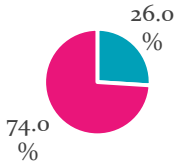
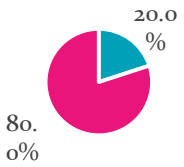
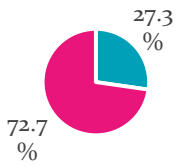
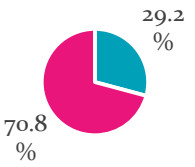
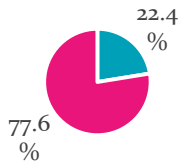
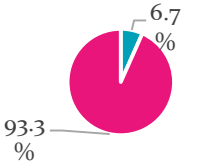
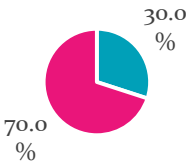
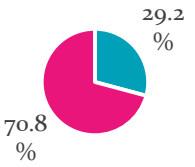
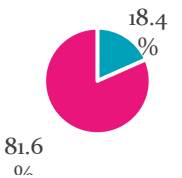
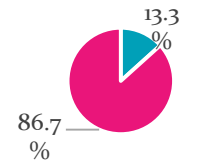
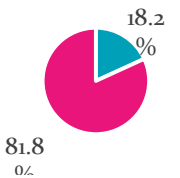
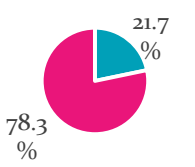
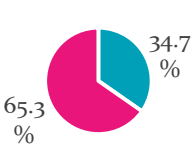
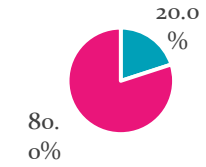
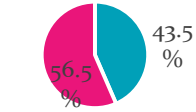
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
PDA					
MDC					
CAD					
SCM					
Note:			Yes No		

Table 13 Q2.6 Which of the following systems do you use? Does the system have an interface to the leading system? (Interface to leading system)

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
MES					
ERP					
PLM					
PDM					
PPS					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
PDA					
MDC					
CAD					
SCM					
Note:			■ Yes ■ No		

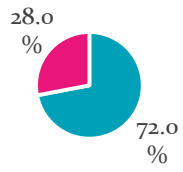
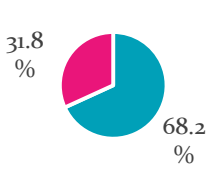
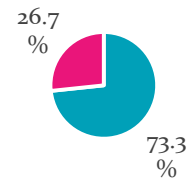
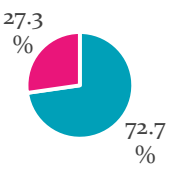
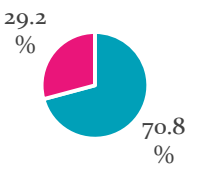
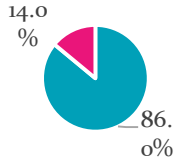
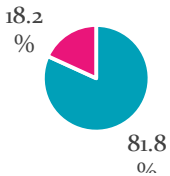
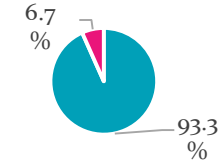
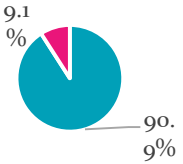
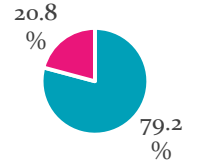
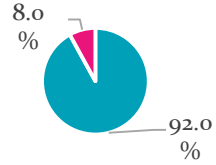
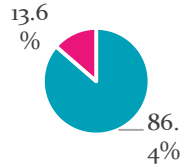
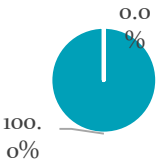
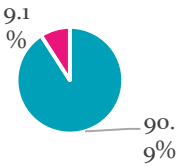
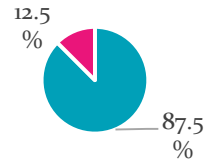
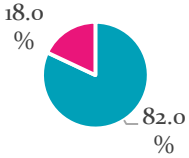
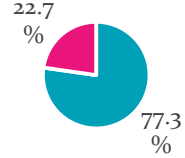
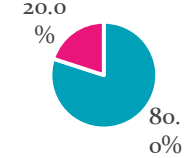
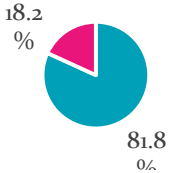
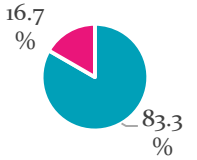
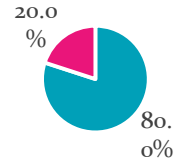
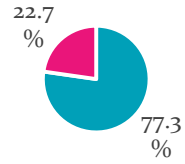
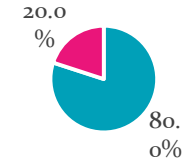
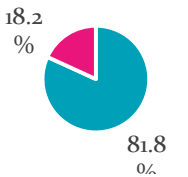
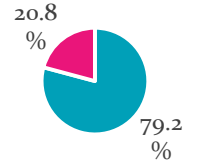
3. SMART OPERATIONS - CONTROLLING, ADJUSTING & MONITORING PROCESS REAL TIME

One hallmark of Industry 4.0 is the enterprise-wide and cross-enterprise integration of the physical and virtual worlds. The advent of digitization and the plethora of data it has brought to production and logistics have made it possible to introduce what are in some cases entirely new forms and approaches to production planning systems (PPS) and supply chain management (SCM). The technical requirements in production and production planning necessary to realize the self-controlling workpiece are known as smart operations.

VERTICAL AND HORIZONTAL INTEGRATION

Q3.1 Where have you integrated cross-departmental information sharing into your system? Distinguish between enterprise-wide (internal) and cross-enterprise (external) information sharing.

Table 14 Q3.1 Where have you integrated cross-departmental information sharing into your system? Distinguish between enterprise-wide (internal) and cross-enterprise (external) information sharing. (Internally between departments)

	Thailand Company	EU Company	Manufacturing cluster (TH)	Electronic cluster (TH)	Automotive and Others cluster (TH)
Research and development					
Production/ Manufacturing					
Purchasing					
Logistics					
Sales					

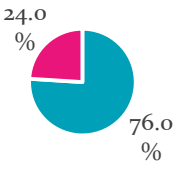
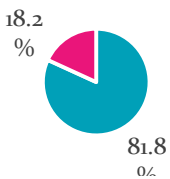
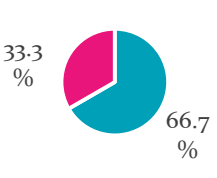
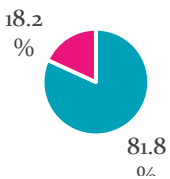
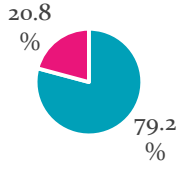
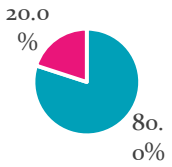
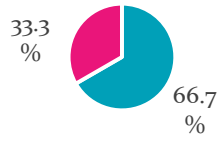
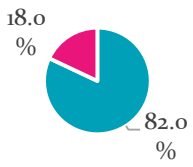
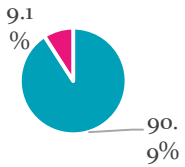
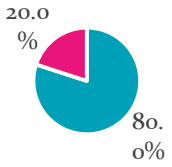
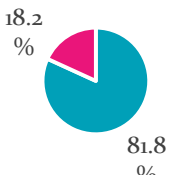
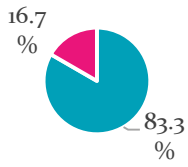
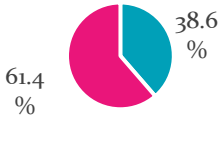
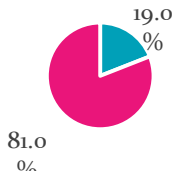
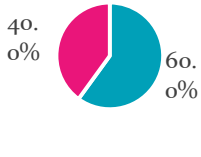
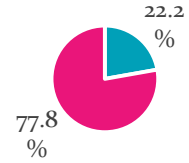
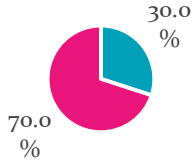
	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Finance/ Accounting					
Service					
IT					
Nowhere					
Note:			Yes No		

Table 15 Q3.1 Where have you integrated cross-departmental information sharing into your system? Distinguish between enterprise-wide (internal) and cross-enterprise (external) information sharing. (Externally with customers and/or suppliers)

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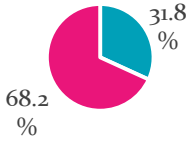
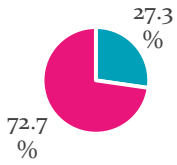
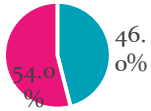
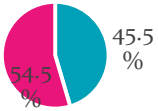
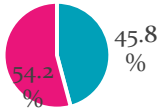
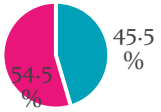
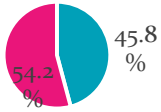
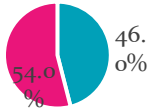
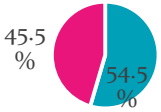
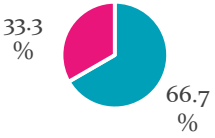
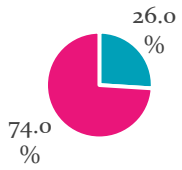
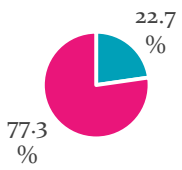
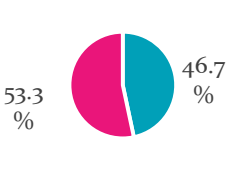
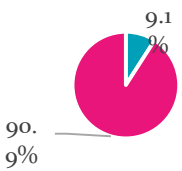
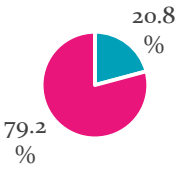
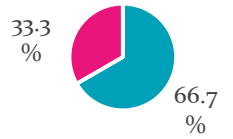
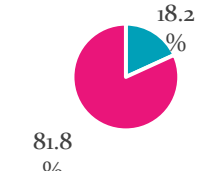
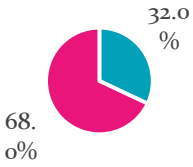
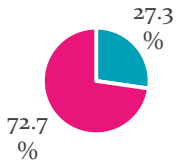
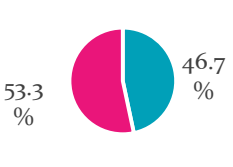
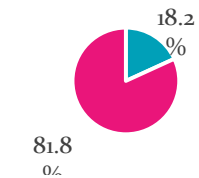
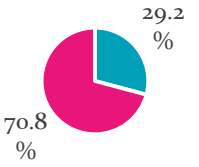
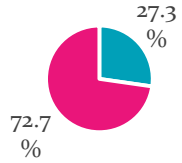
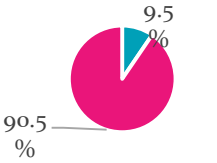
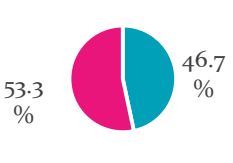
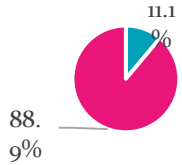
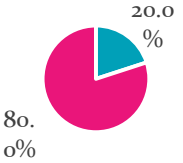
Research and development					
Production/ Manufacturing					
Purchasing					
Logistics					
Sales					

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Finance/ Accounting					
Service					
IT					
Nowhere					
Note:			■ Yes ■ No		

DISTRIBUTED CONTROL

Q3.2 The vision of Industry 4.0 is a workpiece that guides itself autonomously through production. Does your company already have use cases in which the workpiece guides itself autonomously through production?

- ☐ Yes, cross-enterprise
- ☐ Yes, but only in selected areas
- ☐ Yes, but only in the test and pilot phase
- ☐ No

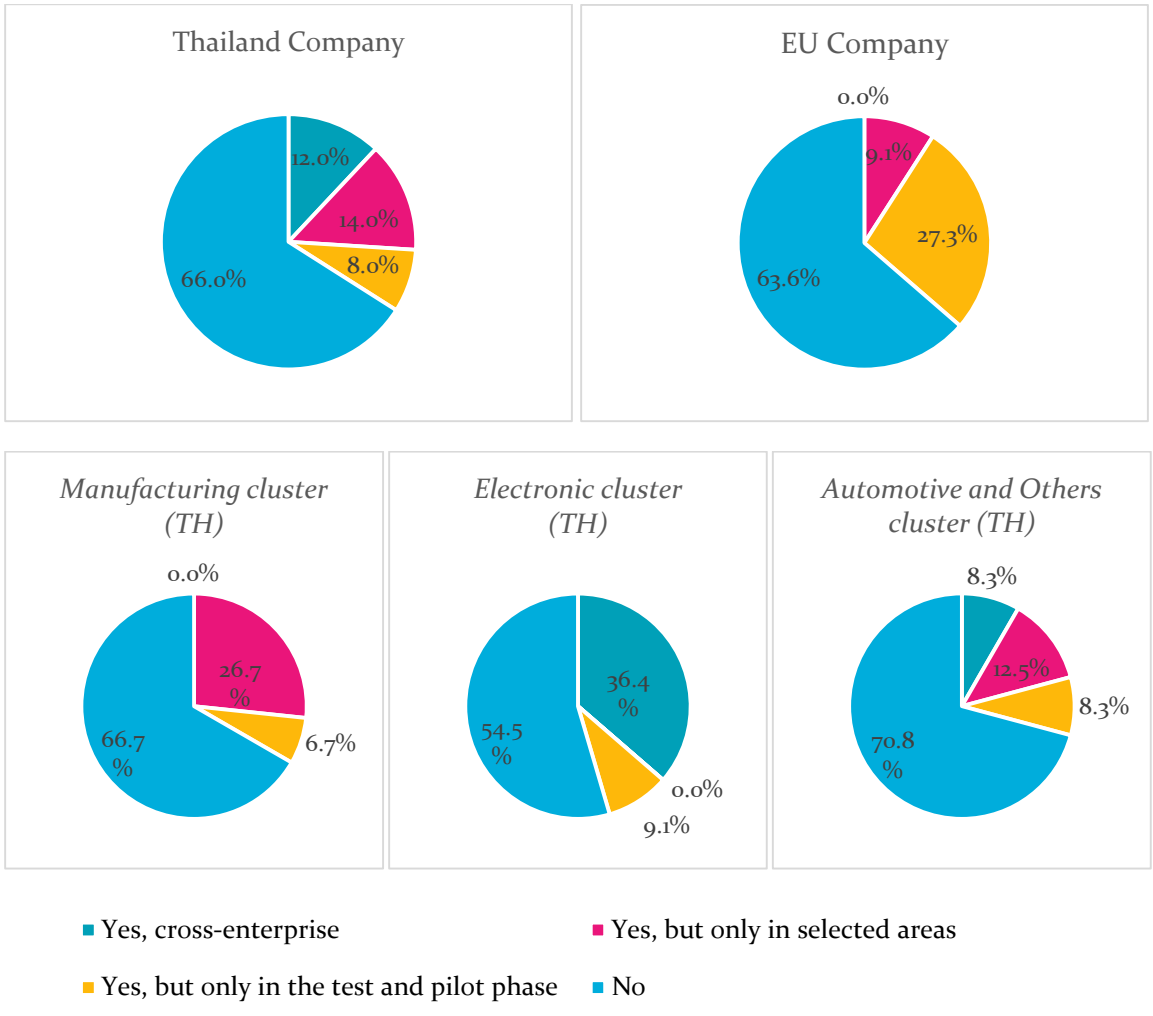


Figure 24 Q3.2 The vision of Industry 4.0 is a workpiece that guides itself autonomously through production. Does your company already have use cases in which the workpiece guides itself autonomously through production?

Q3.3 Does your company have production processes that respond autonomously/ automatically in real time to changes in production conditions?

- ☐ Yes, cross-enterprise
- ☐ Yes, but only in selected areas
- ☐ Yes, but only in the test and pilot phase
- ☐ No

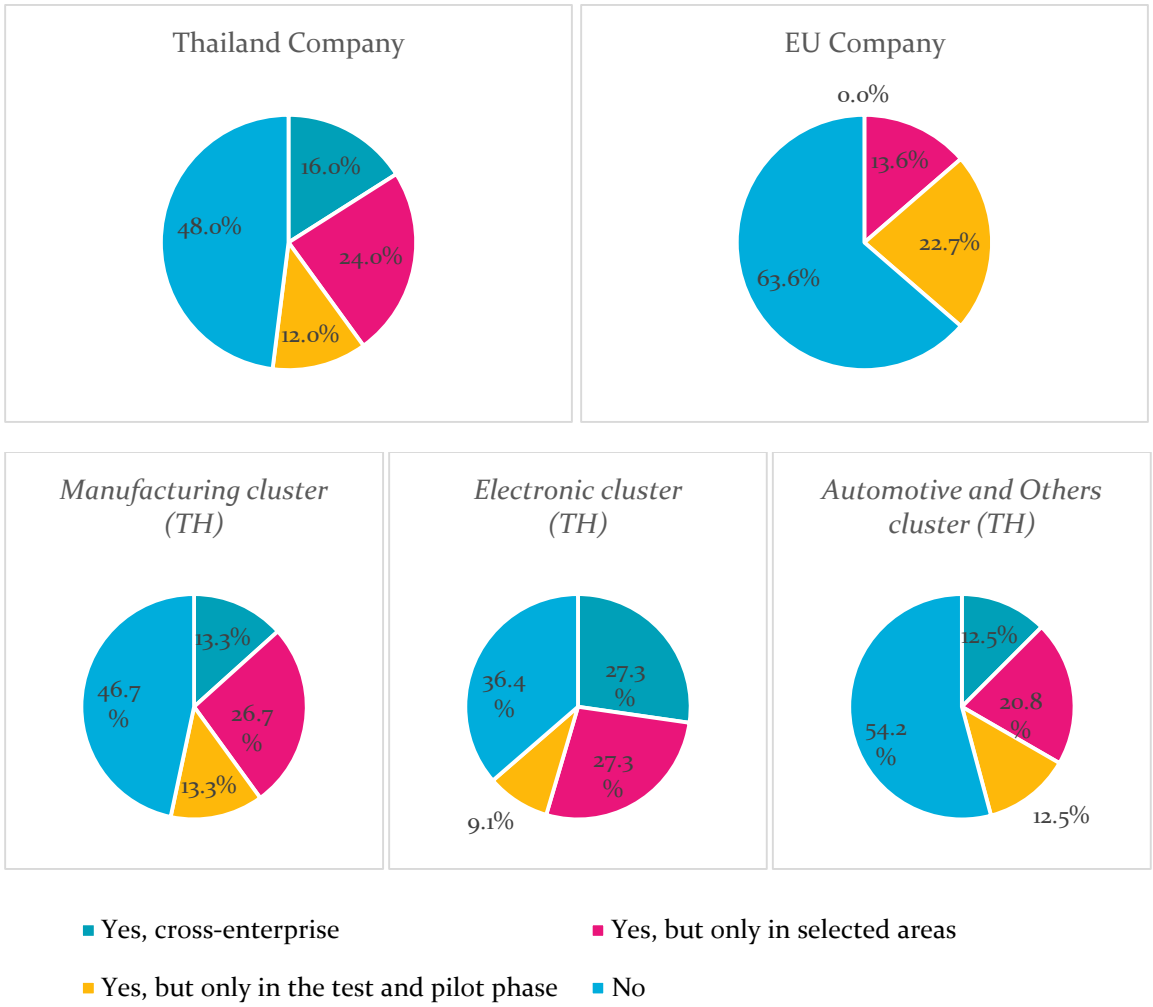


Figure 25 Q3.3 Does your company have production processes that respond autonomously/automatically in real time to changes in production conditions?

DATA AND COMMUNICATIONS SECURITY

Q3.4 How is your IT organized?

- ☐ No in-house IT department (service provider used)
- ☐ Central IT department
- ☐ Local IT departments in each area (production, product development, etc.)
- ☐ IT experts attached to each department

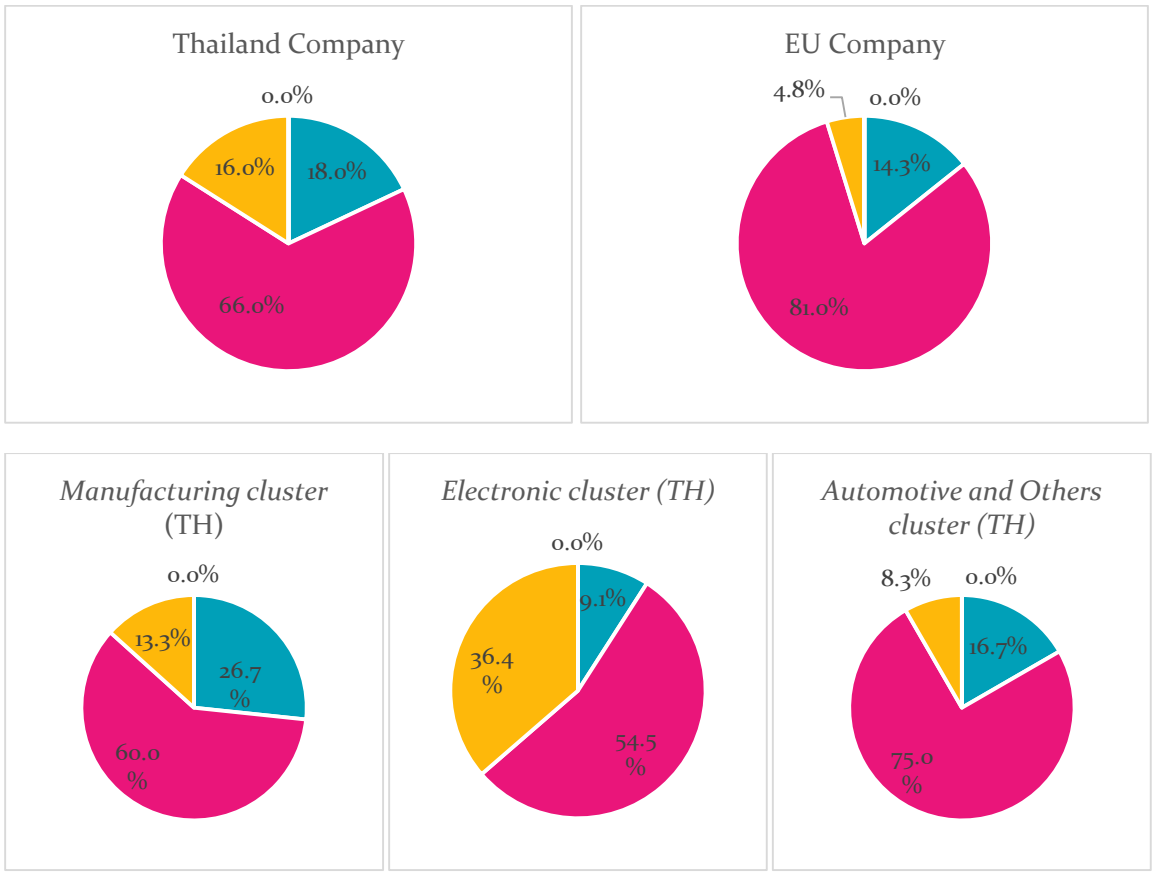
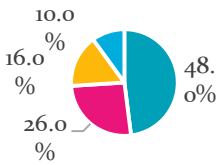
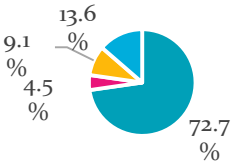
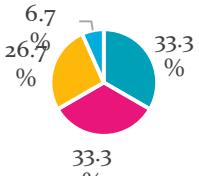
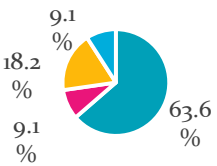
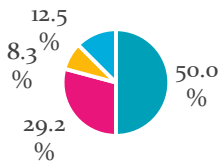
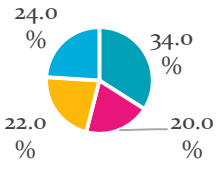
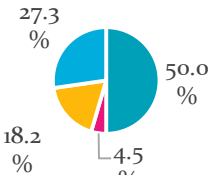
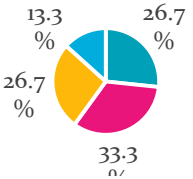
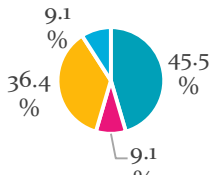
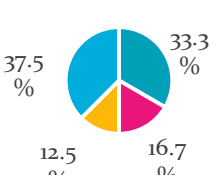
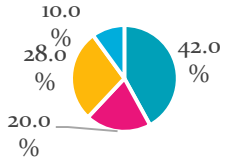
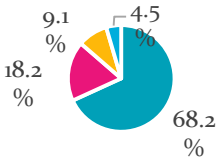
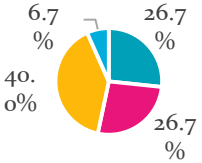
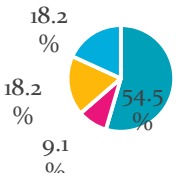
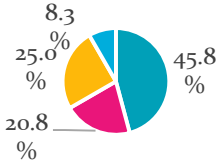
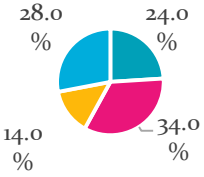
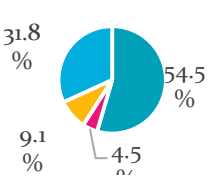
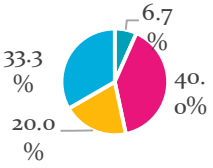
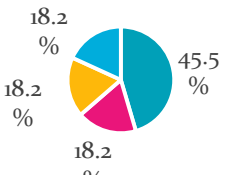
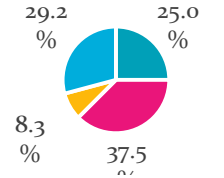


Figure 26 Q3.4 How is your IT organized?

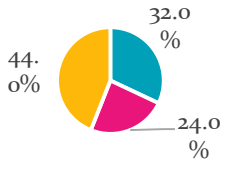
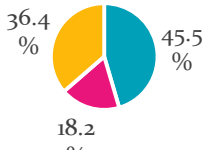
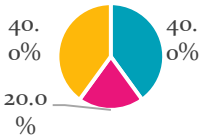
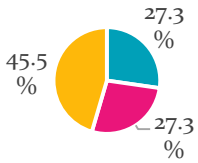
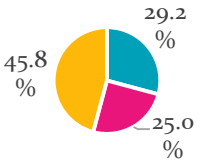
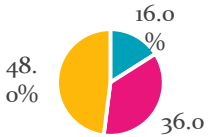
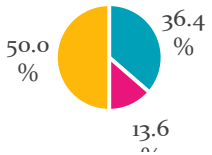
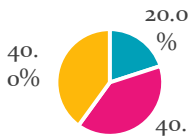
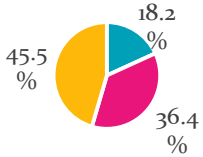
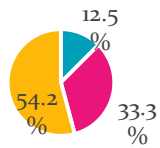
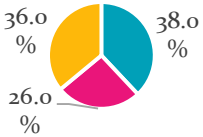
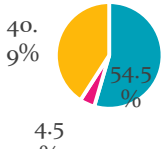
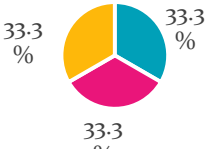
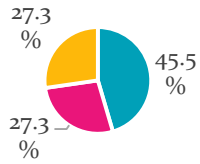
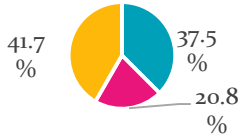
Q3.5 How far along are you with your IT security solutions?
Q3.6 Are you already using cloud services?

Table 16 Q3.5 How far along are you with your IT security solutions?

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Security in internal data storage					
Security of data through cloud services					
Security of communications for in-house data exchange					
Security of communications for data exchange with business partners					

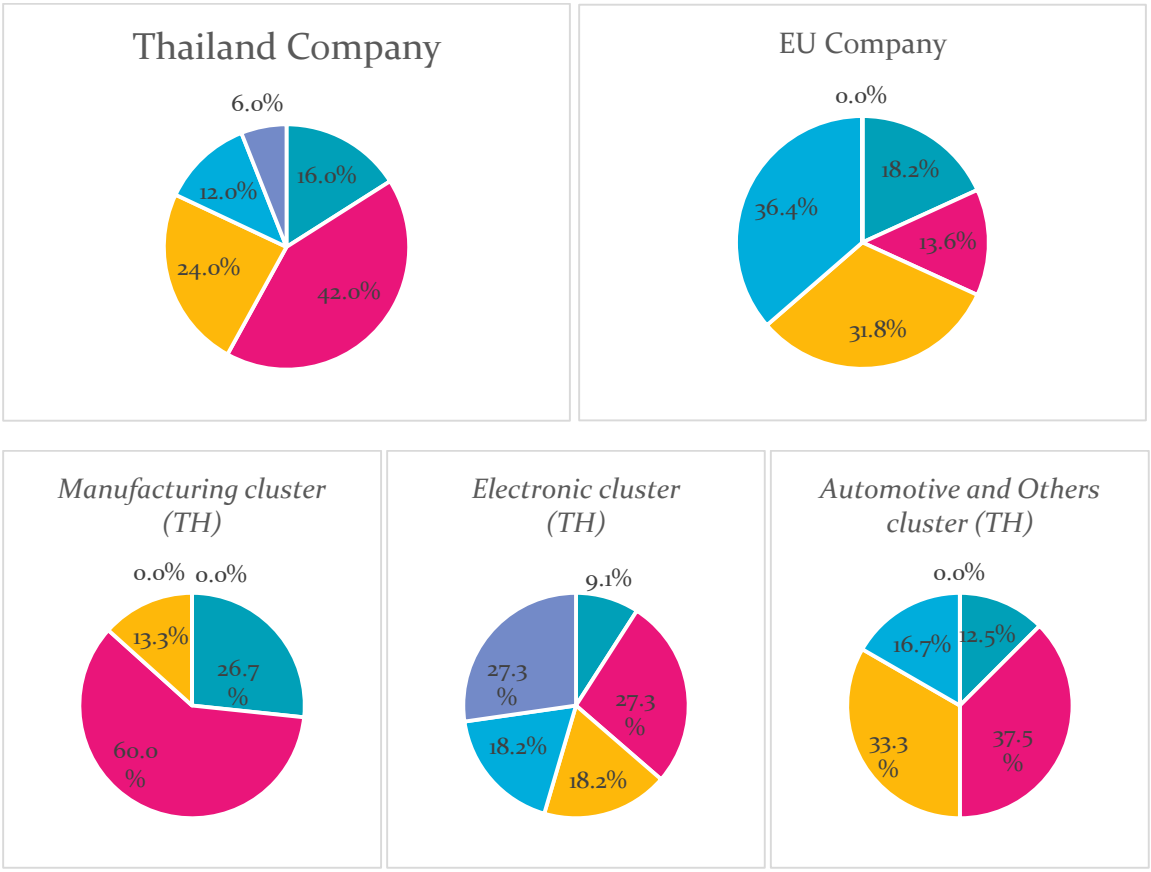
Note: ■ Solution implemented ■ Solution in progress ■ Solution planned ■ Not relevant for us

Table 17 Q3.6 Are you already using cloud services?

	Thailand Company	*EU Company*	*Manufacturing cluster (TH)*	*Electronic cluster (TH)*	*Automotive and Others cluster (TH)*
Cloud-based software					
For data analysis					
For data storage					
Note:	■ Yes	■ No, but we are planning to	■ No		

Q3.7 How would you rate the degree of the digitization of your vertical value chain (from product development to production)?

☐ 1 (No digitization at all - No automated exchange of information along the vertical value chain (e.g. manual machine programming based on paper plans. We plan to analyze and monitor those data in the next 3-5 years)
☐ 2 (Low digitization –some data flow exchange through internal IT within organization)
☐ 3 (Medium digitization –only data flow along within organization and will implement it throughout vertical value chain in the next 1-3 years)
☐ 4 (High digitization –data flow along the vertical value chain e.g. integration of ERP in the past 1-2 years)
☐ 5 (Complete digitization – Continuous data flow along the vertical value chain e.g. direct controlling of machines via CAD models, integration of ERP in the past 2-5 years)

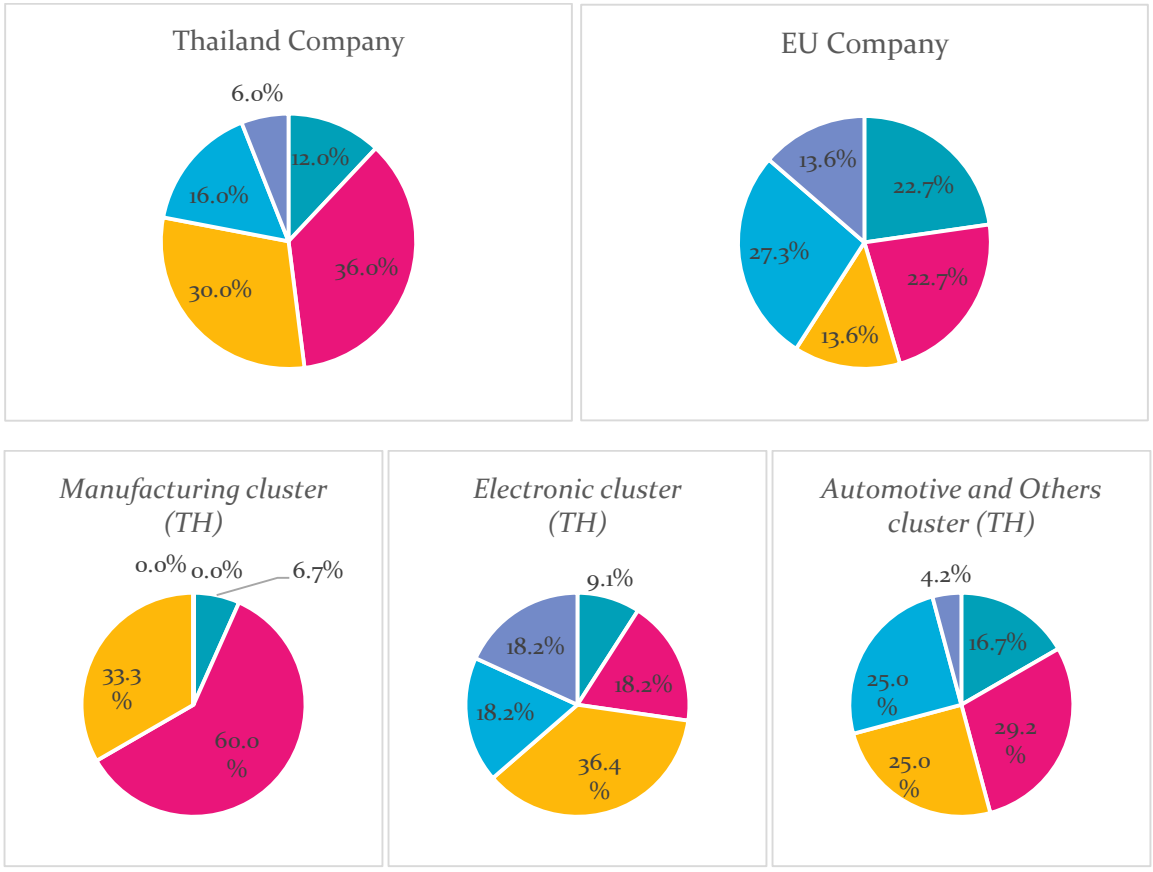


- 1 (No digitization at all - No automated exchange of information along the vertical value chain (e.g. manual machine programming based on paper plans. We plan to analyze and monitor those data in the next 3-5 years)
- 2 (Low digitization - some data flow exchange through internal IT within organization)
- 3 (Medium digitization - only data flow along within organization and will implement it throughout vertical value chain in the next 1-3 years)
- 4 (High digitization - data flow along the vertical value chain e.g. integration of ERP in the past 1-2 years)
- 5 (Complete digitization - Continuous data flow along the vertical value chain e.g. direct controlling of machines via CAD models, integration of ERP in the past 2-5 years)

Figure 27 Q3.7 How would you rate the degree of the digitization of your vertical value chain (from product development to production)?

Q3.8 To which extent do you have a real-time view on your production and can dynamically react on changes in demand?

☐ 1 (Not at all – Batch production for large lot sizes without insight into production status. No ability to react flexible on changes in demand)
☐ 2 (Low Virtual Factory – Batch production for large lot sizes with ability to react flexible on changes in demand, but No Real-time view on productions and no capabilities to dynamically change schedules)
☐ 3 (Medium Virtual Factory –Real-time view on some productions with capabilities to change schedules)
☐ 4 (High Virtual Factory –Real-time view on main productions with capabilities to dynamically change schedules)
☐ 5 (Virtual Factory – Real-time view on all productions with capabilities to dynamically change schedules)

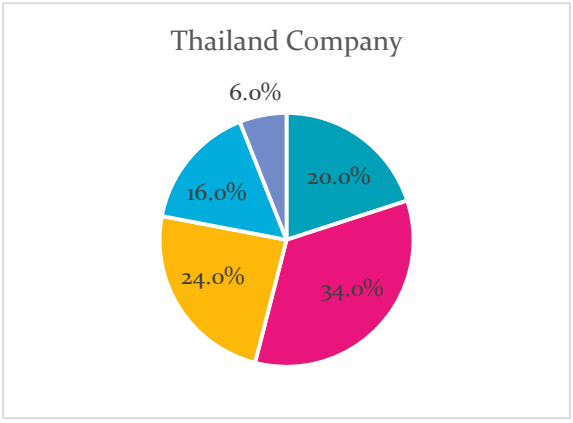


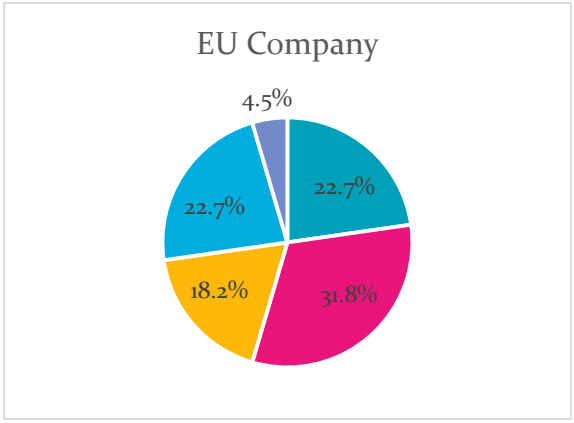
- 1 (Not at all - Batch production for large lot sizes without insight into production status. No ability to react flexible on changes in demand)
- 2 (Low Virtual Factory - Batch production for large lot sizes with ability to react flexible on changes in demand, but No Real-time view on productions and no capabilities to dynamically change schedules)
- 3 (Medium Virtual Factory - Real-time view on some productions with capabilities to change schedules)
- 4 (High Virtual Factory - Real-time view on main productions with capabilities to dynamically change schedules)
- 5 (Virtual Factory - Real-time view on all productions with capabilities to dynamically change schedules)

Figure 28 Q3.8 To which extent do you have a real-time view on your production and can dynamically react on changes in demand?

Q3.9 To which degree do you have an end-to-end IT enabled planning and steering process from sales forecasting, over production to warehouse planning and logistics?

☐ 1 (Isolated planning processes – Neither IT-enabled nor integrated along the value chain (e.g. planning based on past experiences)
☐ 2 (Low Connected system – Comprising information from actual sale/contract to production planning)
☐ 3 (Connected system – Comprising information from sales forecasts to production planning)
☐ 4 (Integrated planning system – Comprising information from sales forecasts to production planning, warehousing)
☐ 5 (Fully Integrated end-to-end planning system – Comprising real-time information along the entire value chain from sales forecasts to production planning and Logistics)





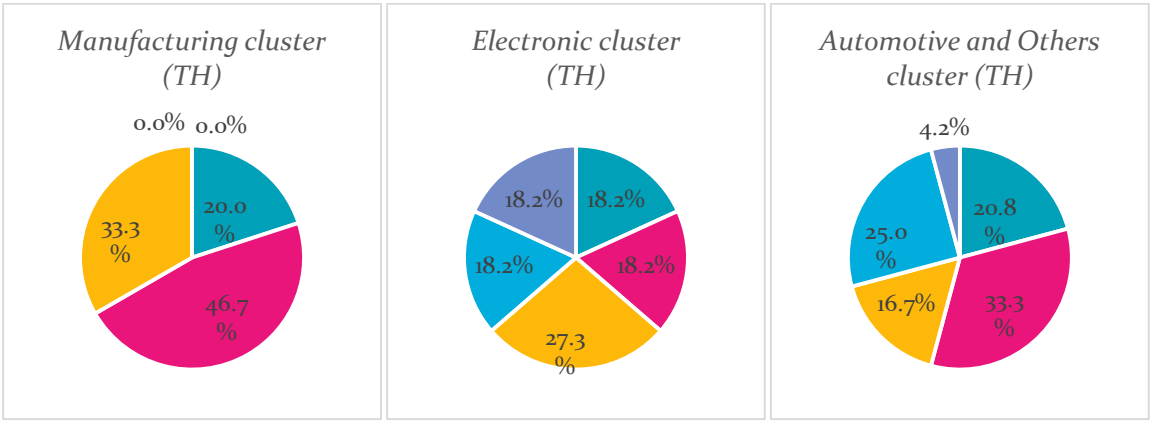
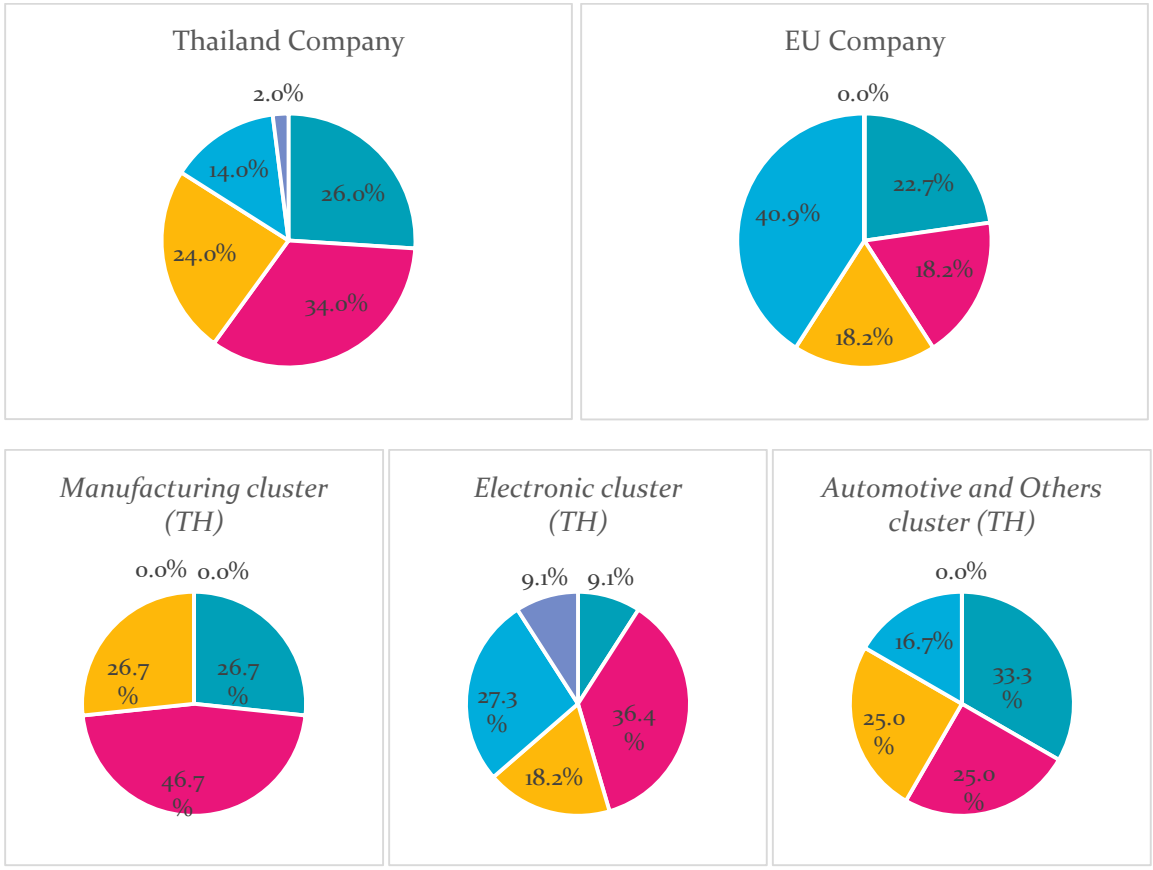


Figure 29 Q3.9 To which degree do you have an end-to-end IT enabled planning and steering process from sales forecasting, over production to warehouse planning and logistics?

Q3.10 How advanced is the digitization of your production equipment (sensors, IoT connection; digital monitoring, control, optimization & automation)?

☐ 1 (Purely physical factory – Production equipment is entirely cut off from IT systems and no real-time information can be gathered)
☐ 2 (Low digitized factory – Interconnected production equipment allows for IT-access and information is fed into some machine in the factory)
☐ 3 (Medium digitized factory – Interconnected production equipment allows for IT-access and information is fed for some part of the production in the factory)
☐ 4 (High digitized factory – Interconnected production equipment allows for IT-access and information is fed into a virtual representation only for the main productions of factory)
☐ 5 (Fully digitized factory – Interconnected production equipment allows for IT-access and information is fed into a virtual representation of the factory)

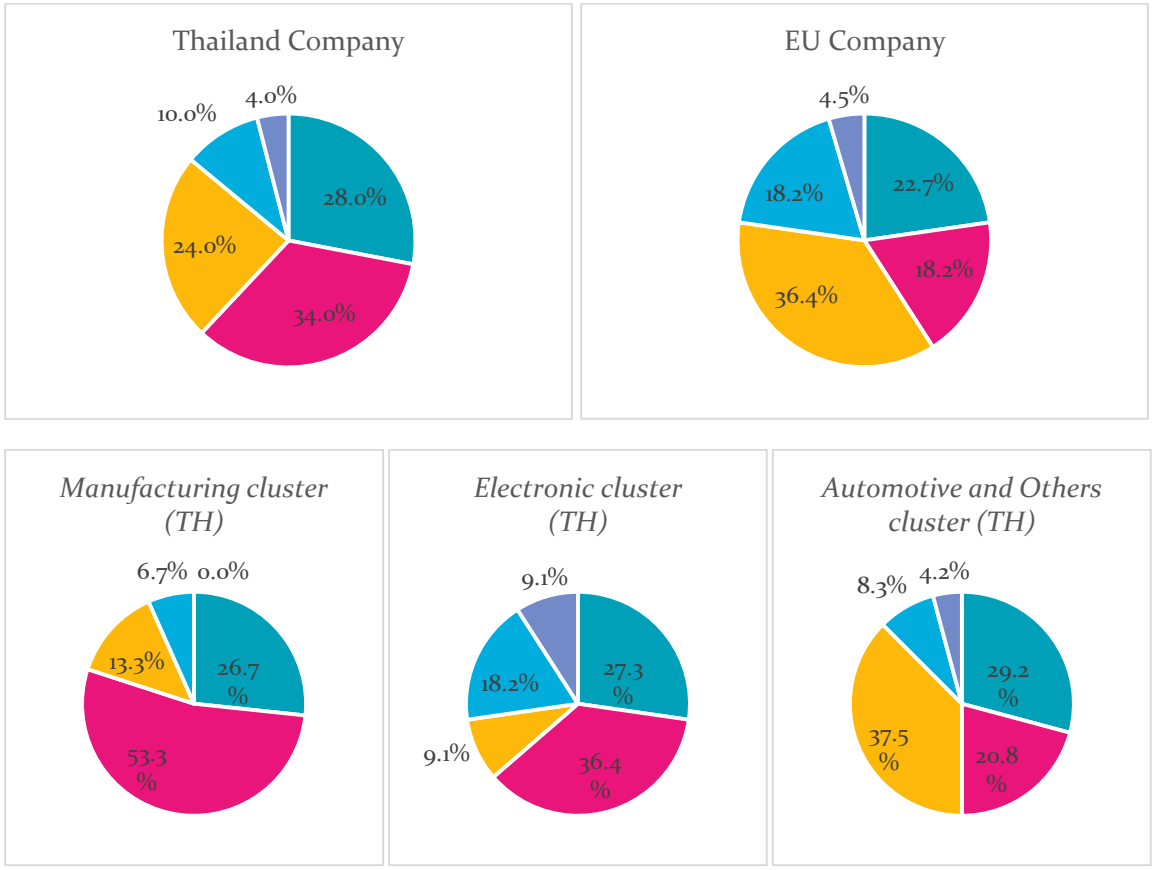


- 1 (Purely physical factory - Production equipment is entirely cut off from IT systems and no real-time information can be gathered)
- 2 (Low digitized factory - Interconnected production equipment allows for IT-access and information is fed into some machine in the factory)
- 3 (Medium digitized factory - Interconnected production equipment allows for IT-access and information is fed for some part of the production in the factory)
- 4 (High digitized factory - Interconnected production equipment allows for IT-access and information is fed into a virtual representation only for the main productions of factory)
- 5 (Fully digitized factory - Interconnected production equipment allows for IT-access and information is fed into a virtual representation of the factory)

Figure 30 Q3.10 How advanced is the digitization of your production equipment (sensors, IoT connection; digital monitoring, control, optimization & automation)?

Q3.11 How would you rate the degree of digitization of your horizontal value chain (from customer order over supplier, production and logistic to service)?

☐ 1 (No digitization at all – No automated exchange of information along the horizontal value chain, e.g. no connection to supplier's IT)
☐ 2 (Low digitized factory – some automated exchange of information to supplier's IT or customer's IT)
☐ 3 (Medium digitization–data flow along the horizontal value chain with integration of logistic)
☐ 4 (High digitization–Continuous data flow along the horizontal value chain with integration of logistic)
☐ 5 (Complete digitization–Continuous data flow along the horizontal value chain with integration of logistic service into internal IT)



- 1 (No digitization at all - No automated exchange of information along the horizontal value chain, e.g. no connection to supplier's IT)
- 2 (Low digitized factory - some automated exchange of information to supplier's IT or customer's IT)
- 3 (Medium digitization - data flow along the horizontal value chain with integration of logistic)
- 4 (High digitization - Continuous data flow along the horizontal value chain with integration of logistic)
- 5 (Complete digitization - Continuous data flow along the horizontal value chain with integration of logistic service into internal IT)

Figure 31 Q3.11 How would you rate the degree of digitization of your horizontal value chain (from customer order over supplier, production and logistic to service)?

4. DATA-DRIVEN SERVICES-INTEGRATED BUSINESS AND OPERATIONAL DATA MANAGEMENT

The objective of data-driven services is to align future business models and enhance the benefit to the customer. The after-sales and services business will be based more and more on the evaluation and analysis of collected data and rely on enterprise-wide integration. The physical products themselves must be equipped with physical IT so they can send, receive, or process the information needed for the operational processes. This means they have a physical and digital component, which in turn are the basis for digitized services in the usage phase of the products.

Q4.1 The process data gathered in production and in the usage phase enable new services. Do you offer such services?

- ☐ Yes, and we are integrated with our customers
- ☐ Yes, but without integration with our customers
- ☐ No

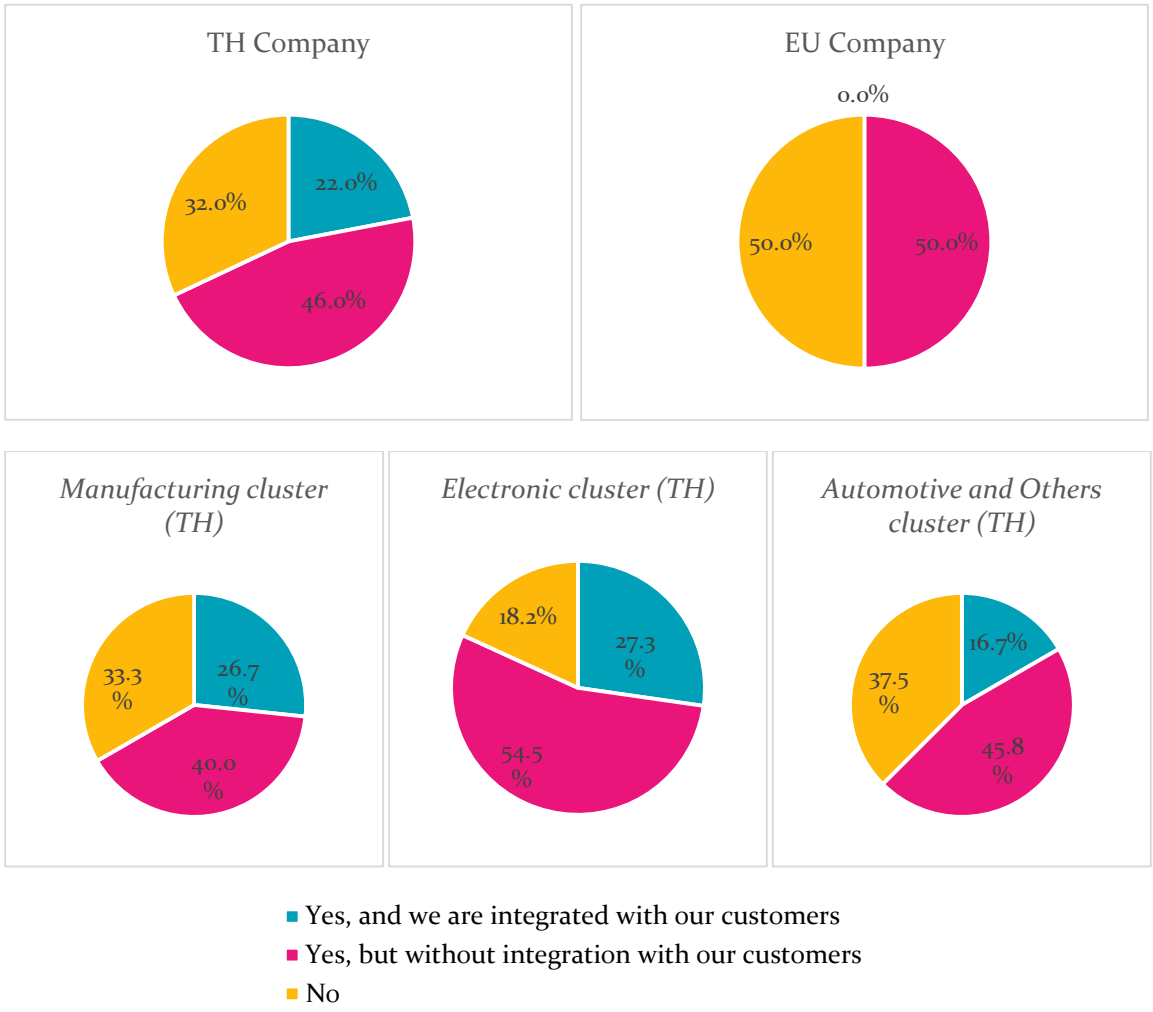


Figure 32 Q4.1 The process data gathered in production and in the usage phase enable new services. Do you offer such services?

Q4.2 What share of your revenues come from these new data-driven services?? Often, data that is collected is just stored and then not used any further. What share of the data you collect are you already using?

- ☐ 0%
- ☐ 0% to 20%
- ☐ 21% to 50%
- ☐ Over 50%

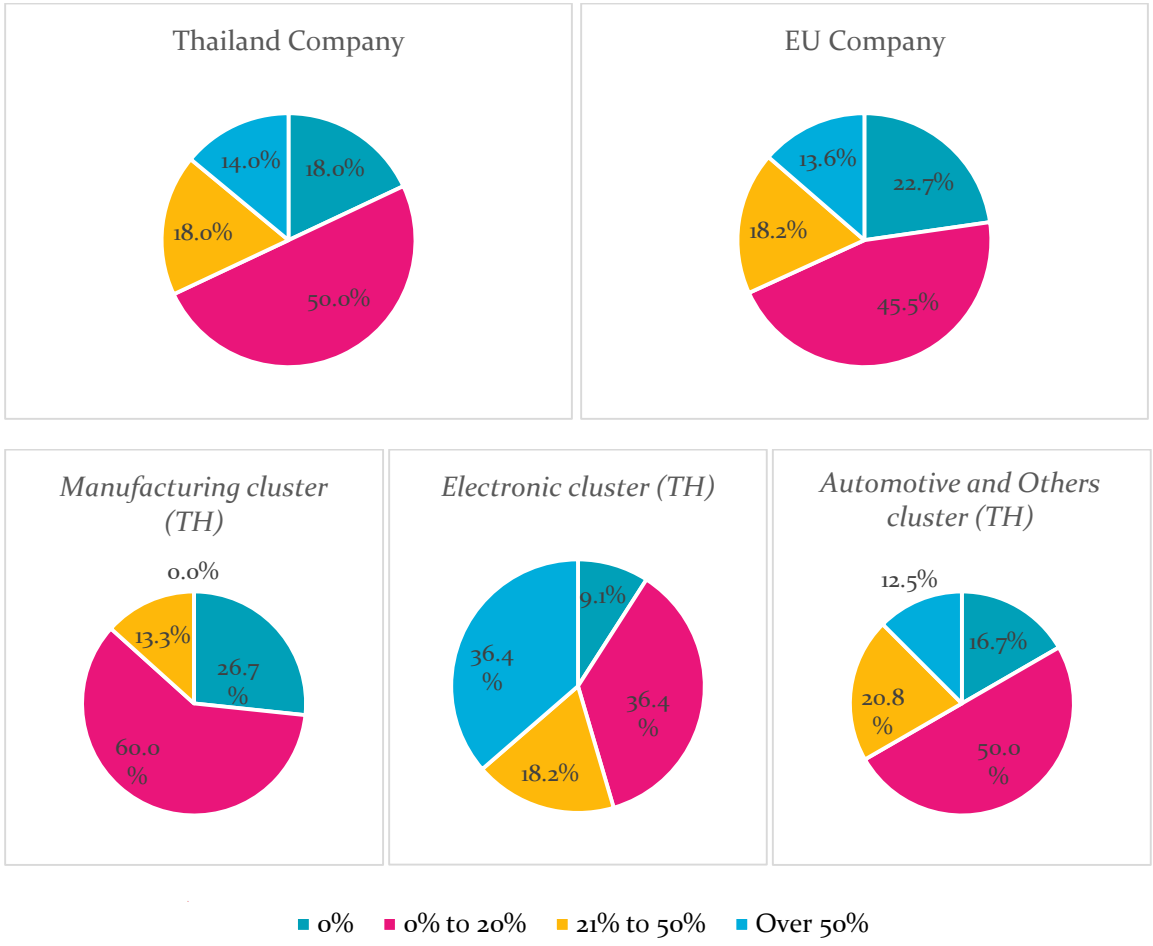


Figure 33 Q4.2 What share of your revenues come from these new data-driven services?? Often, data that is collected is just stored and then not used any further. What share of the data you collect are you already using?

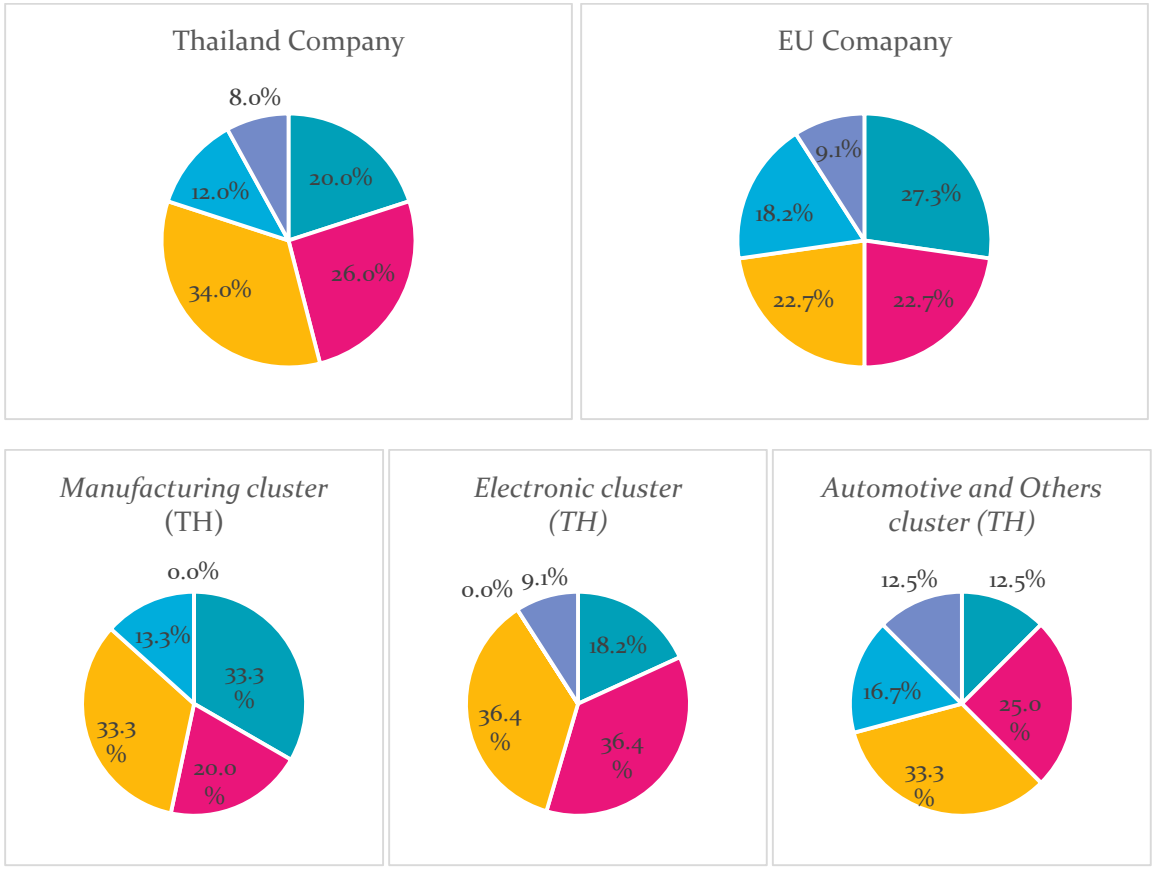
Q4.3 Do you analyze the data you collect from the usage phase?

- ☐ Yes
- ☐ No – we collect the data but do not analyze it
- ☐ No – we do not collect data in the usage phase

Figure 34 Q4.3 Do you analyze the data you collect from the usage phase?

Q4.4 To which extent do you use multiple integrated sales channels to sell your products to your customers?

☐ 1 (One channel - Traditional sales force approach, e.g. local sales force)
☐ 2 (One Channel – Integration of digital and non-digital sales)
☐ 3 (Several Channel –various digital and non-digital sales channels, e.g., sales force, web-shop, sales platforms)
☐ 4 (Multi Channel – Integration of various digital and non-digital sales channels, e.g., sales force, web-shop, sales platforms)
☐ 5 (Multi/ Omni-Channel – Integration of various digital and non-digital sales channels, e.g. store, sales force, web-shop, sales platforms)

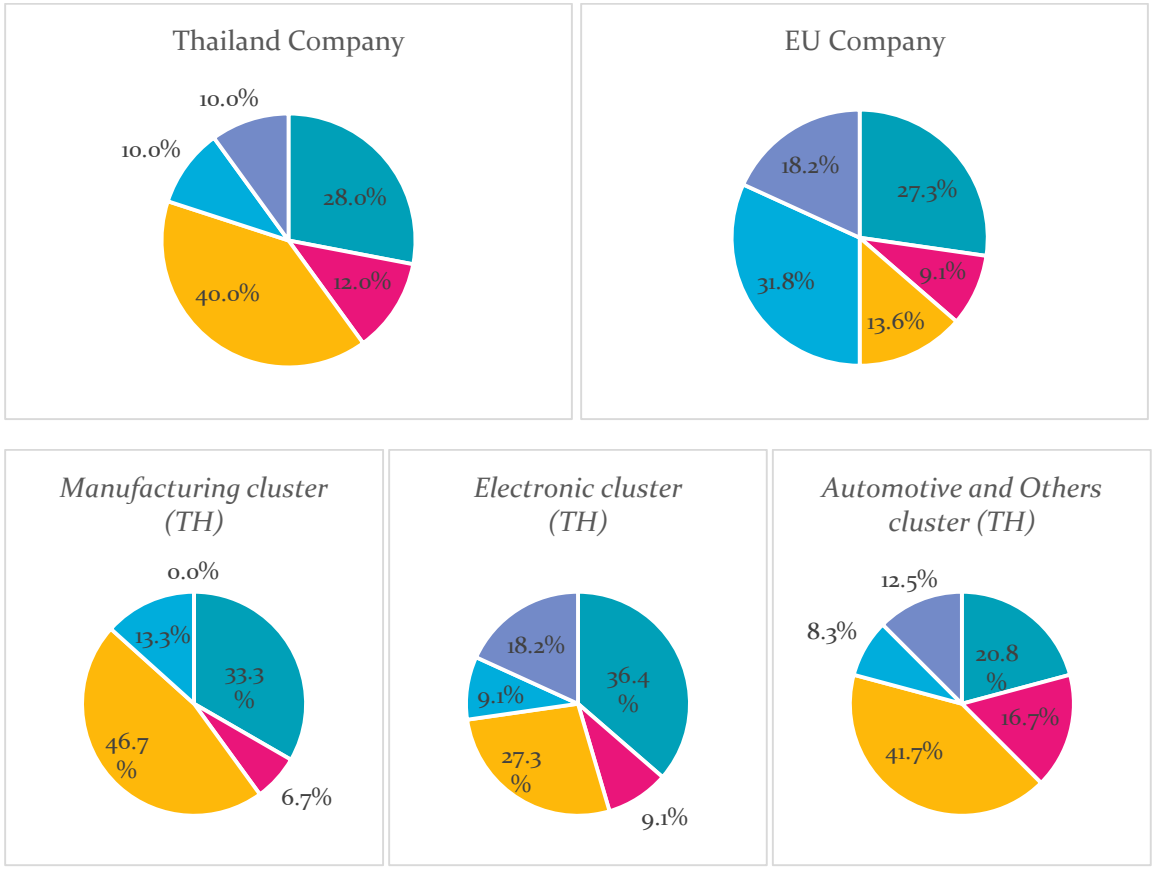


- 1 (One channel - Traditional sales force approach, e.g. local sales force)
- 2 (One Channel - Integration of digital and non-digital sales)
- 3 (Several Channel - various digital and non-digital sales channels, e.g., sales force, web-shop, sales platforms)
- 4 (Multi Channel - Integration of various digital and non-digital sales channels, e.g., sales force, web-shop, sales platforms)
- 5 (Multi/ Omni-Channel - Integration of various digital and non-digital sales channels, e.g. store, sales force, web-shop, sales platforms)

Figure 35 Q.4.4 To which extent do you use multiple integrated sales channels to sell your products to your customers?

Q4.5 How far do you integrate multiple channels (website, blogs, forums, social media platforms etc.) into your customer interactions for communicating news, receiving feedback, managing claims etc.?

☐ 1 (One-way communication – Usage of traditional communication channels for information purposes only (e.g. corporate website, newsletters)
☐ 2 (One-way communication – Usage of traditional communication channels to response to customer from e.g. corporate website)
☐ 3 (Reactive communication – Usage of digital channels to response to customer, e.g. use previous information from customers to product development)
☐ 4 (Proactive communication – Usage of digital channels to acquires customer interaction, e.g. some integrating customers into product development)
☐ 5 (Interactive communication – Usage of multiple digital channels to foster customer interaction, e.g. integrating customers into product development via social media platforms)

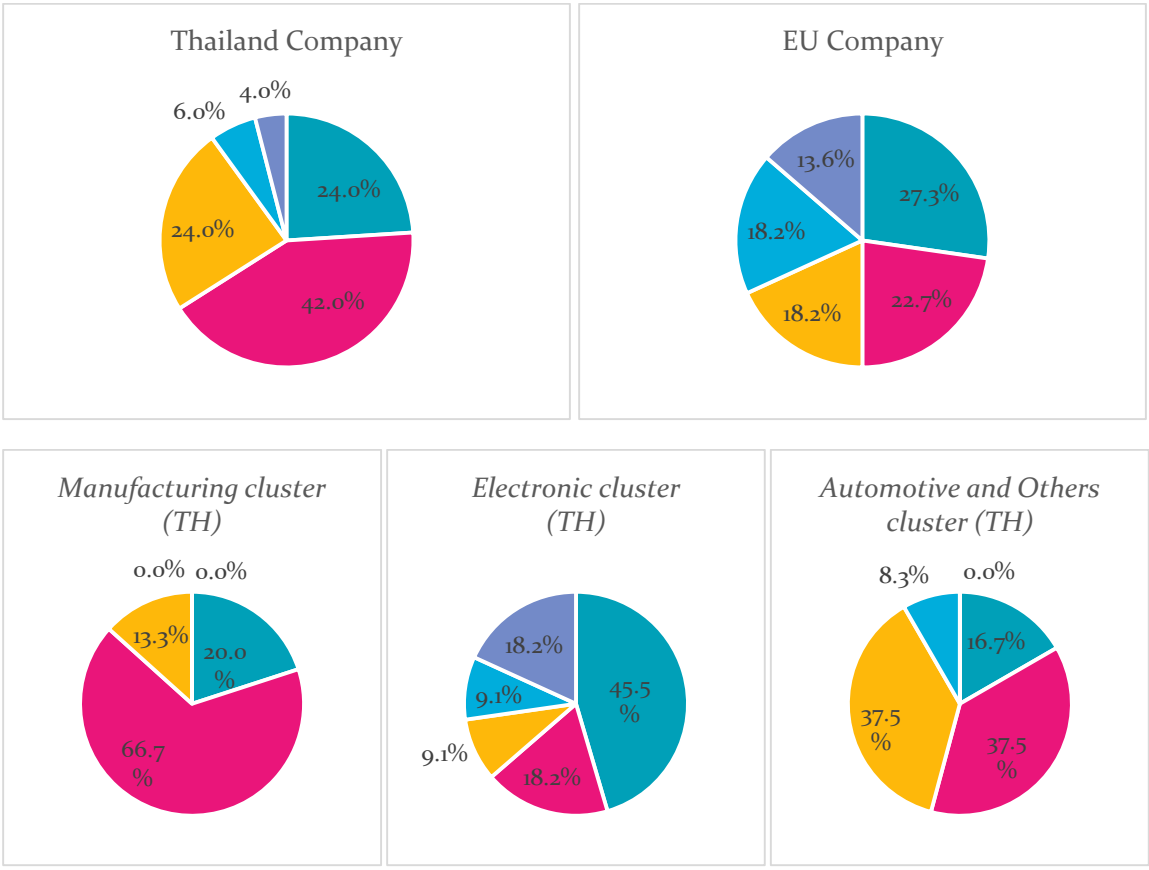


- 1 (One-way communication - Usage of traditional communication channels for information purposes only (e.g. corporate website, newsletters)
- 2 (One-way communication - Usage of traditional communication channels to response to customer from e.g. corporate website)
- 3 (Reactive communication - Usage of digital channels to response to customer, e.g. use previous information from customers to product development)
- 4 (Proactive communication - Usage of digital channels to acquires customer interaction, e.g. some integrating customers into product development)
- 5 (Interactive communication - Usage of multiple digital channels to foster customer interaction, e.g. integrating customers into product development via social media platforms)

Figure 36 Q4.5 How far do you integrate multiple channels (website, blogs, forums, social media platforms etc.) into your customer interactions for communicating news, receiving feedback, managing claims etc.?

Q4.6 How advanced is the digital enablement of your sales force (mobile devices, access to all relevant system anywhere and anytime, full sales process possible at client site)?

☐ 1 (Traditional sales approach - Sales force works 'offline' without access to relevant systems, e.g. using centrally distributed paper documents)
☐ 2 (Connected sales approach - Sales force works 'online' with access to relevant systems, e.g. using centrally digitized document)
☐ 3 (Digital sales approach - Sales force is supported by digital devices and distribute to all relevant processes and systems using centrally integrated IT)
☐ 4 (High Digital sales approach - Sales force is supported by digital devices and access to all relevant processes and systems to customer and product data using horizontally integrated IT with customers and suppliers)
☐ 5 (Digital sales approach - Sales force is supported by digital devices and access to all relevant processes and systems at real-time access to customer and product data, possibility to configure personalized products & dynamically create orders etc.)



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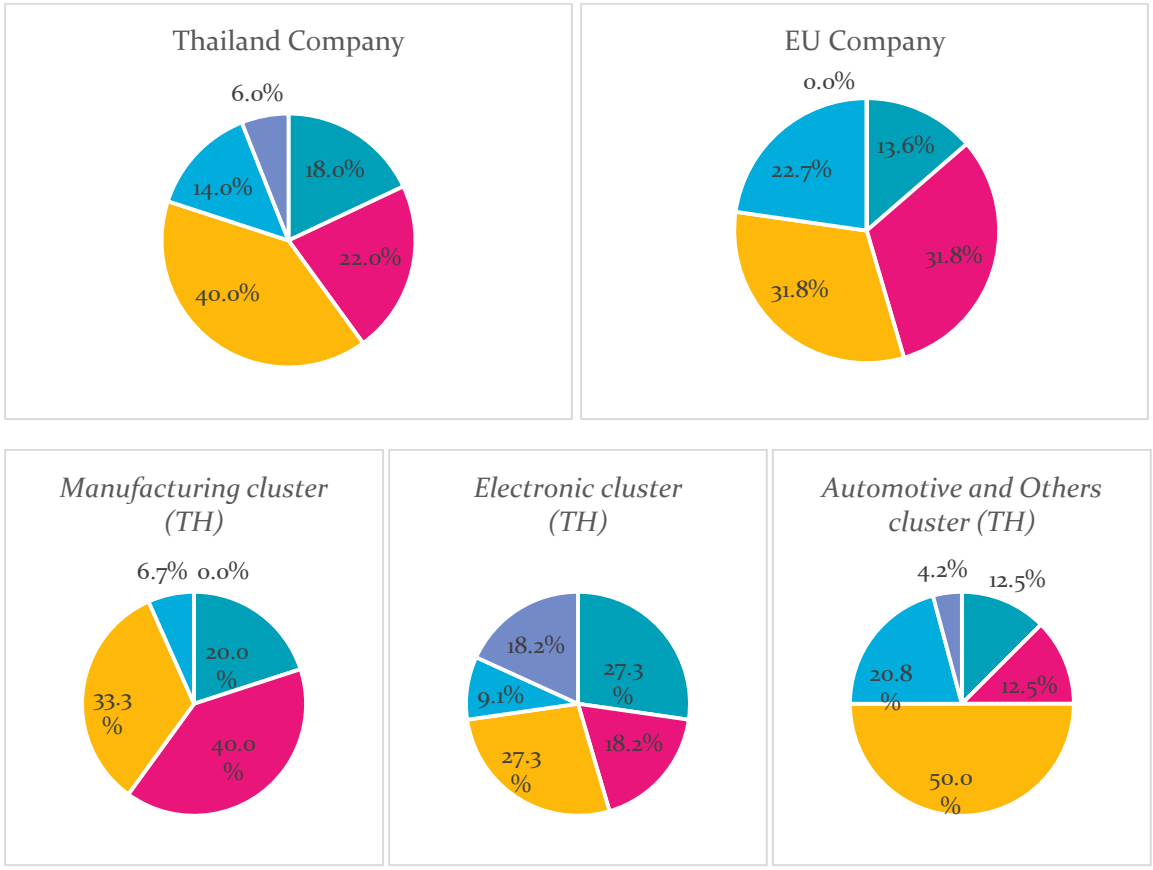
- 5 (Digital sales approach - Sales force is supported by digital devices and access to all relevant processes and systems at real-time access to customer and product data, possibility to configure personalized products & dynamically create orders etc)

Figure 37 Q4.6 How advanced is the digital enablement of your sales force (mobile devices, access to all relevant system anywhere and anytime, full sales process possible at client site)?

Q4.7 To which extent do you analyze customer data to increase customer insight (e. g. personalized offers to customers based on their personal situation, preferences, location, credit score; consideration of usage data for design & engineering etc.)?

☐ 1 (Trivial data usage - Information is kept decentralized and in an unsystematic way by single units and is not analyzed further for, e.g. sales orders in excel sheets)
☐ 2 (Non trivial data usage – Some Information is kept centralized and in an systematic way by single units and is analyzed further for, e.g. sales orders in both files and excel sheets)

☐ 3 (Medium data usage - Main data collection are kept centralized and in an systematic way by single units and is analyzed further for, e.g. sales orders)
☐ 4 (High data usage – Most data collection are kept centralized in integrated systems to review products, sales and customer experience)
☐ 5 (Substantial data usage - Extensive data collection at all touch points that is fed into integrated systems to monitor, review and optimize products, sales and customer experience)

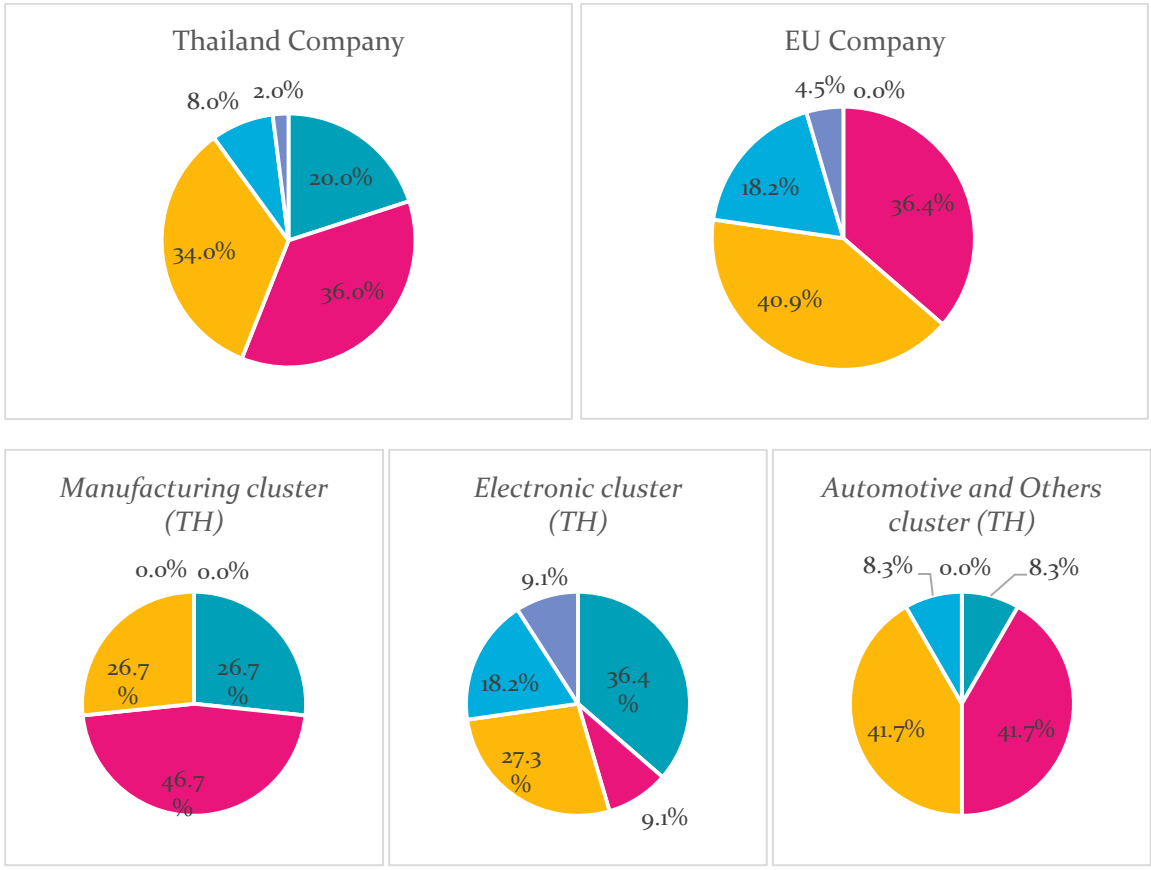


- 1 (Trivial data usage - Information is kept decentralized and in an unsystematic way by single units and is not analyzed further for, e.g. sales orders in excel sheets)
- 2 (Non trivial data usage - Some Information is kept centralized and in an systematic way by single units and is analyzed further for, e.g. sales orders in both files and excel sheets)
- 3 (Medium data usage - Main data collection are kept centralized and in an systematic way by single units and is analyzed further for, e.g. sales orders)
- 4 (High data usage - Most data collection are kept centralized in integrated systems to review products, sales and customer experience)
- 5 (Substantial data usage - Extensive data collection at all touch points that is fed into integrated systems to monitor, review and optimize products, sales and customer experience)

Figure 38 Q4.7 To which extent do you analyze customer data to increase customer insight (e. g. personalized offers to customers based on their personal situation, preferences, location, credit score; consideration of usage data for design & engineering etc.)?

Q4.8 How far do you want to collaborate with partners regarding your approach of accessing customers (exchange of customer insights, coordination of marketing activities etc.)?

☐ 1 (Not at all - No collaboration with partners in approaching customers, e.g. separate customer databases and no coordination of marketing or sales activities)
☐ 2 (Somewhat – Some collaboration with partners in approaching customers for coordination of marketing or sales activities)
☐ 3 (Medium - Some collaboration with partners in approaching customers databases for some coordination of marketing or sales activities and production activities)
☐ 4 (Somewhat Unified approach – Customer access approach is partly backed up along with the partner network, e.g. common customer ID with partners and use of partner data)
☐ 5 (Unified approach – Customer access approach is completely backed up along with the partner network, e.g. common customer ID with partners and use of partner data)



- 1 (Not at all - No collaboration with partners in approaching customers, e.g. separate customer databases and no coordination of marketing or sales activities)
- 2 (Somewhat ï€“ Some collaboration with partners in approaching customers for coordination of marketing or sales activities)
- 3 (Medium - Some collaboration with partners in approaching customers databases for some coordination of marketing or sales activities and production activities)
- 4 (Somewhat Unified approach ï€“ Customer access approach is partly backed up along with the partner network, e.g. common customer ID with partners and use of partner data)
- 5 (Unified approach ï€“ Customer access approach is completely backed up along with the partner network, e.g. common customer ID with partners and use of partner data)

Figure 39 Q4.8 How far do you want to collaborate with partners regarding your approach of accessing customers (exchange of customer insights, coordination of marketing activities etc.)?