

The International Maritime Transport and Logistics Conference  
"Marlog 10"

# Digitalization in Ports & Maritime Industry



## A Systematic Literature of the Maritime Transport Industry 4.00 Applications

Dr. Khaled EL Sakty

Dean – College of International Transport and Logistics

Dr. Mona Awad

Researcher – Maritime Research and Consultation Centre





<b>contents</b>	Introduction	1
	Research Questions & Strategy	2
	Industry 4.00 Applications in Maritime Transport	3
	Industry 4.00 Methodologies in Maritime Transport	4
	Conclusions & Recommendations	5





## 1. Introduction

- Maritime transport characteristics.
- Attention has given using different methodologies.
- i.e. efficiency, safety, environment, security, productivity, etc.
- C.-G.C. trend.
- Competition forms.
- Integrated systems, analytical applications, and fast communication.
- Real-time transmission of information, visualization.





Volume  
11.8 billion tones



Ships  
98,140 commercial ships



Containers  
811.2 million TEUs

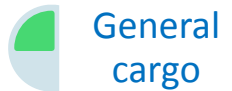
## World Maritime Profile 2020



## Ships Built (2001 vs. 2017)



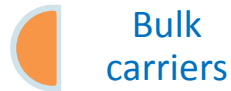
Oil tankers  
9 times bigger



General cargo  
3 times bigger








Containers  
4 times bigger

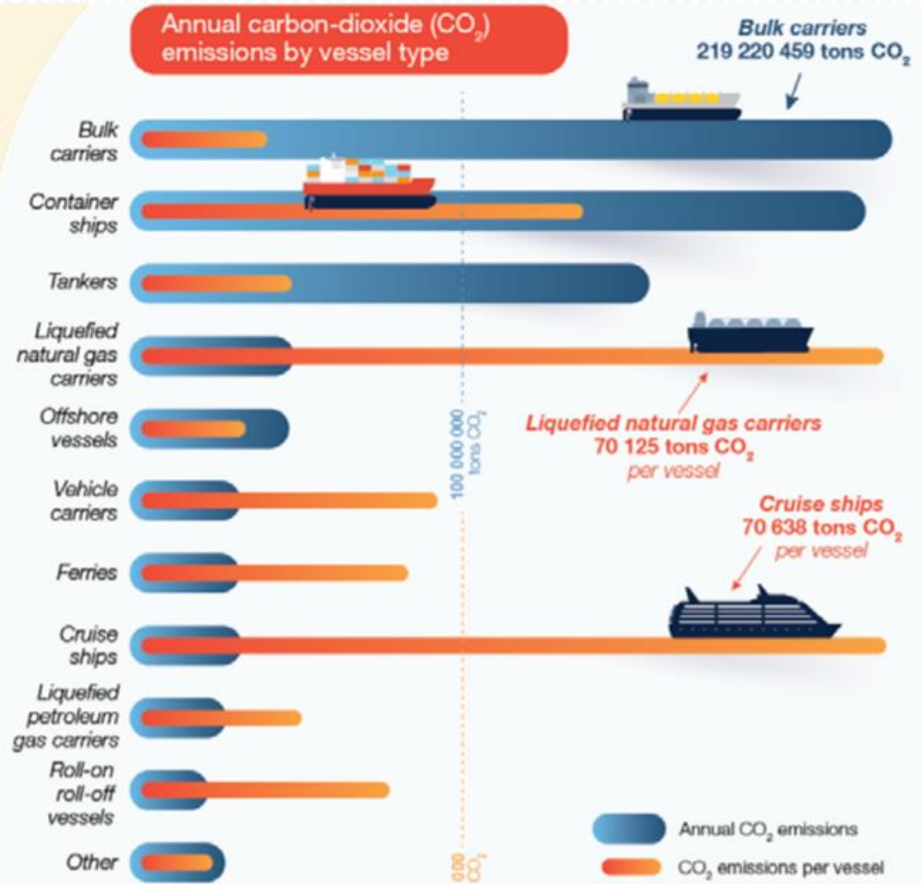


Bulk carriers  
2 times bigger

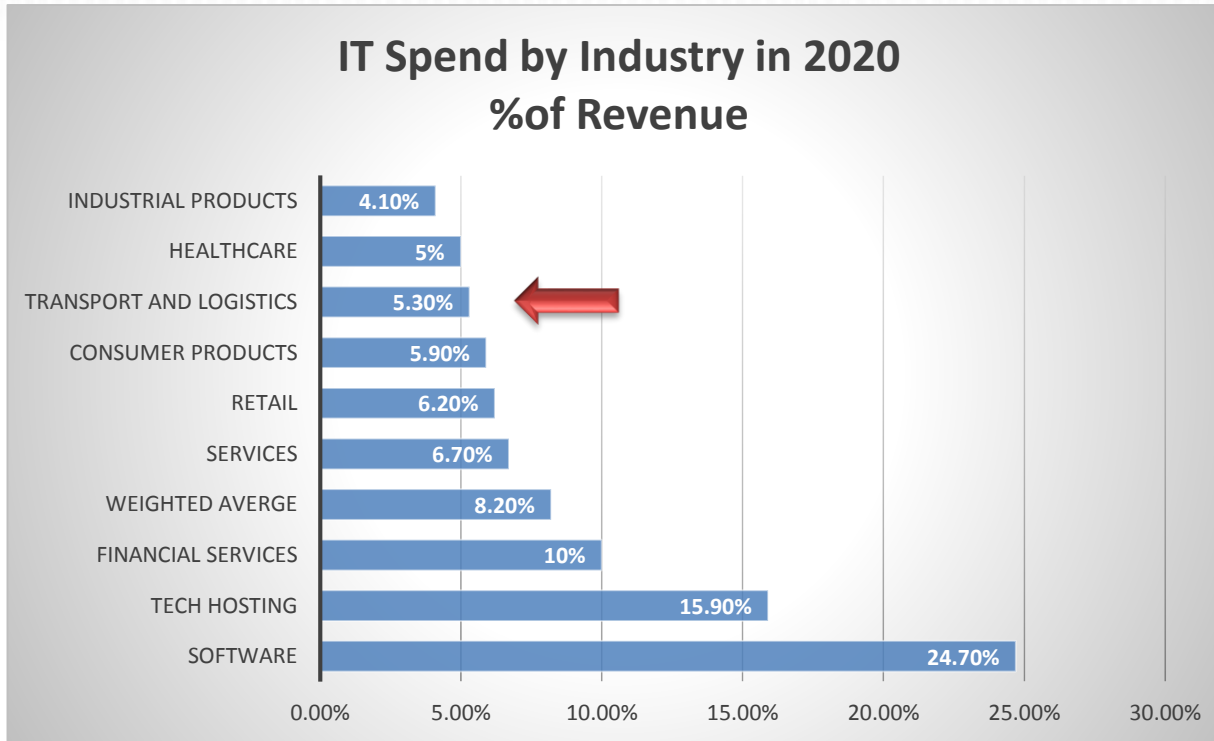




-  Median time in port  
**0.966 day**
-  Average age of vessels  
**18 years**
-  Average size of vessels  
**14,980 gross tons**
-  Maximum size of vessels  
**234,006 gross tons**
-  Maximum container carrying capacity of vessels  
**23,756 TEUs**



Source: UNCTAD, 2020.



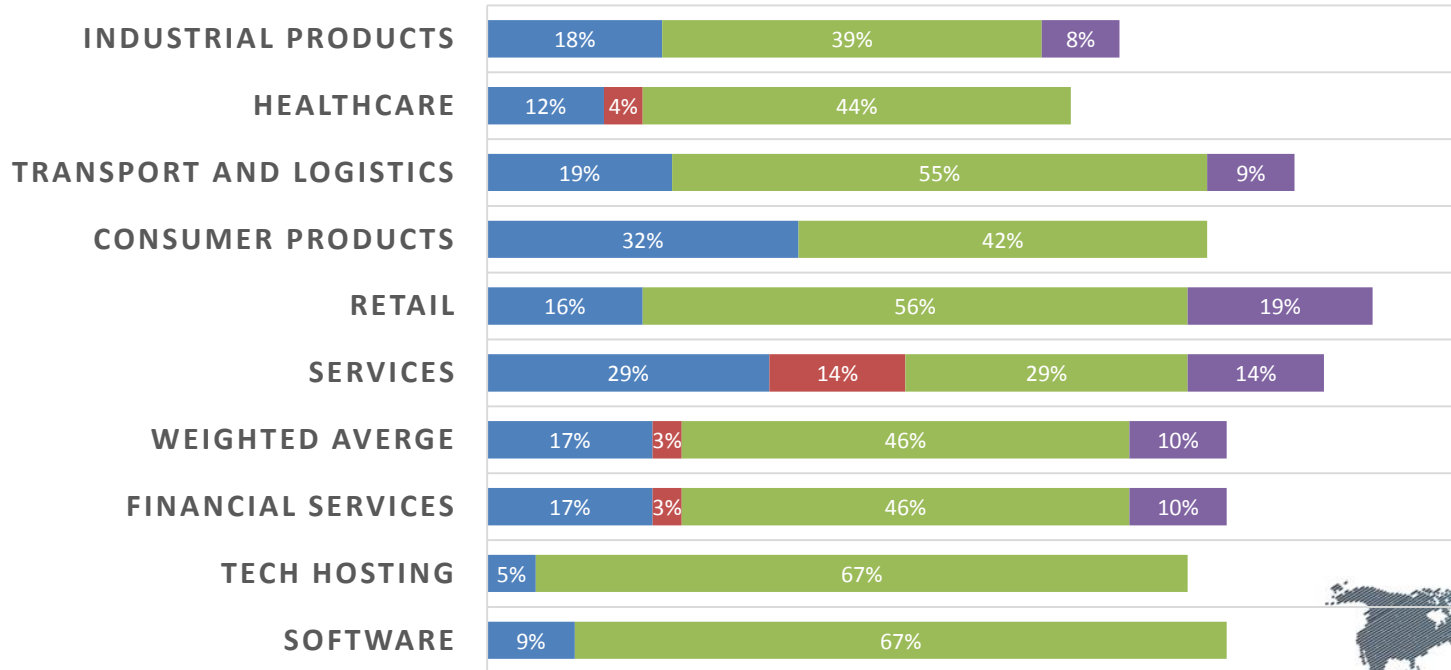
Source: Flexera, 2021.





## CHANGE IN IT SPEND

■ Slight decrease ■ Significant decrease ■ Slight increase ■ Significant increase

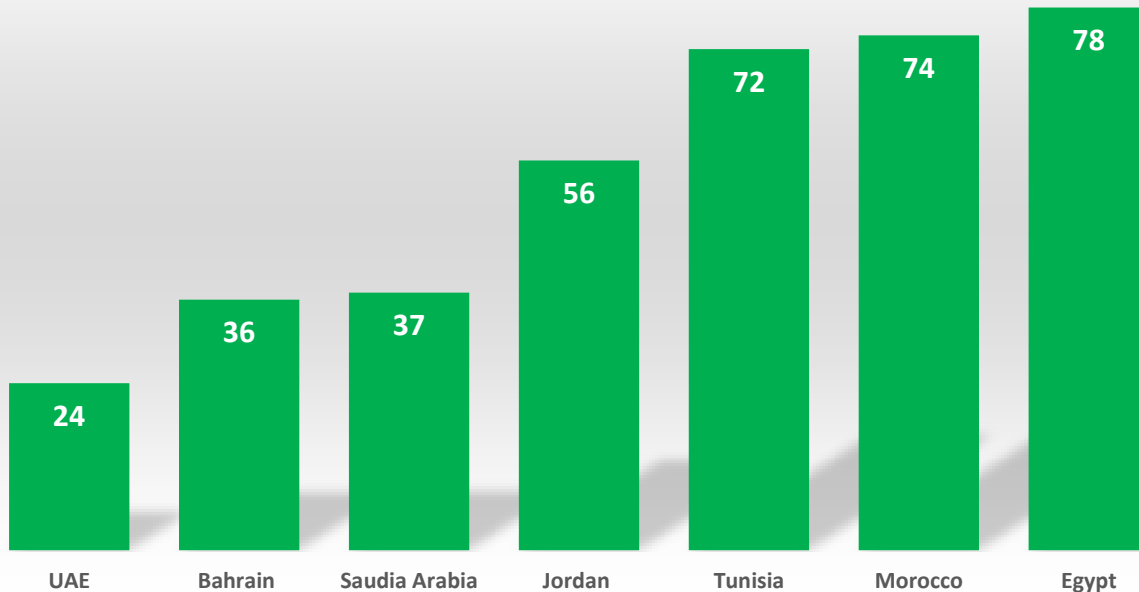


Source: Flexera, 2021.





### World Ranking of Digital Intelligence Index 2021



Source: TUFTS, 2021.





## 2. Research Questions & Strategy



- ✓ To what extent the implementation of the industry 4.00 applications takes place in maritime transport?
- ✓ What are the various methodologies applied?
- ✓ What are the data analysis techniques implemented the industry 4.00 applications?





1. To what extent the implementation of the industry 4.00 applications takes place in maritime transport?

## QUESTION ONE



## Industry 4.00 in Maritime Transport



1<sup>st</sup> Generation

Paperless  
procedures

2<sup>nd</sup> Generation

Automated  
procedures

3<sup>rd</sup> Generation

Smart  
procedures

# Generations of Digital Transformation in Maritime Transport



- Containerization
- Information flows
- Integrated systems
- Port Community System (PCS)

1<sup>st</sup> Generation  
1960-1980

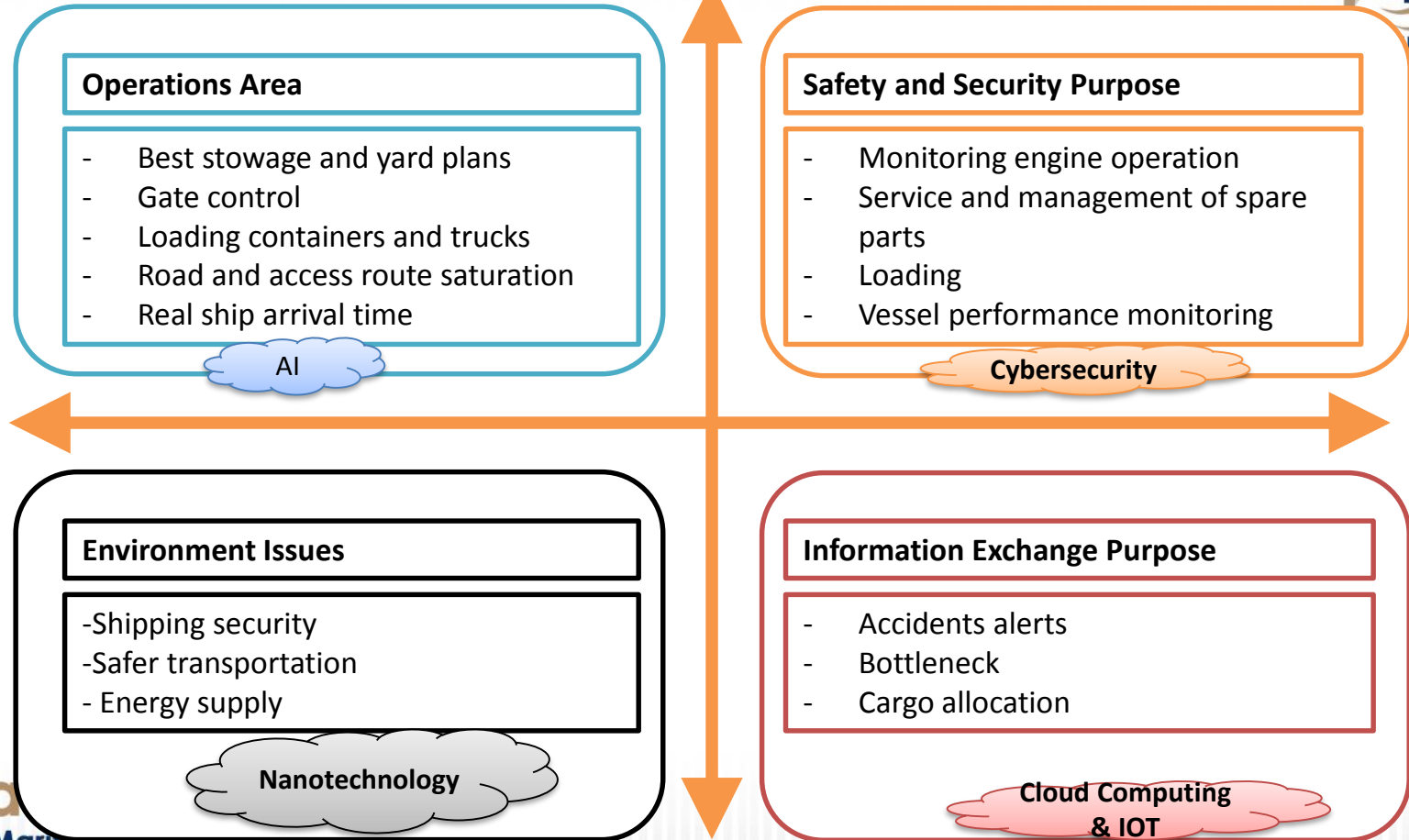
- E-commerce systems
- Single window system
- Vessel Traffic Service (VTS)
- Automatic identification systems(AIS)
- Truck appointment system(TAS)
- Radio-frequency identification (RFID)

2<sup>nd</sup> Generation  
1990-2009

- Port-centric decision support
- value-added information services
- Mobile Technologies
- Sensors/Actuators
- Cloud Computing
- Distributed Computing
- Machine Learning

3<sup>rd</sup> Generation  
2010-2015

The Applications of Industry 4.00 in different maritime Transport Aspects in 2021





2. What are the various methodologies applied?

## QUESTION TWO



## Phase I



- Researches with high impact factor in the maritime transport sector:
  1. 3000 “open access” journals.
  2. More than 300,000 book series.
  3. Main digital libraries such as Taylor and Francis, springer link, El Savier, and science direct.



## Phase II

# 40 Industry 4.00 Applications



1	Internet of things IoT	21	Business Analytics,
2	Artificial intelligent	22	Green Information Technology
3	Nanotechnology	23	Automated Guide Vehicle
4	Digital supply chain	24	Building Information Modelling
5	Blockchain	25	CPS Cyber-physical systems
6	Cloud computing	26	Fibber Bragg Grating.
7	Deductive manufacturing	27	Integrated Supply Chain Management.
8	5G	28	Low Power Wide Area Networking.
9	Cybersecurity	29	Machine to Machine.
10	Smart Assets Management	30	Radio Frequency Identification.
11	Energy Solutions	31	Remotely Piloted Aircraft Systems.
12	Drones, robotics, and automation	32	Real-Time Locating System.
13	Augmented Reality	33	Ship Information Management Systems
14	Virtual Reality	34	Wireless Sensor Networks.
15	Machine Learning	35	Location Detection technologies (LDs),
16	Horizontal and Vertical System Integration (HVSI)	36	Mobile devices (MDs),
17	3DP & AM	37	Multilevel Customer Interaction (MCI),
18	Simulation and Modelling	38	Customer Profiling (CP)
19	Additive Manufacturing (AM)	39	Smart Sensors (SSs).
20	Big Data (BD)	40	Green logistics



Source: developed by the authors, 2021.



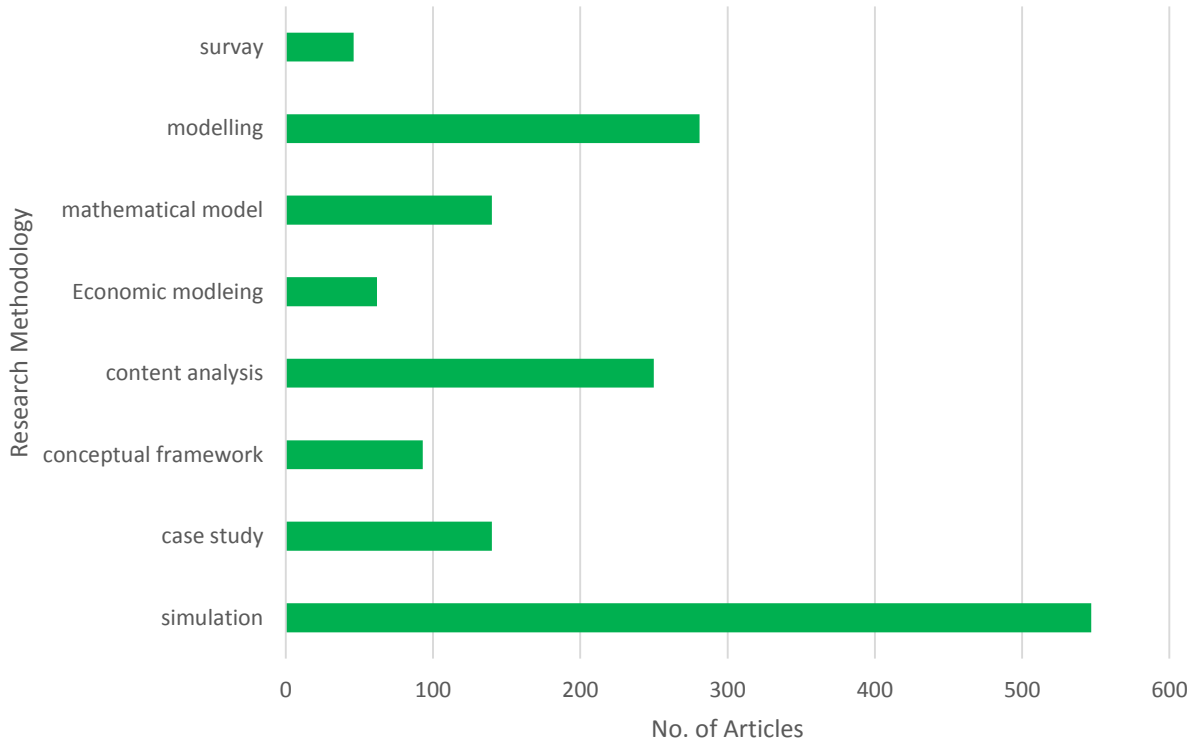
## Phase III Study Selection



- Criteria:
  1. The researchers and applications should be related to the application of industry 4.00 in the maritime sector.
  2. The papers preferred to be written in the English language.
  3. They should be published in a scientifically indexed journal.
  4. Non-peer-reviewed articles, white paper, technical report, abstract, short paper, and Books are excluded.
  5. 1,564 articles starting from 2014 until 2018.

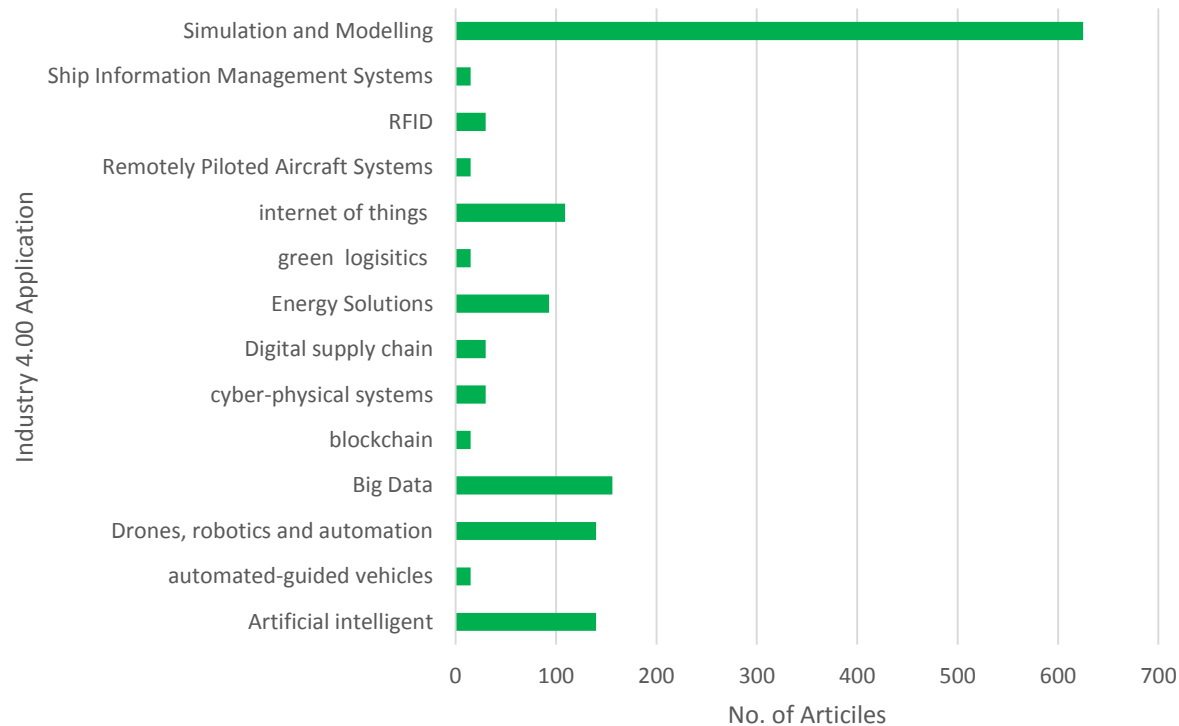


## The Most Applied Research Methodologies in a Maritime Transport



Source: developed by the authors, 2021.

## Industry 4.00 Applications in a Maritime Transport



Source: developed by the authors, 2021.



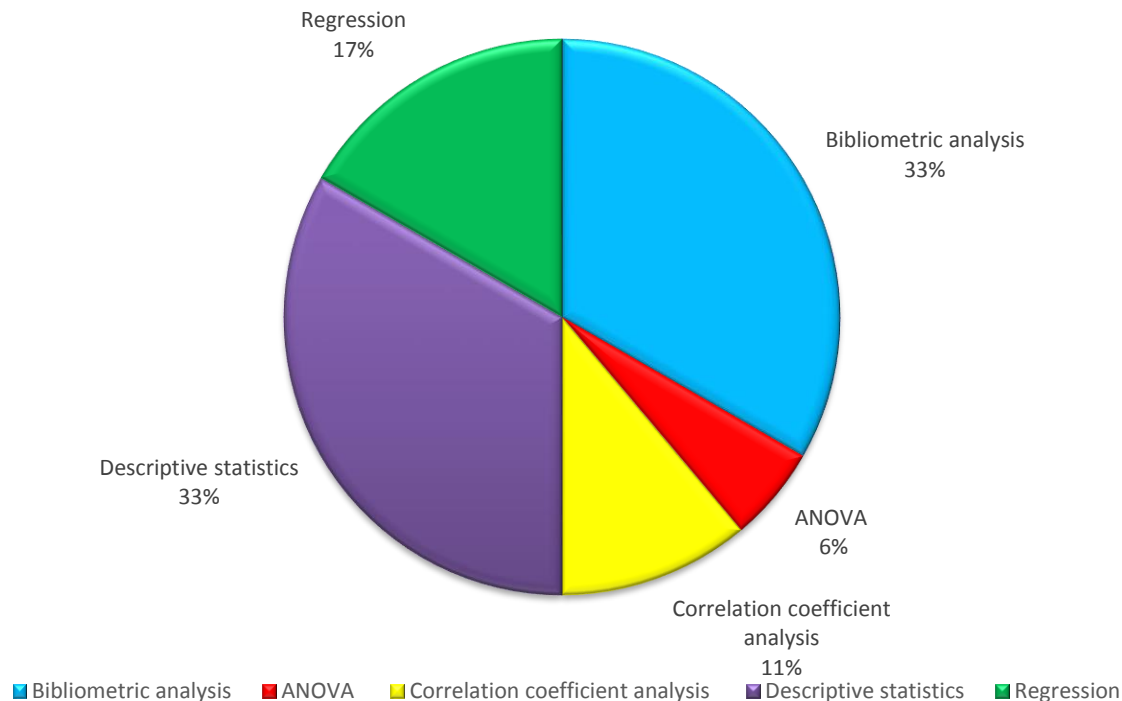
3. What are the data analysis techniques implemented the industry 4.00 applications?

## QUESTION THREE





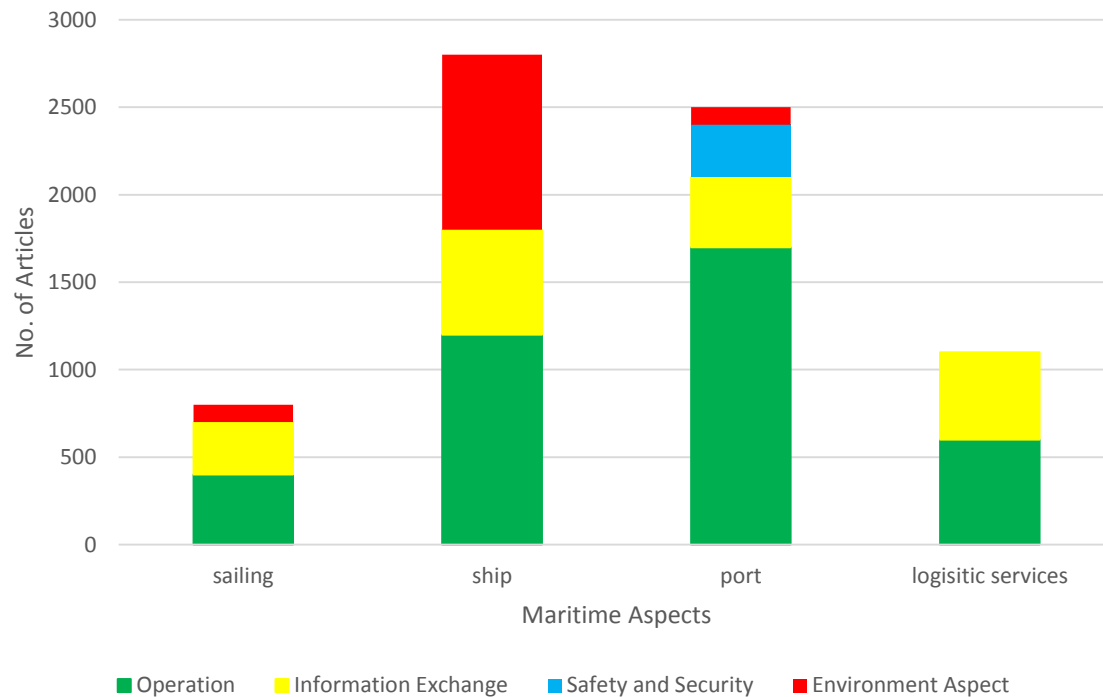
## Data Analysis in a Maritime Transport



Source: developed by the authors, 2021.



## Applied Researches in Maritime Aspects

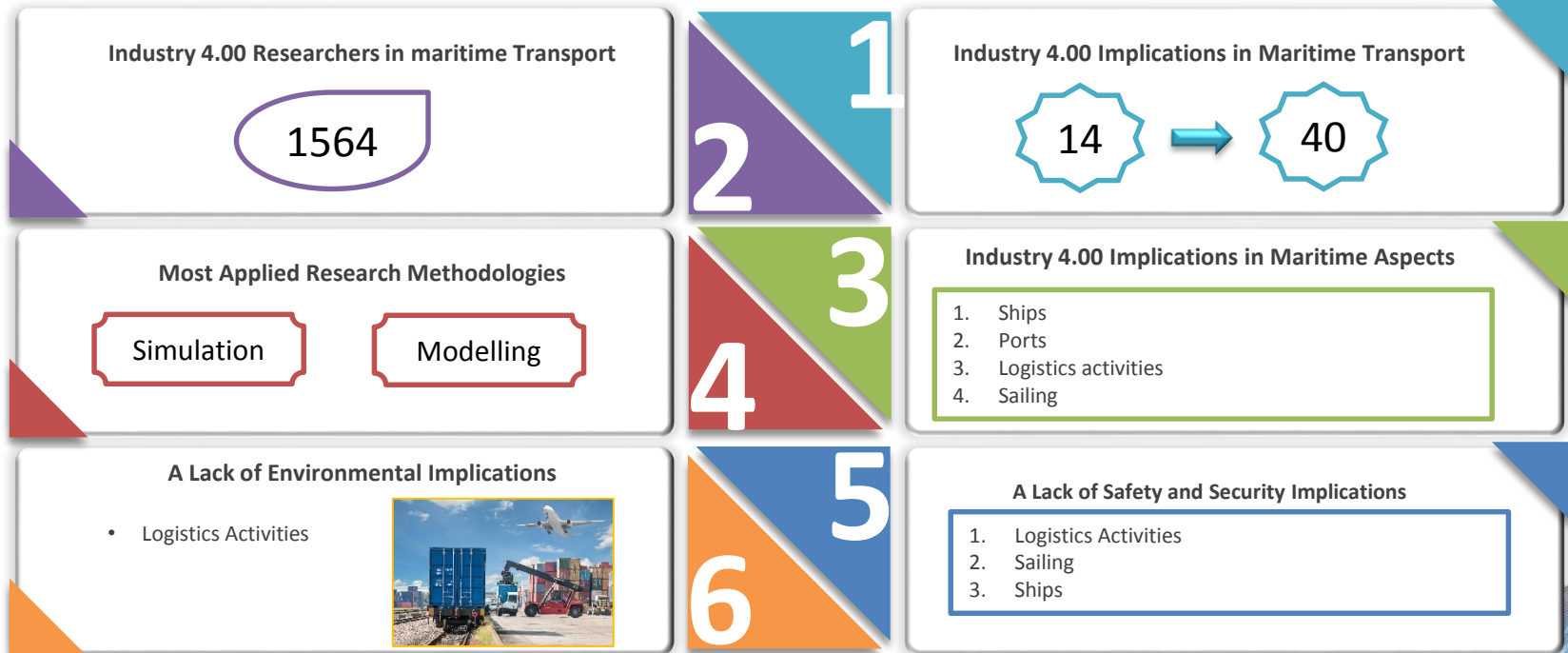


Source: developed by the authors, 2021.





## 5. Conclusions

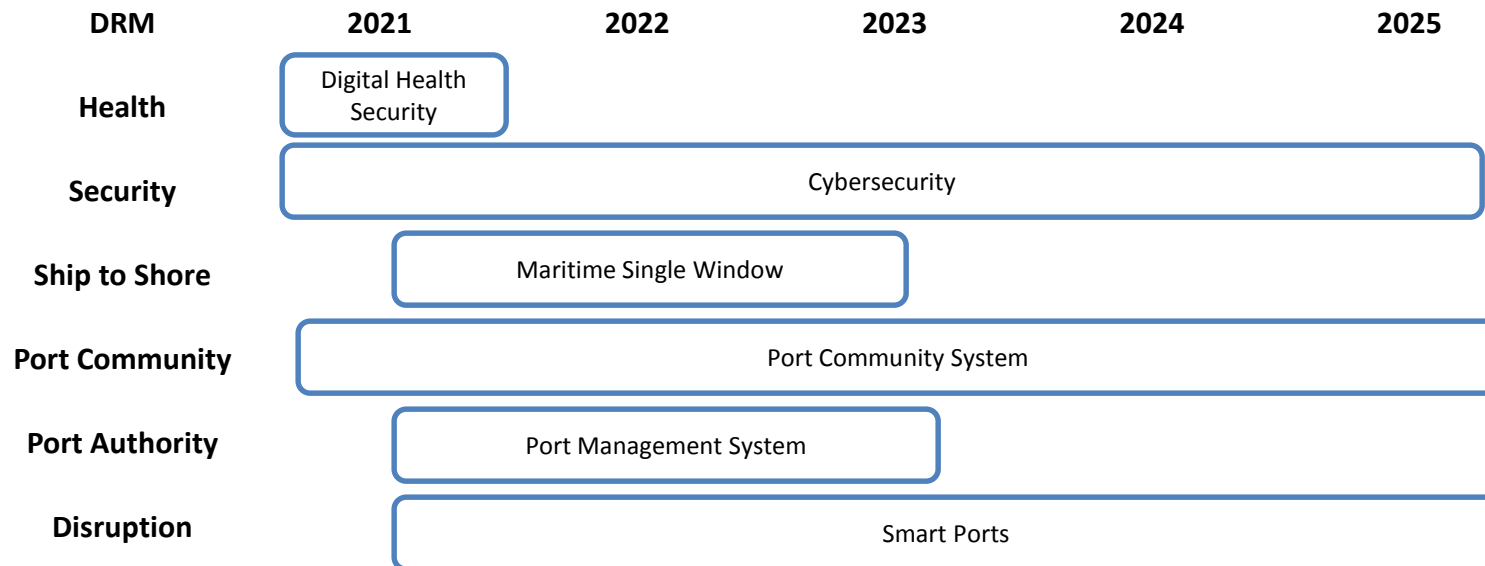


# Industry 4.0 and the Emergence of Logistics 4.0

## Digitization Road Map



Recommendations







The floor is yours

**THANKS FOR LISTENING**

