IACS 24th JWG/CS meeting
Tuesday, 11 April 2023

What data quality recommendation do we need? -from ship owner's perspective-

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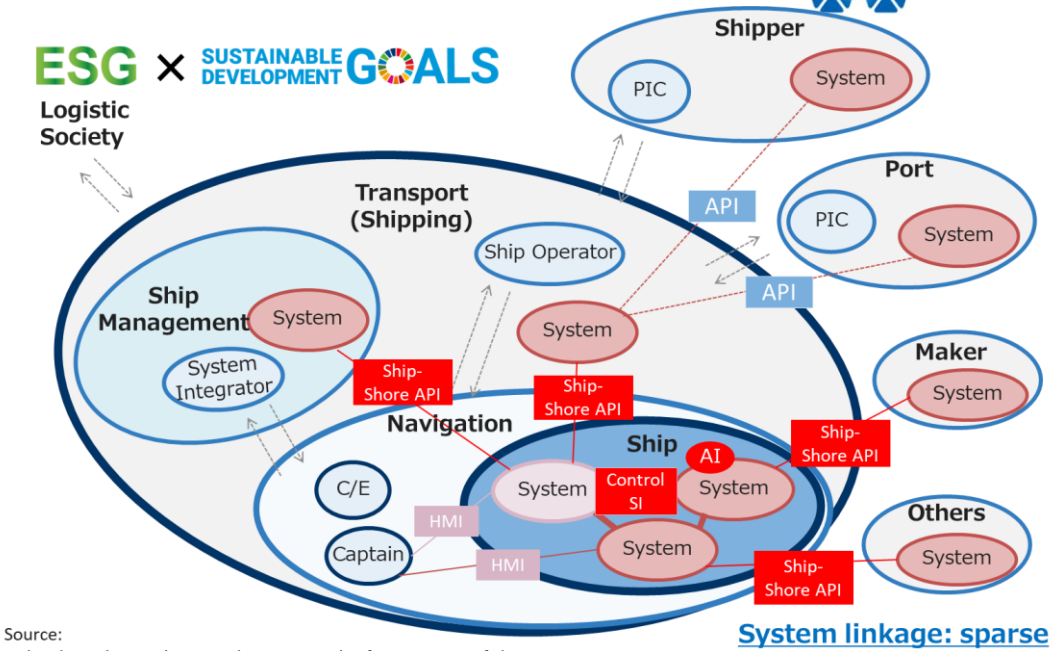
A Member of SSAP SMART SHIP APPLICATION PLATFORM

Introduction

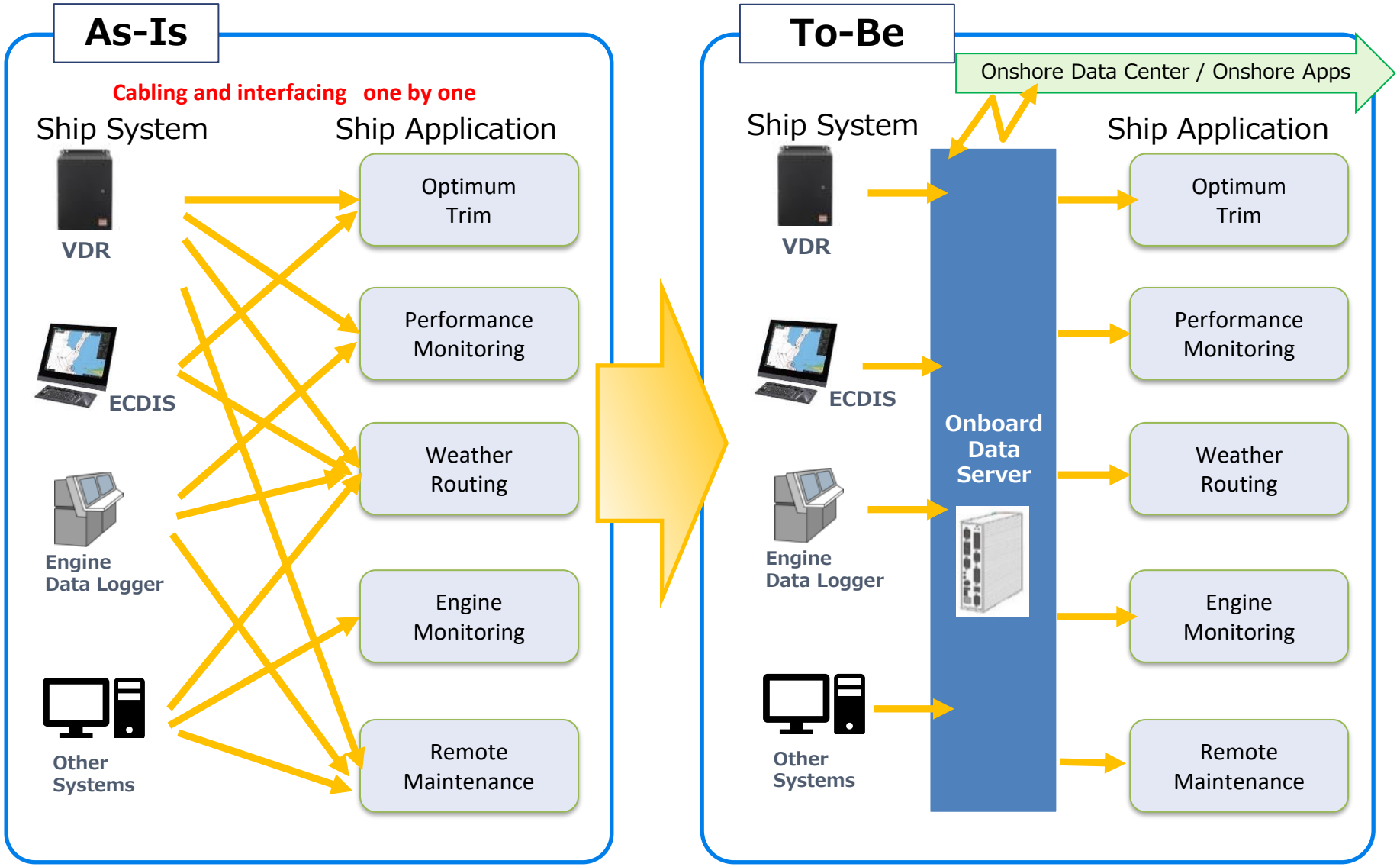
- The future of ship system will be very much linked to other part of supply chain system (Smart Ship).
- The concept of Smart Ship is to utilize various data and applications to achieve optimum ship operation in terms of safety and energy efficiency.
- Effort to realize the open platform concept for data sharing in maritime industry is steadily progressing.
- The quality of data will become as important as what data is being collected and shared and how the data being collected



Source:
Hideyuki Ando, -Sophisticated systems and safe navigation of ships-
MTI Techno Forum, Hiroshima, 2019

- In Japan, shipping companies have been discussing and responding to the question of how to manage ship data quality for the past several years.
- Today, as member of Smart Ship Application Platform project (SSAP) we would like to introduce our efforts in ship data quality management from the viewpoint of shipping companies.
- We are planning to use this initiative as a basis for discussions on data quality management in the SSAP, involving shipyards, shipbuilders, equipment makers, maritime solution providers as well as classification societies.
- We hope that the contents of today's presentation can be of reference in order to make the IACS data quality recommendation guidelines more realistic and better in the future.

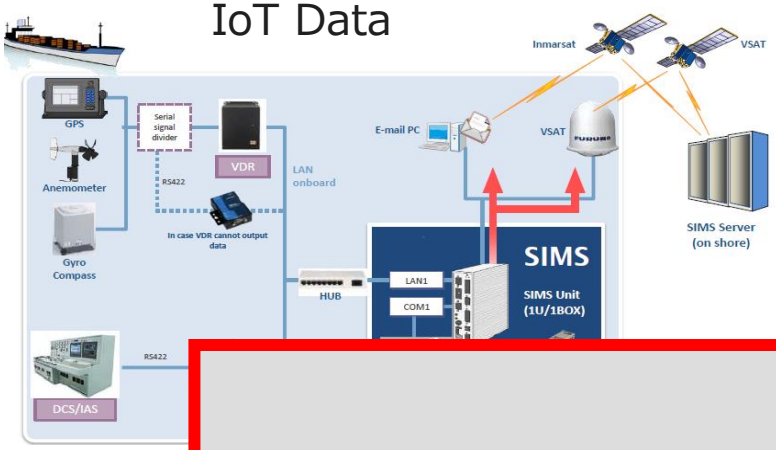
Standardized IoS Platform (ISO 19847, 19848)



Source : JSMEA

Data can be used for many things, more when combined

IoT Data



Data Viewer Application

Data Analytics Application

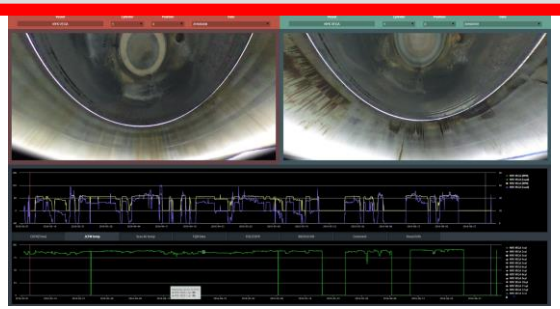
Everyone knows the potentials
Many seems to knows what are the bottleneck
Many seems to not realize where the problem lies
Everyone want to solve the problem

Cr

many value-added
ctivities

al SMS

Onboard tools



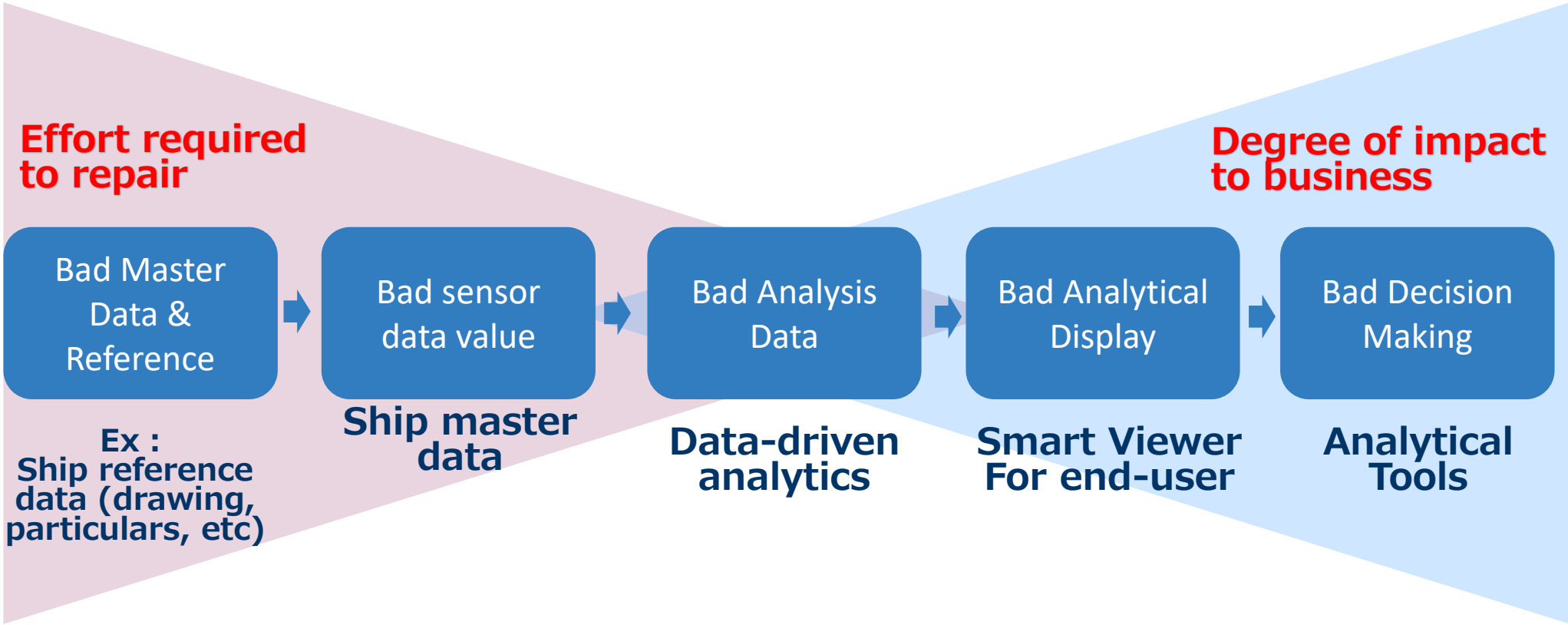
CHAPTER 2

Pain points: actual data quality problem

SSAP
SMART SHIP APPLICATION PLATFORM

What separates dreams from reality: Data Quality

Data Error Chain → Data collection and input errors in the top level affect Decision Making.



Garbage In ≈ Garbage Out

If the data source is incorrect, the Wrong and unnecessary data will accumulate day by day.

Data quality issues (Bad Master data)

Even if the data sent from the ship is correct, the calculation data using it will also be deranged due to the mistake of the master data input.

For example, if MCR (kW) of main engine is wrong, value of the main engine load(%) is

Correct) Actual horsepower 16,000 kW ÷ 18,310 = **87%**

False)　Actual horsepower 16,000 kW ÷ 28,310 = **57%**

There will be a big difference.

1

Model	Number of Unit	9	Type I	X	Bore 82
	WINGD(WARTSILA) DU W 9X82				
Number	1	sets			
1) M/E MCR	18,310.00	kW	38,491	PS	
1) MCR RPM	65.3	RPM			

Mistaken for 28,310kW

2

Boiler

Manufacturer	OSAKA BOILER MFG
Operating Pressure	6 kPa

Mistaken unit for 6bar?

3

Main Engine

Type	Diesel			
Licenser	J-ENG(MHI)			
Licensee	MHI			
Model	Number of Unit	Type I	Bore	
	6	UEC	60	
	J-ENG(MHI) MHI 6UEC60LSII			

Mistaken for a six-cylinder?

4

Propeller

Manufacturer	Number		sets
Pitch	Diameter	58,000	mm

5,800mm and single-digit typo?

Data quality issues (Bad Sensor Metadata)

① Both channels are named M/E No.1 AUX BLOWER (auxiliary blower), but channel40240 indicates “auxiliary blower is RUN or STOP”. The lower channel indicates “auxiliary blower is normal or abnormal”. When we monitor whether the auxiliary blower is running or not, if we connect/link the lower channel, it will show different movement.

①

40240	M/E NO.1 AUX BLOWER	-	Machinery	Main Engine	Aux. Blower	
45011	M/E NO.1 AUX BLOWER	-	Machinery	Main Engine	Aux. Blower	

Data quality issues (Units, Digits issues)

As the data, pressure unit may be MPa or bar, and number of digits such as flow meter, rpm, running hour, shaft horsepower, etc. varies, so it is necessary to unify them into one.

No. ▲	Channel No ▲	Channel Name ▲	Unit ▲	FORMULA ▲
1	0101	M/E FO FLOW COUNT	X10L	[0101]*10
2	0102	M/E CYL OIL FLOW COUNT	L	
3	0104	D/G DO FLOW COUNT	L	
4	0105	AUX BOILER FO FLOW COUNT	X10L	[0105]*10

Channel No ▲	ALL	Channel Name ▲	Unit ▲	2022/07/20 11:59:59
MT003	☐	METHANOL FUEL SERV. TANK LEVEL	M	252
MT004	☐	METHANOL FUEL SERV. TANK PRESS	bar	13
MT013	☐	METHANOL SERV. TANK TEMP	°C	314
GE112	☐	NO.1 G/E L.O PRESS	MPa	538
GE113	☐	NO.1 G/E T/C L.O PRESS	MPa	353

Channel No *Channel No* Name *Channel Name* Unit *Channel Unit*

Channel No ▲	ALL	Channel Name ▲	Unit ▲	2022/07/20 11:59:58
0914	☐	M/E SCAV AIR P	MPA	0.054
0916	☐	M/E NO.1 T/C TACHOMETER	X10MIN-1	562
0917	☐	M/E NO.2 T/C TACHOMETER	X10MIN-1	-27
0918	☐	M/E NO.3 T/C TACHOMETER	X10MIN-1	560

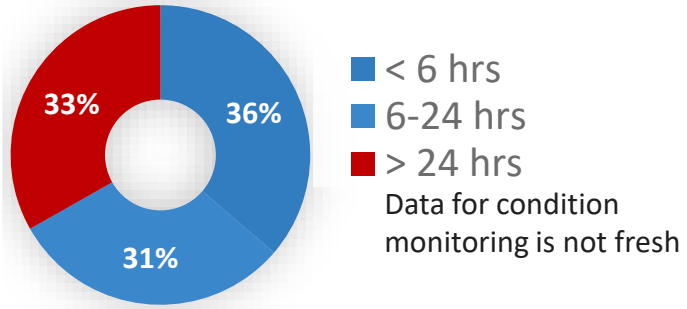
Data quality issues: Just a bad sensor value

To develop solutions, we need to know what we are up against

[1] Misleading ship information.

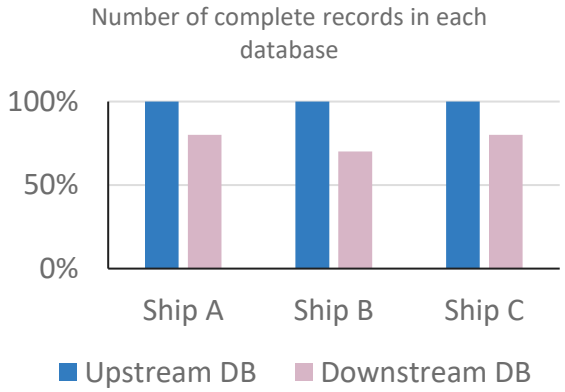
Affect commercials decision in scheduling

[2] Data transmission delays.



Affect robustness of data-driven solution

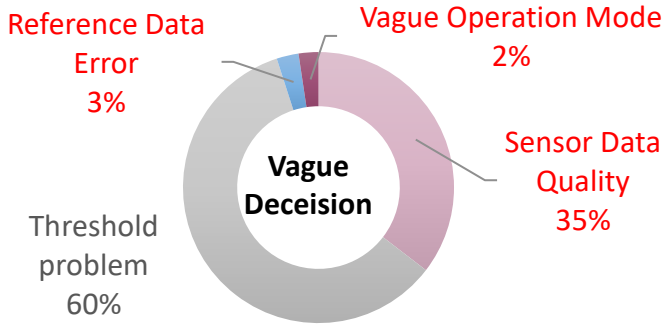
[3] Data inconsistencies between databases.



Confusion amongst different divisions

[4] Decision-making becomes more difficult

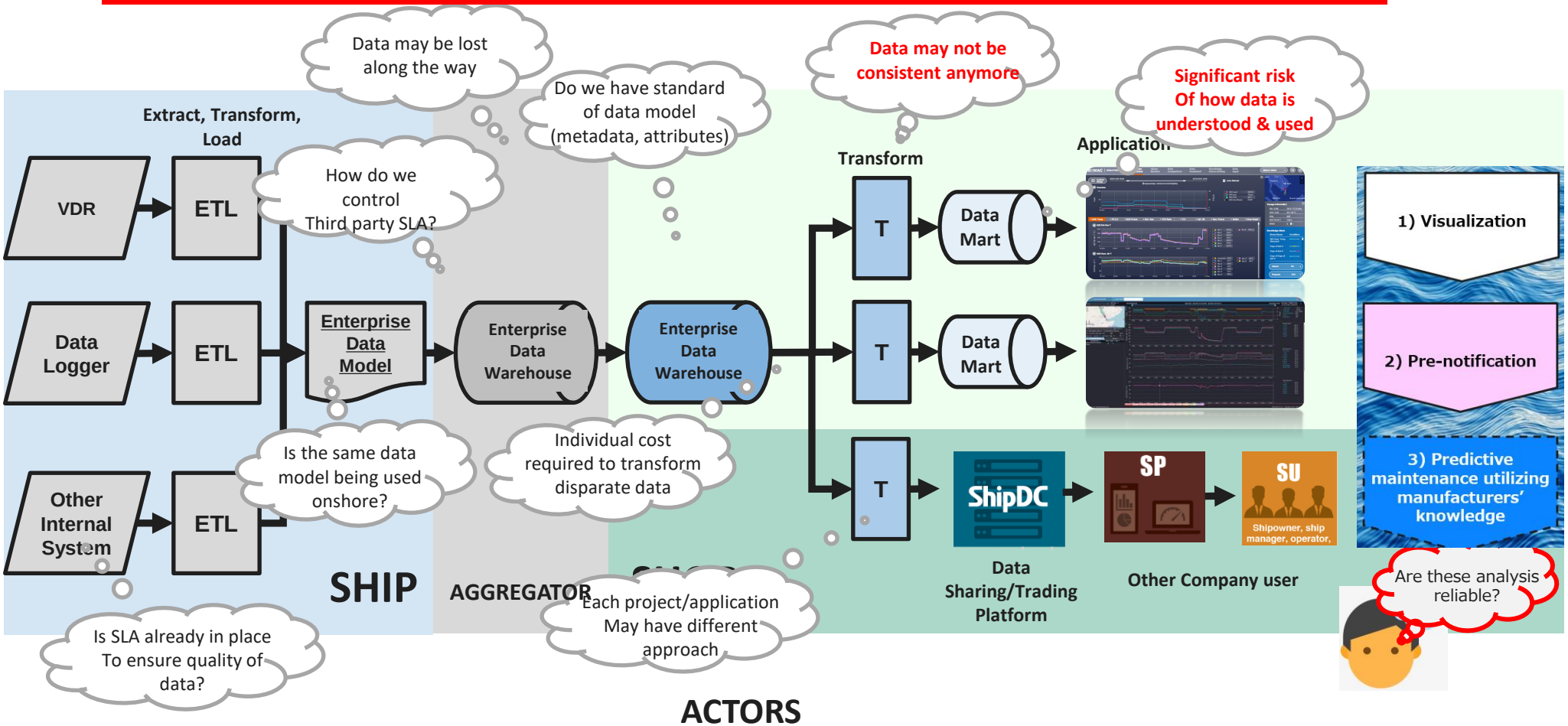
Root causes of unclear maintenance judgment when using poor data



Affect decision making for safety purpose

Data quality problem along the pipeline

It seems that even if we fix in one end, data quality may come up in the other end



ACTORS

Platform User (i.e Data collector) → Extract/Call API → Platform Provider (e.i. Data Aggregator) → Extract/Call API → Solution Provider → Extract/Call API → Solution User

CHAPTER 3

Pain points: standard and framework

SSAP
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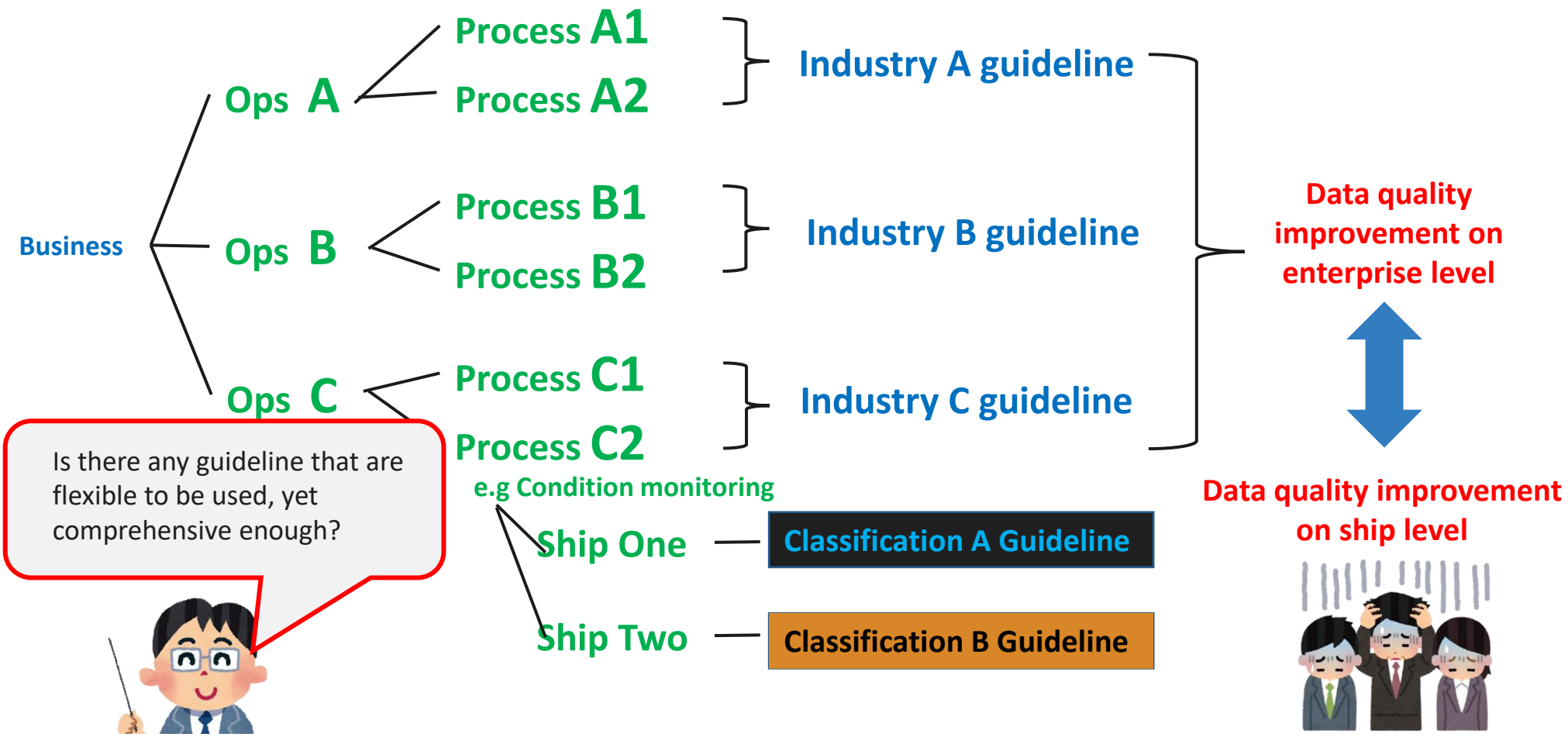
Data Quality Management Framework are confusing

Especially for ship owner/operator, data quality improvement is requiring enormous amount of effort to digest and implement,

due to various, often overlapping or conflicting rules, standard, guideline, and recommendation available



Now that we know the pain, where to start

Rather than reinventing the wheels,
There's already several existing standard for Data Quality, e.g. ISO 250XX & ISO 8000-XX
And a guide to international data management standards and practices such as DAMA DMBoK

ISO/IEC JTC 1 →ISO/IEC 250XX

ISO/IEC 25012 Software engineering -- Data quality model

ISO/IEC 25024 Systems and software engineering -- Measurement of data quality

IEC:International Electrotechnical Commission
JTC: Joint technical committee
TS: Technical specification
ECCMA：Electronic Commerce Code Management Association

ISO TS → ISO8000-XX [by ECCMA]

General considerations

Part 1: Overview	Part 2: Vocabulary
Part 8: Information and data quality: Concepts and measuring	

Data quality management

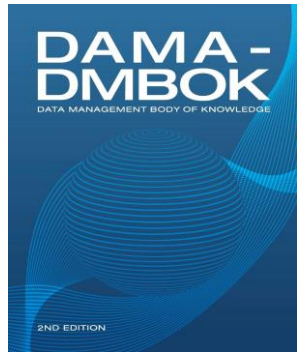
Part 60: Data quality management: Overview
Part 61: Data quality management: Process reference model

Master Data

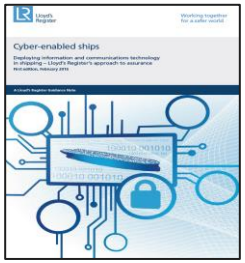
Part 100: Master data: Exchange of characteristic data: Overview		
Part 110: Master data: Exchange of characteristic data: Syntax, semantic encoding, and conformance to data specification		Part 115: Master data: Exchange of quality identifiers: Syntactic, semantic and resolution requirements
Part 120: Master data: Exchange of characteristic data: Provenance	Part 130: Master data: Exchange of characteristic data: Accuracy	Part 140: Master data: Exchange of characteristic data: Completeness
Part 150: Master data: Quality management framework		

Engineering information

Part 311: Guidance for the application of product data quality for shape (PDQ-S)



There's already also several existing Data Quality guideline by classification societies



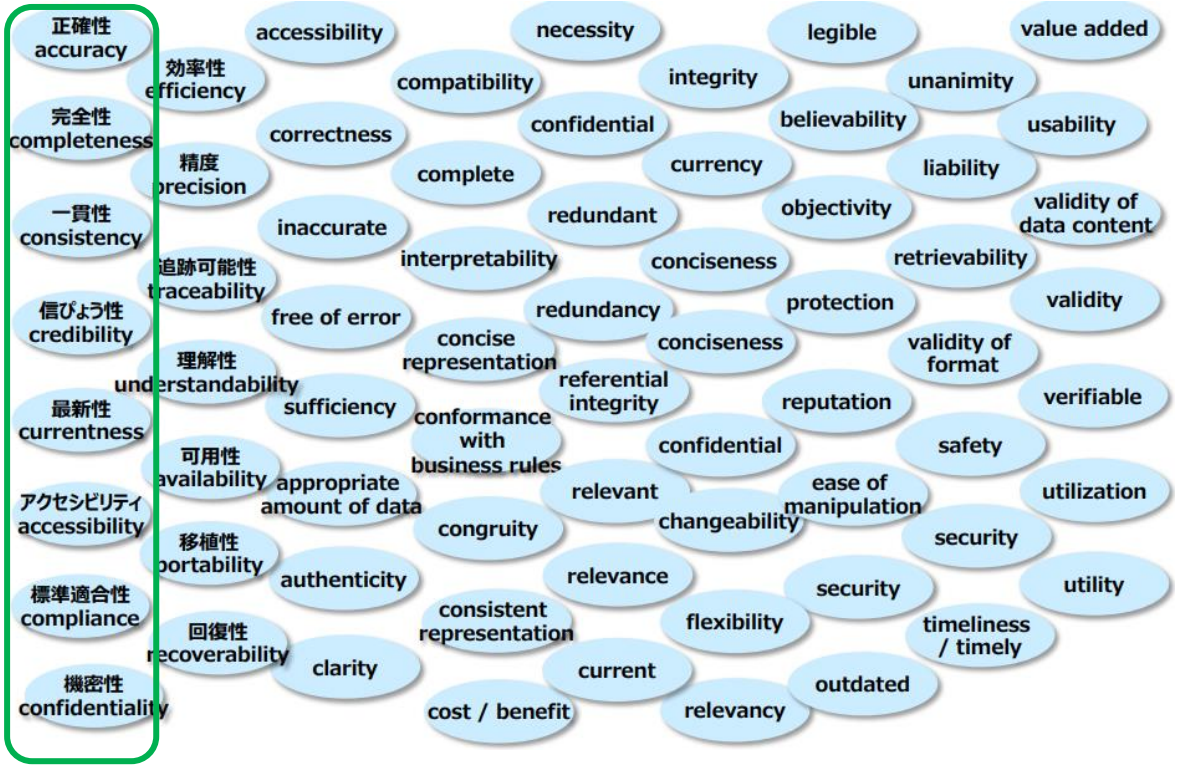
Data quality metrics in various Standards: what to expect

ISO/IEC 25012 has 15 metrics

ISO/IEC 20547-3:
Big data reference architecture
Has 18 metrics

(mostly similar to
ISO 25012 Metrics)

Although there are many in ISO 8000-8.
8 Metrics was mainly recommended



There are many aspects of data quality, and somehow
Each maritime organization may decide on appropriate to use DQ dimensions that impacted their business.
(Business-driven metrics)
However, industry player still need a guidance because metric calculation alone do not solve data quality problem

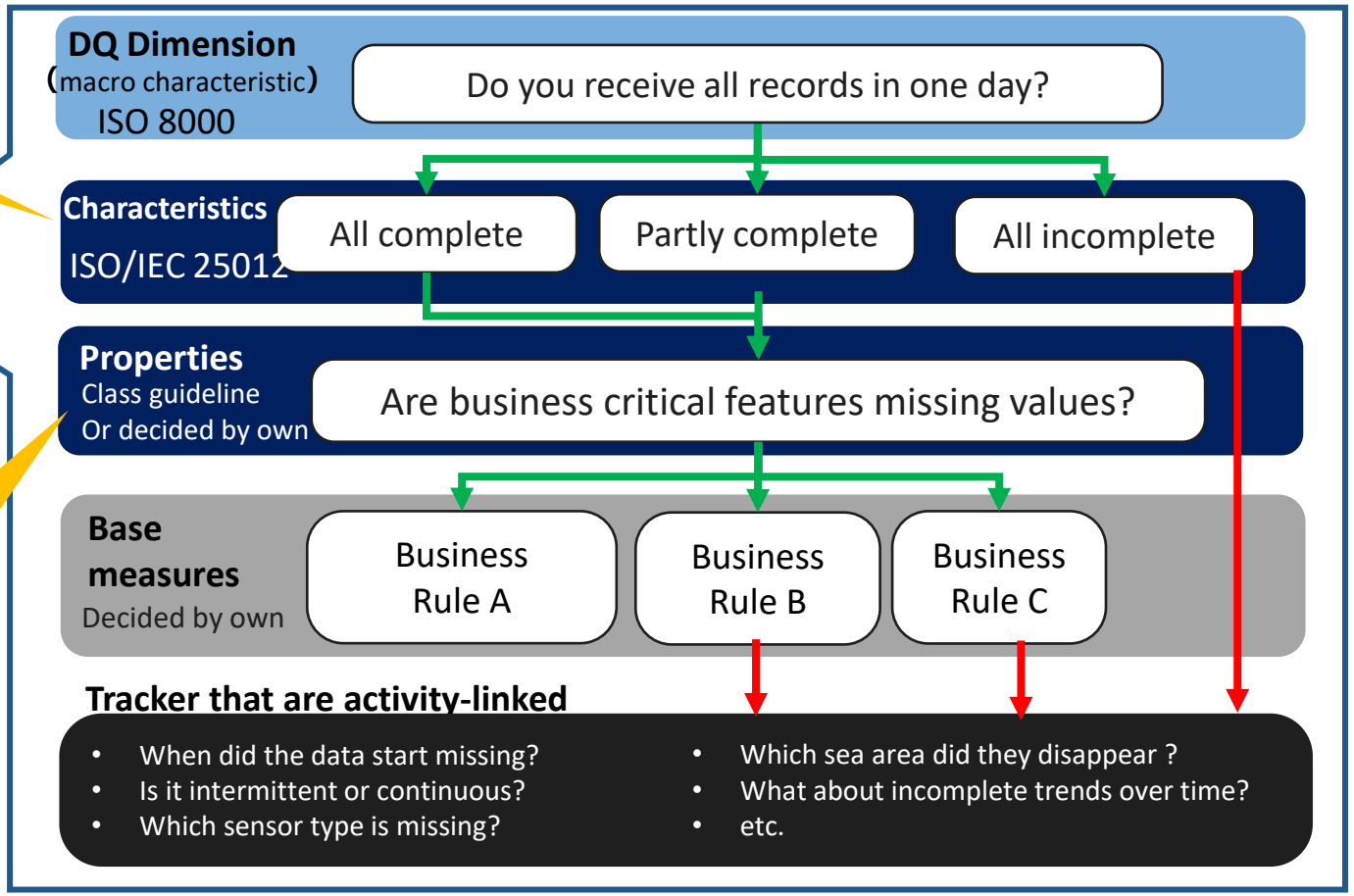
Example of how ship owner currently combine guidelines

Due to non-existence of flexible guideline: Ship owner tends to combine various standards by themselves which are very business driven

ISO's are usually referred until this part

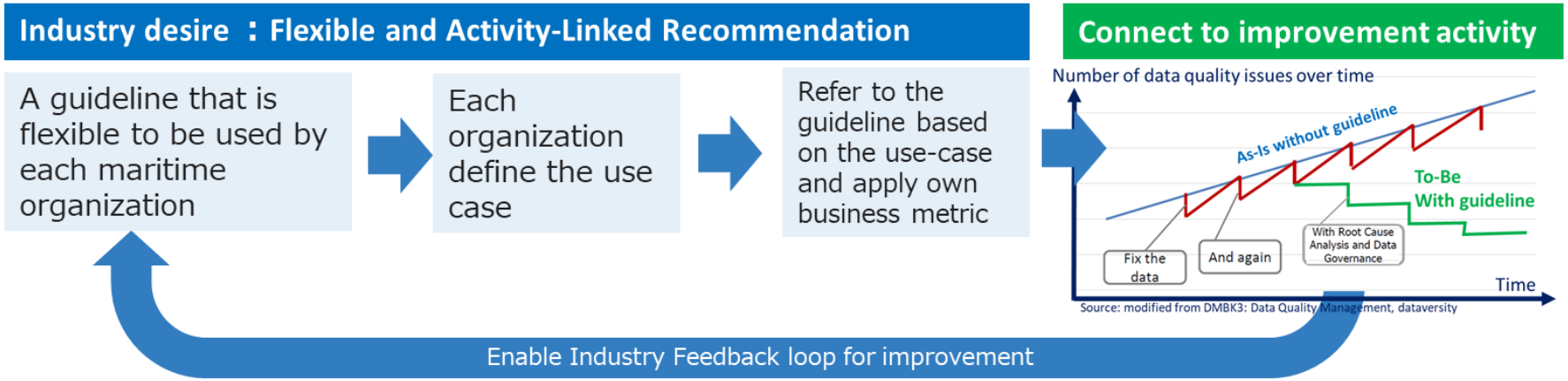
Completeness
Confirm that all required information has been acquired

This part is particularly flexible to be decided on each use case



Conclusion

- Data quality problem can emerge anywhere in the data flow pipeline, from master data to data used by a software solution
- There might be no one-size-fit-all standards to be referred to, but ship owner's need a guidance still (some might already figure it out, some haven't).
- Data quality activity and the reference ISO does not belong only to one or two actors, but rather all actors that utilizes the data.
  - If it's ship owner, maybe ISO 8000 (easier to link to ISO 9000)
  - If it's software company, maybe ISO/IEC 25012
  - If It's AI company, maybe ISO/IEC AWI 5259-2
- **Flexible and Action-Enabled Recommendation is needed**



- We from shipping company side are more than willing to contribute to this activity in order to IACS data quality recommendation guidelines more realistic and better in the future.

Thank you for your attention

Maritime Industry Revolution Through Big Data & IoT Technology

Smart Ship Application Platform