



Needs Tailored Interoperable Railway Infrastructure

# Lean techniques for Switches & Crossings

NeTIRail-INFRA Final Conference, Ljubljana, Slovenia

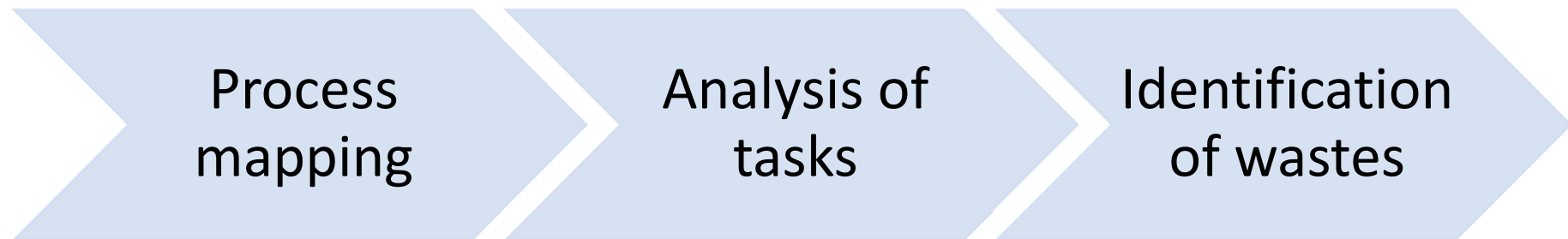
Jon PARAGREEN



# Lean - objective and technique



- Aim – to optimise S&C installation, by using **Lean** techniques to identify and eliminate **wastes**





# Process mapping

- Basic process maps produced of high level steps of S&C installation which will be observed.

Eg. Celje, Slovenia

Installation and construction of new S&C	Installation of point machine (switch 1 and switch 2)	Fill with new ballast	Tamping work
<ul style="list-style-type: none"> <li>• Install transition from 60kg/m rail on concrete sleepers to 49kg/m rail and wooden sleepers</li> <li>• Install switch section (switch 1)</li> <li>• Install intermediate section (switch 1)</li> <li>• Install crossing (switch 1)</li> <li>• Install plain line between the two switches</li> <li>• Install switch section (switch 2)</li> <li>• Install intermediate section (switch 2)</li> <li>• Install crossing (switch 2)</li> </ul>	<ul style="list-style-type: none"> <li>• Connect switch motor mechanically</li> <li>• Connect electrically</li> <li>• Adjust</li> </ul>	<ul style="list-style-type: none"> <li>• Deliver and drop ballast using engineering train</li> <li>• Distribute ballast</li> </ul>	<ul style="list-style-type: none"> <li>• Tamping machine arrives on site</li> <li>• Tamping operation</li> </ul>

# Analysis of tasks - wastes

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- Tasks observed – detailed list of individual tasks produced
  - Data collected on sub tasks
- Task categorised and wastes identified from observations
- Tasks categorised as:



Value adding task – task that directly adds value



Non-value adding necessary task – task that is necessary but in itself does not add any value



Waste - task with some element of waste as defined in seven types of waste defined below

# Analysis of tasks - wastes

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- Wastes



Transport



Inventory



Motion



Waiting



Overproduction



Over Processing



Defects

# Application in Turkey and Slovenia



- Celje, Slovenia – Remodelling track around station
- Kayseri, Turkey – Switch replacement



# Application in Turkey and Slovenia



Task	Fasten f. Hongs + rail to	- attach clips
Start time	13:36	sleep
End time	13:57	
No of people	3 x 2 teams	
Equipment used	16 plus	
	drop down	manoeuvre
	to one team	sleepy



# Application in Turkey and Slovenia

NeTIRail



2017-10-16 12:44:40





# Key findings – utilisation of resources

ID	Task Mode	Task Name	Duration	Start	Finish	15 May, 10		15 May, 11		15 May, 12		15 May, 13		15 May, 14		15 May, 15	
						0	30	0	30	0	30	0	30	0	30	0	30
1	★	Unfasten joints for intermediate section	26 mins	15/05/17 10:06	15/05/17 10:32	█ Excavator + operator[0], Backhoe loader + operator[0], Track worker											
2	★	Lift new crossing section on top of adjacent track	8 mins	15/05/17 10:14	15/05/17 10:22	█ Track worker inc engineers and supervisors[2], Backhoe loader + opera											
3	★	Clear old ballast from switch section	38 mins	15/05/17 10:08	15/05/17 10:46	█ Track worker inc engineers and supervisors[3], Backhoe loader + c											
4	★	Unfasten joints for crossing section	26 mins	15/05/17 10:06	15/05/17 10:32	█ Track worker inc engineers and supervisors[4]											
5	★	Lift and remove crossing section	12 mins	15/05/17 10:32	15/05/17 10:44	█ Backhoe loader + operator, Excavator + operator, Track worker inc											
6	★	Lift and remove old intermediate section	7 mins	15/05/17 10:37	15/05/17 10:44	█ Track worker inc engineers and supervisors[4], Backhoe loader + c											
7	★	Clear old ballast from whole section	24 mins	15/05/17 10:46	15/05/17 11:10	█ Track worker inc engineers and supervisors[4], Backhoe load											
8	★	Move new switch section on top of adjacent track	4 mins	15/05/17 10:44	15/05/17 10:48	█ Backhoe loader + operator, Track worker inc engineers and super											
9	★	Levelling of old ballast	51 mins	15/05/17 11:10	15/05/17 12:01	█ Backhoe loader + operator, Excavator + operator											
10	★	Apply fresh ballast	7 mins	15/05/17 12:01	15/05/17 12:08	█ Engineering train + driver, Track worker inc eng											
11	★	Distribute clean ballast	30 mins	15/05/17 12:08	15/05/17 12:38	█ Backhoe loader + operator, Track worker											



# Key recommendations and optimisations

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- Get right first time – eliminate defects and reworking
- Utilise different tools for some lifting and moving operations
- Re-plan the timing of some tasks - Use periods of low utilisation of staff
- Different approaches for optimising possession time vs optimising costs