

Best Practices Implementing CoC and Type Approval Data Exchange for Vehicle Manufacturers

Agenda

- Chances for the future: Benefitting from digitalization
- A paradigm shift: Impacts of a digitalized homologation on vehicle manufacturers
- Recommendations from implementing the electronic CoC

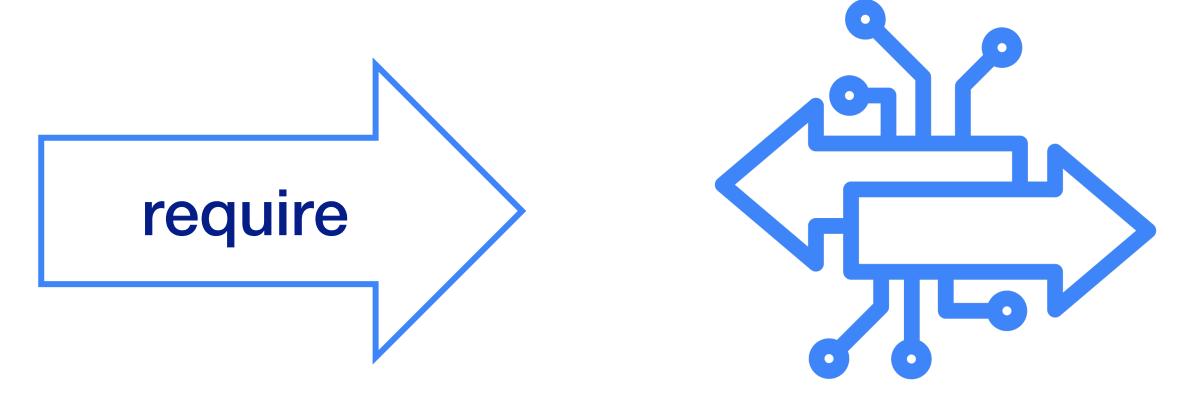


Chances for the future How manufacturers will benefit from a digitalized homologation



Homologation processes will have to be digitalized





digital processes



Digitalized processes bring major improvements



Improved quality through less errors



Quicker processes through less manual work



Higher customer satisfaction through seamless delivery



A Paradigm Shift Moving from paper towards digital data



Human reader vs. Machine reader



Human reader

- Information needs to be accessible for the eyes
- If things are unclear, there is room to explain (footnotes, additional comments)
- Rather slow
- → Best served by a human writer

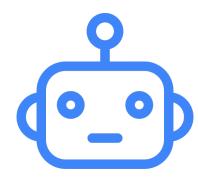


Human reader vs. Machine reader



Human reader

- Information needs to be accessible for the eyes
- If things are unclear, there is room to explain (footnotes, additional comments)
- Rather slow
- → Best served by a human writer



Machine reader

- Information needs a strictly defined structure
- Does not allow compromises on structure or data format
- Very fast
- → Best served by a machine writer



VSF								1	EU CER	TIFICATE	OF CONF	ORMIT	Υ					Page 2 of 5
Masse	s										4.1.2.3	Mas	ss(es) and	crawler underc	amiage			
4.1.1.1		Unlade	n mass(es) in rur	nning orde	r						Set of	1.0000					<u> </u>	
4.1.1.1	4.1.1.1.1.		Maximum:							2900 kg		Track dimensions		Average	Maximum	Maximum	Maximum	
4.1.1.1	.2.	Minimu	m:							2500 kg	track trains	length	width	contact pressure on	load per track roller [kg]	permissible mass per set	permissib mass of th	
4.1.2.1		Techni	cal permissible m	aximum la	den mass	(es):				6000 kg	No	[mm]	[mm]	the ground	Toller [kg]	of track trains	vehicle [k	
4.1.2.1	.1.	Technical permissible maximum laden mass(es) per axle:									1			[kPa]		[kg]		point [kg]
		Axle 1:								2700 kg								
		Axle 2:								3300 kg	-							35
4.1.2.2		Mass(e	s) and tyre(s)															
Tyre combi-	Axie No	capac	mension incl load ity index & speed	Rolling radius	rating per	Maximum permissi-	Maximum permissi-	Maximum permissi-	Track wi	idth [mm]	4.1.3.		chnically pe category ve		ble mass(es) for	each chassis/br	raking config	uration of the R- or
nation No		cat	egory symbol	[mm] tyre [kg]		ble mass per axle	ble mass of vehicle	ble vertical				R- a	and S-categ				1	
						[kg]	[kg]	load on the coupling	Mini- mum	Maxi- mum	Brake		veh		awbar	Rigid drawb	par	Centre-axle
10 10	1	235	/65 R16C 121 R	356	1667	2700	6000	point (kg)	1048	1048	Unbrake	ed			750 kg		750 kg	750 kg
1	2	235	/65 R16C 111 R	356		3300			83	83	Inertia-b	raked		- 1	3000 kg		3000 kg	3000 kg
	1	_	5 R16C 121/128	356		2700	6000	300		1048	Hydraul	ic braked			- kg		- kg	- kg
2		25510	255/05 K10C 121/125		1007	1001	300	1040	1040	Pneuma	Pneumatic braked - kg		- kg	- kg		- kg		
	2	2 235/65 R16C 111 R		356	1667	3300			83	83		YM		1.00			1/2	
3	1	235/6	5 R16C 121/128 R	356	1667	2700	6000	300	1048	1048	4.1.4.	vehicle (R- or S		S-category veh		tractor (T- or C- n for each chass		nicle) and towed onfiguration of the
	2	235	/65 R16C 111 R	356	1667	3300			83	83		P(- (or 5-catego	ory vehicle:				
5	1	235/6	5 R16C 121/128 R	356	1667	2700	6000	300	1048	1048		R- a	and S-categ veh	icle	awbar	Rigid drawbar		Centre-axle
3333	2	235	/65 R16C 111 R	356	1667	3300			83	83	Brake				awoai	Nigia diawa	,41	Certife-axie
		Maxim	um vertical load o	n the coup	oling per ty	re combina	ation depe	nding on t	ne couplin	g	Unbrake	ed			4250 kg		4250 kg	4250 kg
Tyre	combin	ation	E1-55R-12345	E1-55R-9	98765 E1	-55R-9876	6 E1-55	R-98767	E1-55R-9	98768	Inertia-b	raked			6500 kg		6500 kg	6500 kg
- 1	numbe	r			\		1				Hydraul	ic braked			- kg	0	- kg	- kg
25	1	-	5000 kg	40	000 kg	5500	kg	4400 kg	50	000 kg	Pneuma	tic braked	. 1		- kg	O B	- kg	- kg
9	2		5000 kg	50	000 kg	-1	kg	- kg		- kg	Ballast	masses						
Tyre	combin	ation	E1-55R-98769								29.2.	Nur	mber of set	s of ballast ma	sses:			
	umbe										29.2.1.	Nur	mber of cor	mponents on ea	ach set:			
	1		4000 kg	1								Set	-:				2	
7	2		- kg								1 1000000000	Set	2:					10
	2		- 49	L							29.4	Tot	al mass of	hallast masses				- ka

TESTVINVCX000001



number

4000 kg

Needs corporate design

/SF								E	EU CER	TIFICATE	OF CONF	ORMIT
Masse	s										4.1.2.3	Ma
4.1.1.1		Unlad	en mass(es) in rur	ning order							0.1.1	
4.1.1.1	.1.	Maxin	num:							2900 kg	Set of track	Track di
4.1.1.1	.2.	Minim	um:							2500 kg	trains	length
4.1.2.1		Techn	ical permissible m	aximum la	den ma	ss(es):			- 0	6000 kg	No	[mm]
4.1.2.1	.1.	Techn	ical permissible m	aximum la	den ma	ss(es) per av	le:					
		Axle 1	:							2700 kg	200	
		Axle 2	:							3300 kg	-	
4 1.2.2		Mass(es) and tyre(s)									
Tyre combi-	Axde No		Tyre timension incl load capacity index & speed		Tyre Load Maximum rating per permissi-		Maximum permissi-	Maximum permissi	Track width [mm]		4.1.3.	Te S-
nation			ategory symbol	radius rating [mm] tyre		[kg] ble mass	ble mass	ble				
No						per axie [kg]	of vehicle [kg]	load on the coupling point [kg]	Mini- mum	Maxi- mum	Brake	
100	1	23	5/65 R16C 121 R	356	16	67 2700	6000	300	1048	1048	Unbrak	ed
1	2	23	5/65 R16C 111 R	356	16	1667 3300			83	83	Inertia-b	raked
	1		65 R16C 121/128	356	16		6000	300	1048	1048	Hydraul	ic braked
2	Ι.	2551	R	330		2700	0000	300	1040	1040	Pneuma	atic braked
-	2	23	5/65 R16C 111 R	356	16	67 3300	1		83	83		7
3	1		65 R16C 121/128 R	356	16		6000	300		1048	4.1.4.	To
	2	23	235/65 R16C 111 R		16	67 3300	1		83	83		R-
5	1		65 R16C 121/128 R	356	16	67 2700	6000	300	1048	1048		R-
3373	2	23	5/65 R16C 111 R	356	16	67 3300			83	83	Brake	
		Maxim	num vertical load o	n the coup	ling per	tyre combina	ation depe	nding on th	e couplin	g	Unbrak	ed
Turo	combin	ation	E1-55R-12345	E1-55R-9	0765	E1-55R-9876	E 1 55	R-98767	E1-55R-9	0760	Inertia-t	
	umber		E1-35K-12345	E1-35K-8	90705	E1-55R-9670	D E1-35	K-90707	E1-35R-9	0700		ic braked
	1		5000 kg	40	000 kg	5500	kg	4400 kg	50	00 kg		atic brake
9	2		5000 kg	50	000 kg		kg	- kg		- kg		
											-	t masses
Tyre o	combin	ation	E1-55R-98769								29.2.	Nu

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4.1.2.3	Mas	s(es) and	crawler underca	arriage				
Set of	Track dim	ensions	Average	Maximum	Maximum	Maximum	Maximum	
track trains No	length [mm]	width [mm]	contact pressure on the ground [kPa]	load per track roller [kg]	permissible mass per set of track trains [kg]	permissible mass of the vehicle [kg]	permissible vertical load on the coupling point [kg]	
	-					-		
		٠.	-					

Technically permissible towable mass(es) for each chassis/braking configuration of the R- or S-category vehicle:

R- and S-category vehicle		Rigid drawbar	Centre-axle
Unbraked	750 kg	750 kg	750 kg
Inertia-braked	3000 kg	3000 kg	3000 kg
Hydraulic braked	- kg	- kg	- kg
Pneumatic braked	- kg	- kg	- kg

Total technically permissible mass(es) of the tractor (T- or C-category vehicle) and towed vehicle (R- or S-category vehicle) combination for each chassis/braking configuration of the R- or S-category vehicle:

Drawbar	Rigid drawbar	Centre-axle
4250 kg	4250 kg	4250 kg
6500 kg	6500 kg	6500 kg
- kg	- kg	- kg
- kg	- kg	- kg
	Drawbar 4250 kg 6500 kg - kg	Drawbar Rigid drawbar 4250 kg 4250 kg 6500 kg 6500 kg - kg - kg

Ballast masses

29.2.	Number of sets of ballast masses:	
29.2.1.	Number of components on each set:	
	Set -:	2
	Set 2:	10
29.4.	Total mass of ballast masses:	- kg

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Needs corporate design VSF EU CERTIFICATE OF CONFORMITY Page 2 of 5 Masses 4.1.2.3. Mass(es) and crawler undercarriage 4.1.1.1. Unladen mass(es) in running order Set of Maximum Track dimensions Average Maximum Maximum Maximum 4.1.1.1.1. 2900 kg track load per track contact permissible permissible permissible length 4.1.1.1.2. 2500 kg trains roller [kg] mass of the vertical load on pressure on mass per set [mm] [mm] No Technical permissible maximum laden mass(es): 6000 kg vehicle [kg] the coupling the ground of track trains [kPa] [kg] point [kg] Technical permissible max 2700 kg Axle 1: Axle 2: 3300 kg Mass(e s) and tyre(s) Technically permissible towable mass(es) for each chassis/braking configuration of the R- or Tyre Load Maximum Maximum Maximur Track width [mm] S-category vehicle: combiindex & speed radius rating per permissigary symbol nation tyre [kg] ble mass ble mass R- and S-category per axle of vehicle Mini-Maxiload on Rigid drawbar Centre-axle Drawbar mum mum Brake coupling Unbraked 750 kg 750 kg 750 kg 235/65 R16C 121 R 1667 1048 1048 3000 kg 3000 kg 3000 kg Inertia-braked 235/65 R16C 111 R 356 Hydraulic braked - kg - kg - kg 235/65 R16C 121/128 356 1667 1048 - kg Pneumatic braked - kg - kg 235/65 R16C 111 R 356 1667 3300 83 4.1.4. Total technically permissible mass(es) of the tractor (T- or C-category vehicle) and towed 235/65 R16C 121/128 356 1048 1667 1048 vehicle (R- or S-category vehicle) combination for each chassis/braking configuration of the R- or S-category vehicle: 235/65 R16C 111 R 356 1667 3300 83 83 R- and S-category 1048 235/65 R16C 121/128 356 1667 2700 1048 Drawbar Rigid drawbar Centre-axle 2 235/65 R16C 111 R 356 1667 83 83 Brake Maximum vertical load on the coupling per tyre combination depending on the coupling Unbraked 4250 kg 4250 kg 4250 kg 6500 kg 6500 kg Inertia-braked 6500 kg E1-55R-12345 E1-55R-98765 E1-55R-98766 E1-55R-98767 E1-55R-98768 Tyre combination number - kg - kg Hydraulic braked - kg 4000 kg 5500 kg 4400 kg 5000 kg 5000 kg - kg - kg - kg Pneumatic braked 5000 kg 5000 kg - kg **Ballast masses** 29.2. Number of sets of ballast masses: E1-55R-98769 Tyre combination number 29.2.1. Number of components on each set: 2 4000 kg Set 2:

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29.4.

Total mass of ballast masses:



How to fit on one A4?

VSF EU CERTIFICATE OF CONFORMITY Masses 4.1.1.1. Unladen mass(es) in running order 4.1.1.1.1. 2900 kg Needs 4.1.1.1.2. 2500 kg Technical permissible maximum laden mass(es): 6000 kg corporate Technical permissible may 2700 kg design Axle 2: 3300 kg Mass(e Track width [mm] combiindex & speed radius rating per permissination ory symbol tyre [kg] ble mass ble mass per axle of vehicle Mini-Maxiload on mum mum 235/55 R16C 121 R 1667 1048 1048 235/65 R16C 111 R 356 356 235/65 R16C 121/128 1667 1048 235/65 R16C 111 R 356 1667 235/65 R16C 121/128 1667 1048 235/65 R16C 111 R 356 1667 3300 83 83 235/65 R16C 121/128 1048 356 1667 2700 1048 How to fit 2 235/65 R16C 111 R 356 1667 83 83 tables into Maximum vertical load on the coupling per tyre combination depending on the coupling E1-55R-12345 E1-55R-98765 E1-55R-98766 E1-55R-98767 E1-55R-98768 Tyre combination the design? number 5000 kg 4000 kg 5500 kg 4400 kg 5000 kg 5000 kg 5000 kg ombination E1-55R-98769

How to fit Mass(es) and crawler undercarriage on one A4? Track dimensions Average Maximum Maximum Maximum Maximum contact load per track permissible permissible permissible roller [kg] mass of the vertical load on pressure on mass per set [mm] of track trains vehicle [kg] the coupling the ground [kPa] [kg] point [kg]

Centre-axle

Centre-axle

750 kg

3000 kg

4250 kg

6500 kg

- kg

- kg

- kg

- kg

Technically permissible towable mass(es) for each chassis/braking configuration of the R- or

Rigid drawbar

Rigid drawbar

750 kg

3000 kg

4250 kg

6500 kg

- kg

- kg

- kg

- kg

Drawbar

Drawbar

750 kg

3000 kg

4250 kg

6500 kg

- kg

- kg

Total technically permissible mass(es) of the tractor (T- or C-category vehicle) and towed

vehicle (R- or S-category vehicle) combination for each chassis/braking configuration of the

Page 2 of 5

4.1.2.3.

Set of

track

trains

No

Brake

Brake

Unbraked

29.4.

Inertia-braked

Hydraulic braked

Pneumatic braked

Ballast masses

Set 2:

Unbraked

Inertia-braked

Hydraulic braked

Pneumatic braked

[mm]

S-category vehicle:

R- and S-category

R- or S-category vehicle:

Number of sets of ballast masses: Number of components on each set

Total mass of ballast masses:

R- and S-category



VSF EU CERTIFICATE OF CONFORMITY Masses 4.1.1.1. Unladen mass(es) in running order 4.1.1.1.1. 2900 kg Needs 4.1.1.1.2. 2500 kg Technical permissible maximum laden mass(es): 6000 kg corporate Technical permissible ma 2700 kg Axle 1: design Axle 2: 3300 kg Mass(e Track width [mm] combiradius index & speed rating per permissination ble mass ble mass per axle of vehicle Mini-Maxiload on mum mum 235/55 R16C 121 R 356 1667 1048 235/65 R16C 111 R 356 356 1667 235/65 R16C 121/128 1048 235/65 R16C 111 R 356 1667 1048 235/65 R16C 121/128 1667 235/65 R16C 111 R 356 1667 3300 83 83 235/65 R16C 121/128 356 1048 1048 1667 2700 How to fit 2 235/65 R16C 111 R 356 1667 83 83 tables into Maximum vertical load on the coupling per tyre combination depending on the coupling E1-55R-12345 E1-55R-98765 E1-55R-98766 E1-55R-98767 E1-55R-98768 Tyre combination the design? number 5000 kg 4000 kg 5500 kg 4400 kg 5000 kg 5000 kg 5000 kg ombination E1-55R-98769 4000 kg

How to fit on one A4?

Page 2 of 5

Maximum

permissible

vertical load on

the coupling

point [kg]

Centre-axle

Centre-axle

750 kg

3000 kg

4250 kg

6500 kg

- kg

- kg

- kg

How to make copy proof?

How to provide duplicates?

4.1.2.3.

Set of

track

trains

No

Brake

Brake

Unbraked

29.2.

29.4.

Inertia-braked

Hydraulic braked

Pneumatic braked

Ballast masses

Set 2:

Unbraked

Inertia-braked

Hydraulic braked

Pneumatic braked

Mass(es) and crawler undercarriage

Average

contact

pressure on

the ground

Maximum

load per track

roller [kg]

750 kg

3000 kg

4250 kg

6500 kg

- kg

- kg

Total technically permissible mass(es) of the tractor (T- or C-category vehicle) and towed

vehicle (R- or S-category vehicle) combination for each chassis/braking configuration of the

Drawbar

Drawbar

Maximum

permissible

mass per set

of track trains

[kg]

Rigid drawbar

Rigid drawbar

750 kg

3000 kg

4250 kg

6500 kg

- kg

- kg

- kg

- kg

Technically permissible towable mass(es) for each chassis/braking configuration of the R- or

Maximum

permissible

mass of the

vehicle [kg]

Track dimensions

[mm]

[mm]

S-category vehicle:

R- and S-category

R- or S-category vehicle:

Number of sets of ballast masses: Number of components on each set

Total mass of ballast masses:

R- and S-category



Paper thoughts vs. Data thoughts

Printing on paper

- Needs corporate design
- How to fit on one A4?
- How to fit tables into the design?
- How to make copy proof?
- How to provide duplicates?



Paper thoughts vs. Data thoughts

Printing on paper

- Needs corporate design
- How to fit on one A4?
- How to fit tables into the design?
- How to make copy proof?
- How to provide duplicates?

Sending data

- How to authenticate?
- How to avoid manipulation of data?
- How to ensure secure transmission of data?
- How to handle exceptions?



Outlook: Towards a living documentation?

Paper documents

- Do not change
- CoC as "birth certificate"
- Need to be carried along

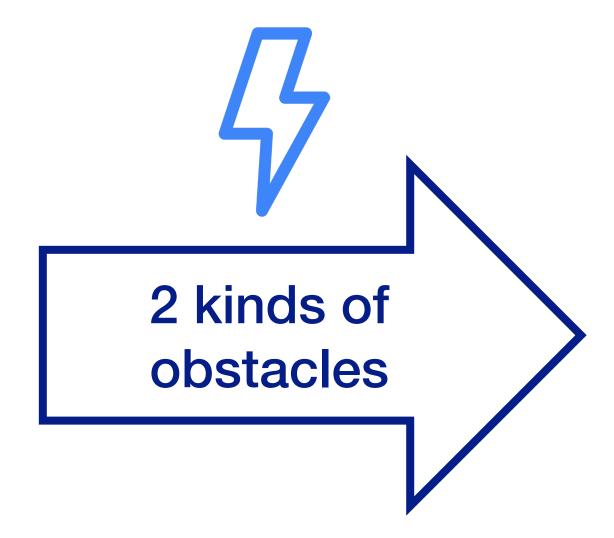
Data

- Can be updated
- Can have a version and history
- Are transparent and accessible



Reality check: A paradigm shift takes time

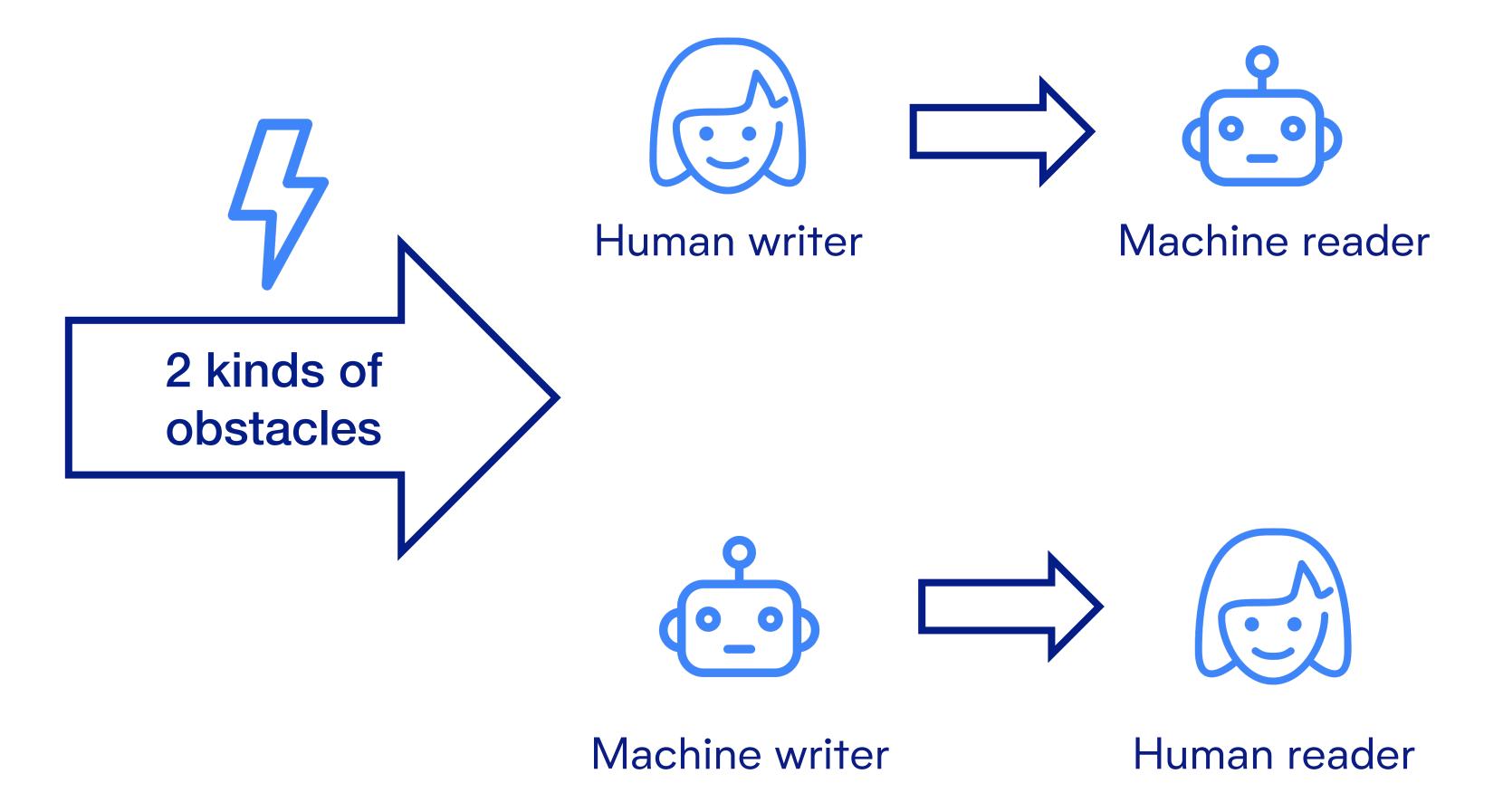
Mixture of paper and data processes





Reality check: A paradigm shift takes time

Mixture of paper and data processes





Recommendations

Some learnings from implementing electronic COCs



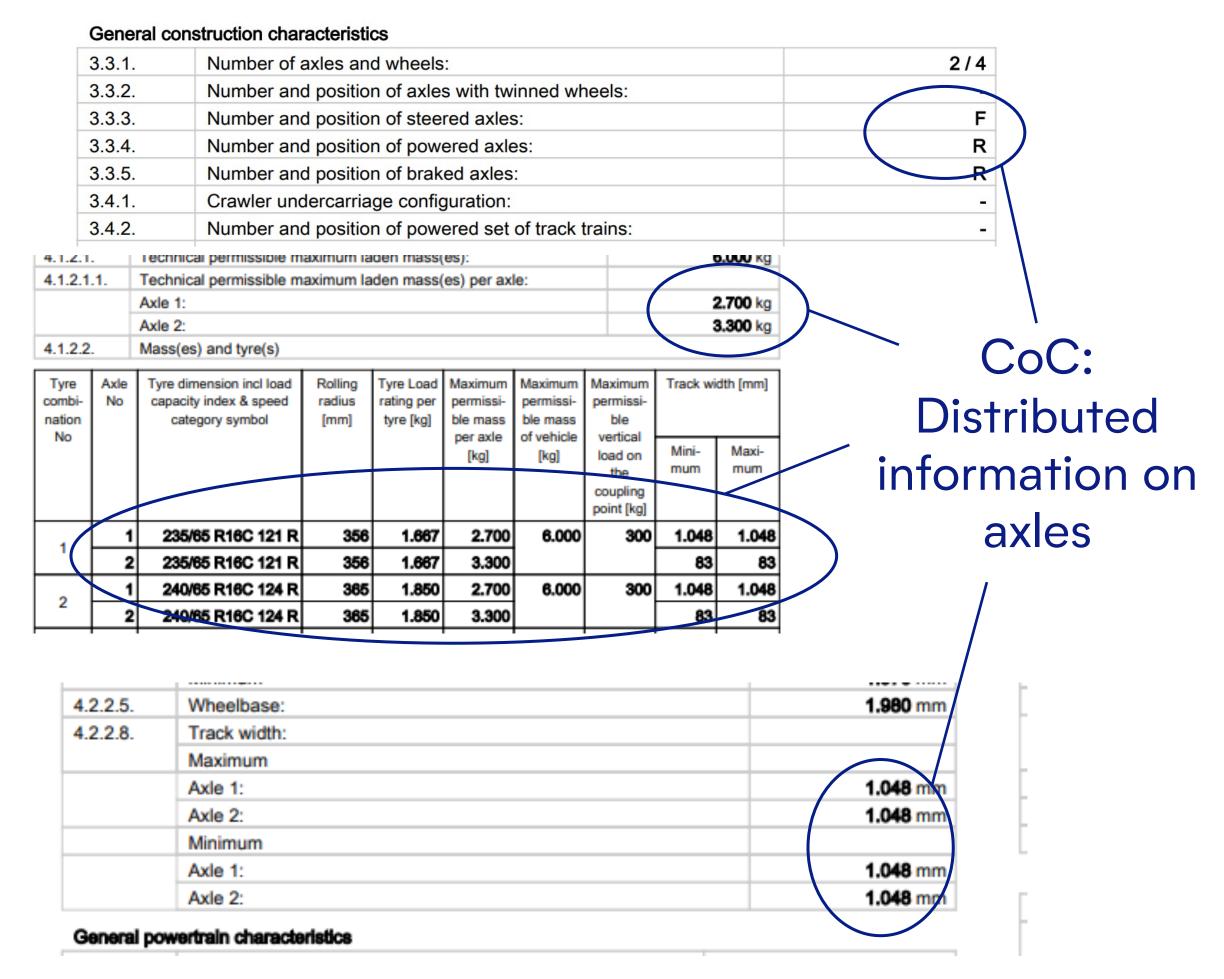
Start being strict on formalities

Some examples:

- Number of wheels: "2 (optionally 4)"
 - + this will not be possible in a number field, only comment field as workaround available
- Explanatory footnotes on tyre combinations
 - > there are no field related comments at all in the IVI
- Tyre combination tables and coupling tables as images or attachments
 - > For a printout solution, this is fine, but electronic documents require the contents



Thinking in objects



IVI: all information on one Axle object

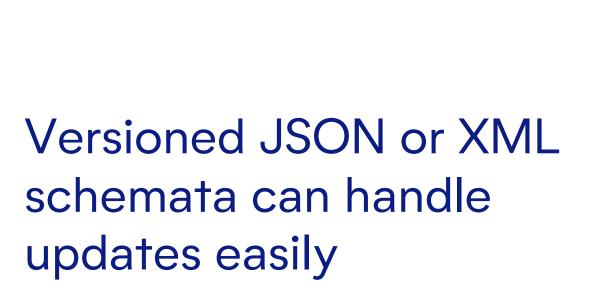
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        <PoweredAxleInd>N</PoweredAxleInd>
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                (...)
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        </TyreAxleTable>
    </AxleGroup>
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                <LoadCapacityIndexSingleWheel>121</LoadCapacityIndexSingleWheel>
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                (...)
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    </AxleGroup>
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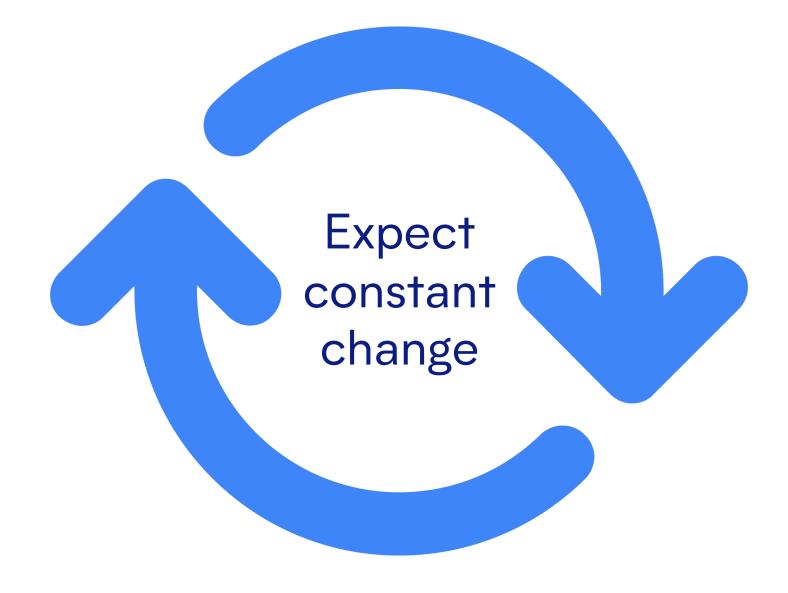


Flexible data structures and processes



Rigid database structures will fail on change







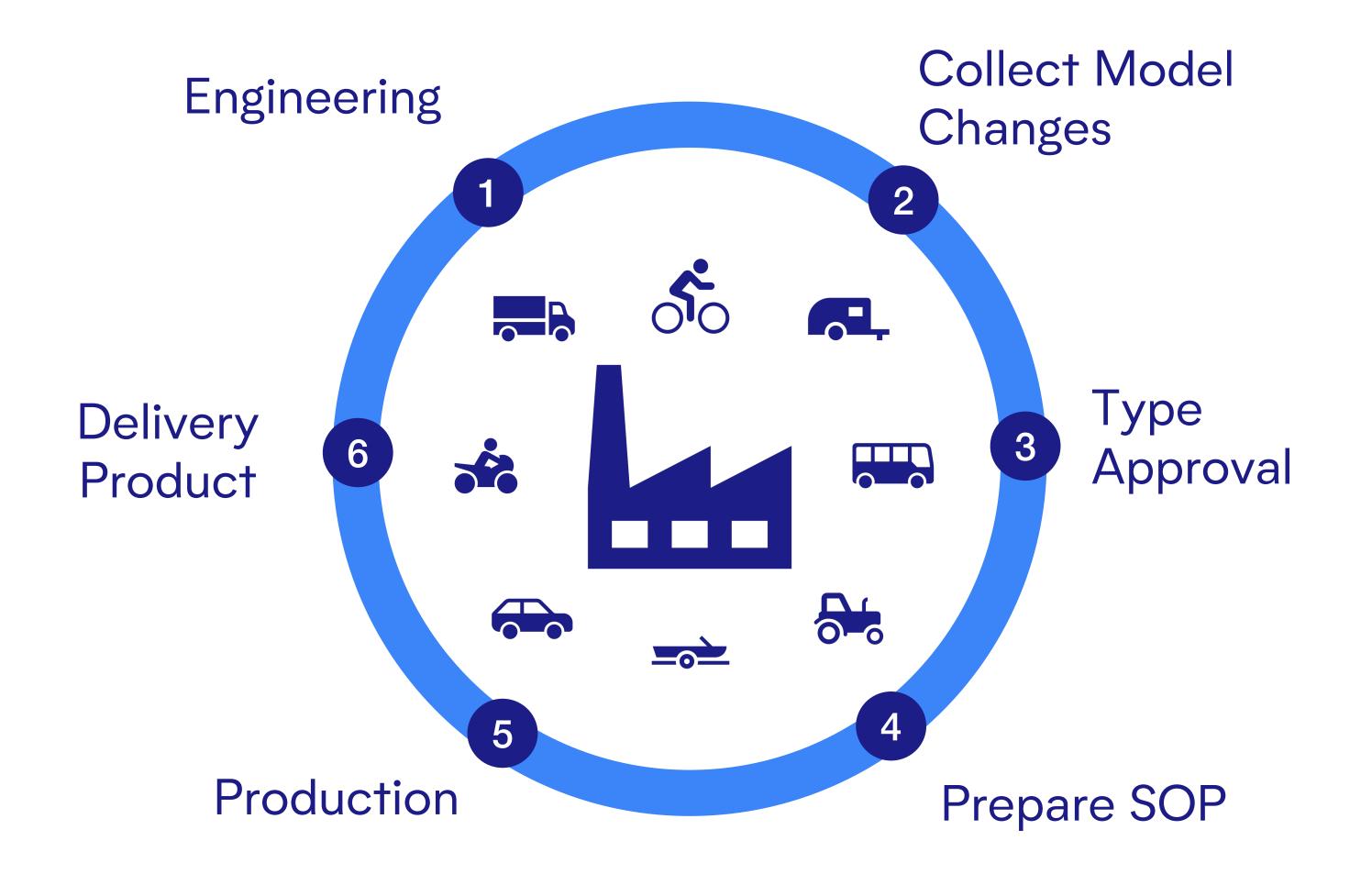
"Hard-coding" a strict rigid workflow will be costly on change



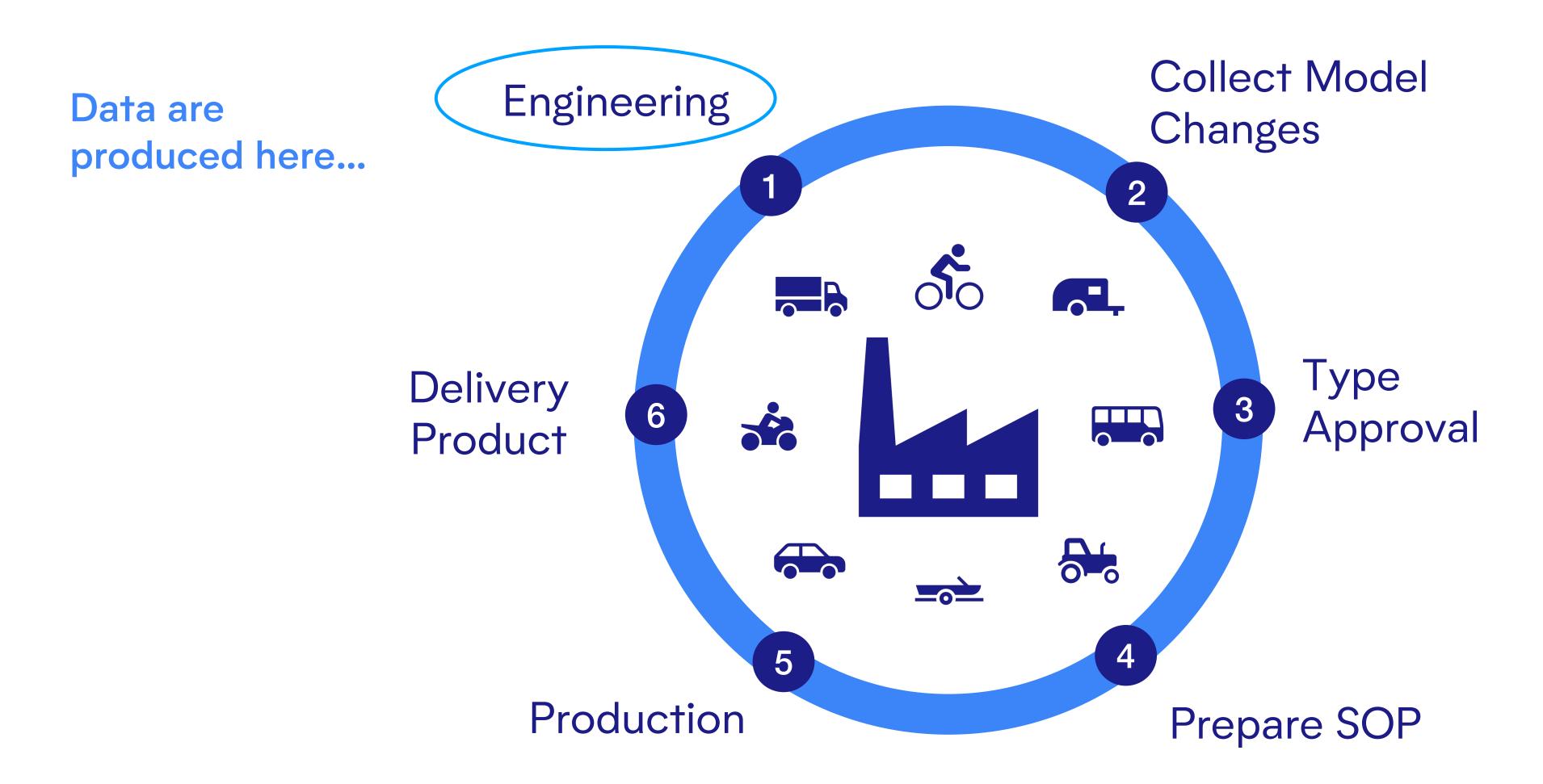
Configurable workflows and rules to extend and adjust if needed

Involve IT to find the best solutions!

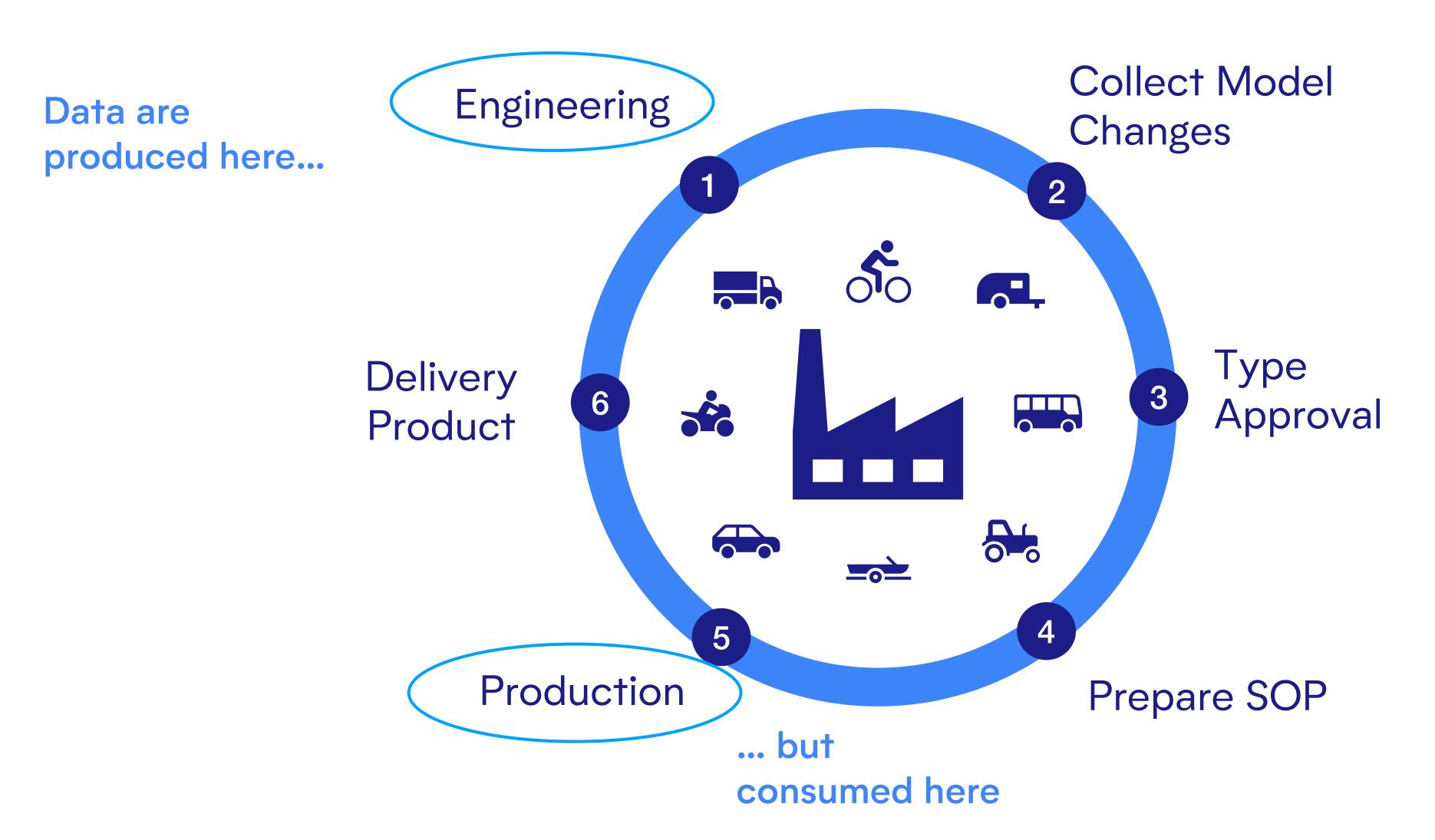














Collect Model Engineering Data are Changes produced here... Type Delivery **Approval** Product 5 5 Avoid finding out Production Prepare SOP problems here! ... but consumed here



Outlook: Digital Type Approvals

- Extracting data into attachments will vanish
- Quicker approval processes will make iterations more frequent
- Data exchange and collaboration between all stakeholders will become an important factor





Thank you! Any questions?

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