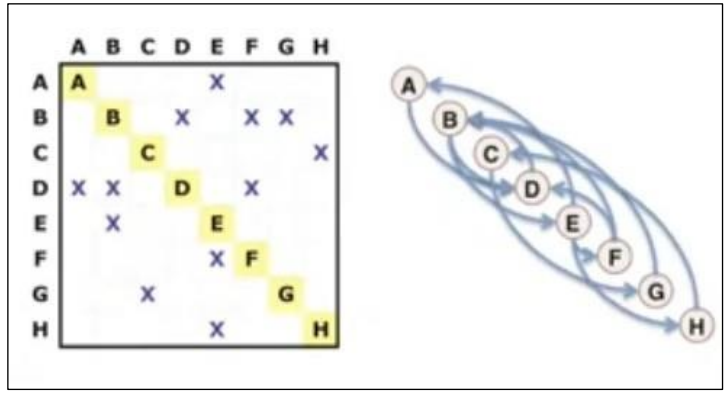
26TH INTERNATIONAL DEPENDENCY AND STRUCTURE MODELING CONFERENCE, DSM 2024
STUTTGART, GERMANY, 24 – 26 SEPTEMBER, 2024

"Development of a method for comparing industrial processes using DSM: application to a case study in the automotive sector, the SeatBridge patent"

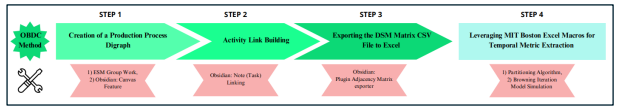
Daniele Grazzini[1], Andrea Falegnami[1], Andrea Tomassi[1], Claudio Buccini[2], Elpidio Romano[1].

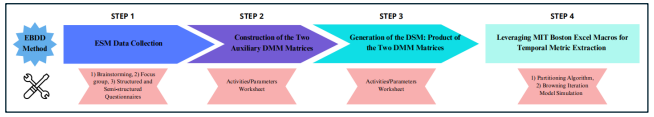
[1]International Telematic University UNINETTUNO (Rome)
[2]SB Sintec

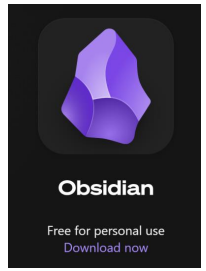


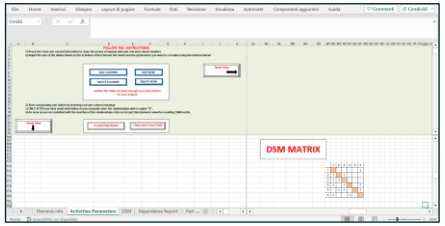
DSM

Project Management

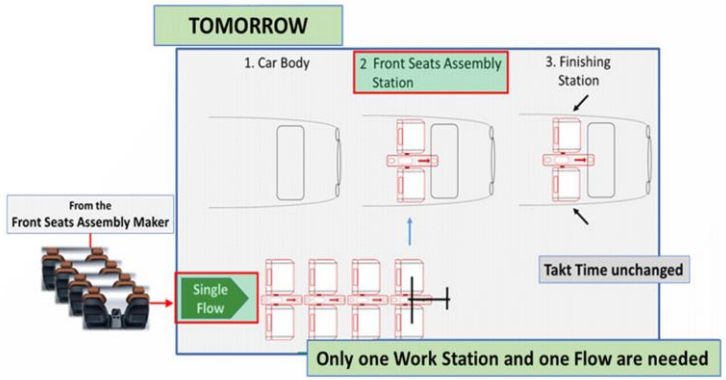




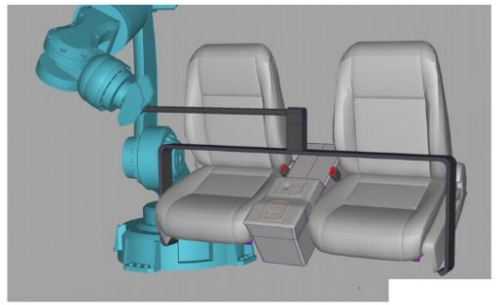




Innovative Process

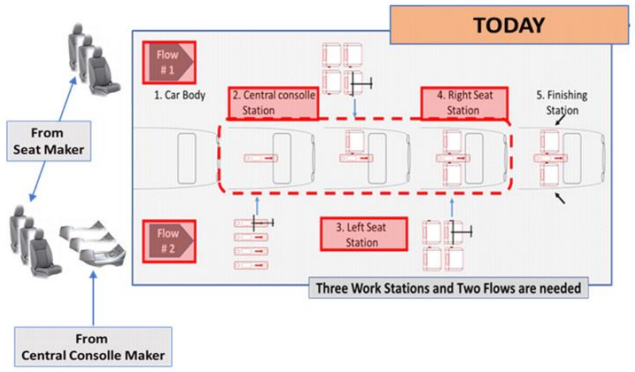


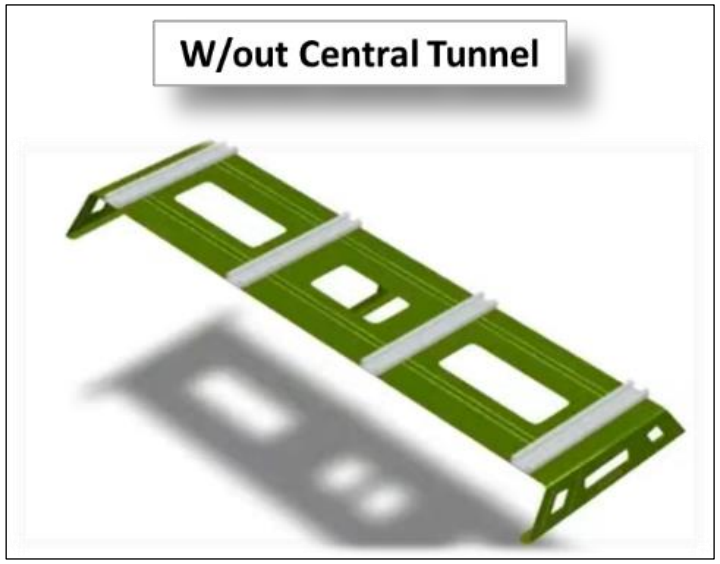
SeatBridge Patent



The FSA
is mounted with only one shot
onto the car
in the Final Assembly Line

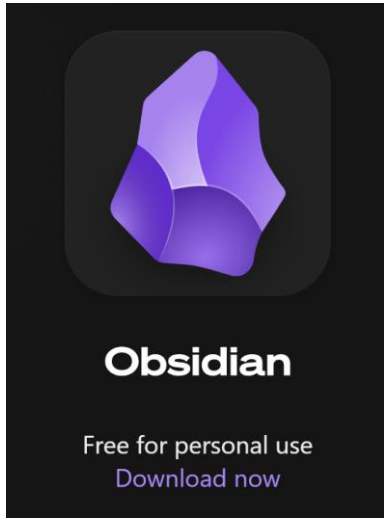
Traditional Process

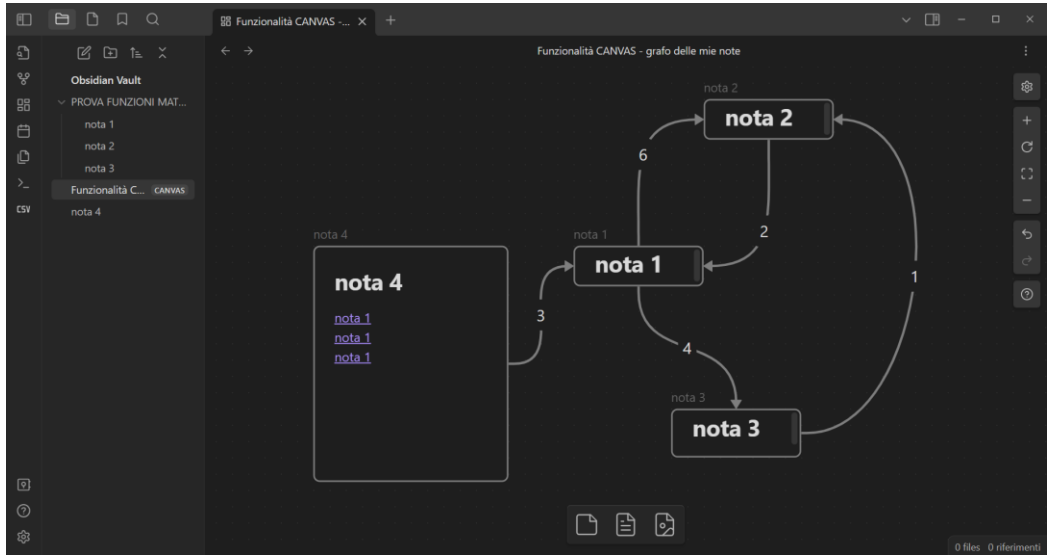




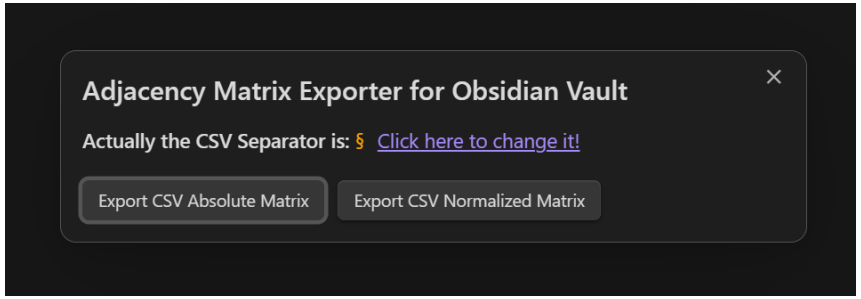
3D of SeatBridge Patent

https://vimeo.com/884338415?share=copy



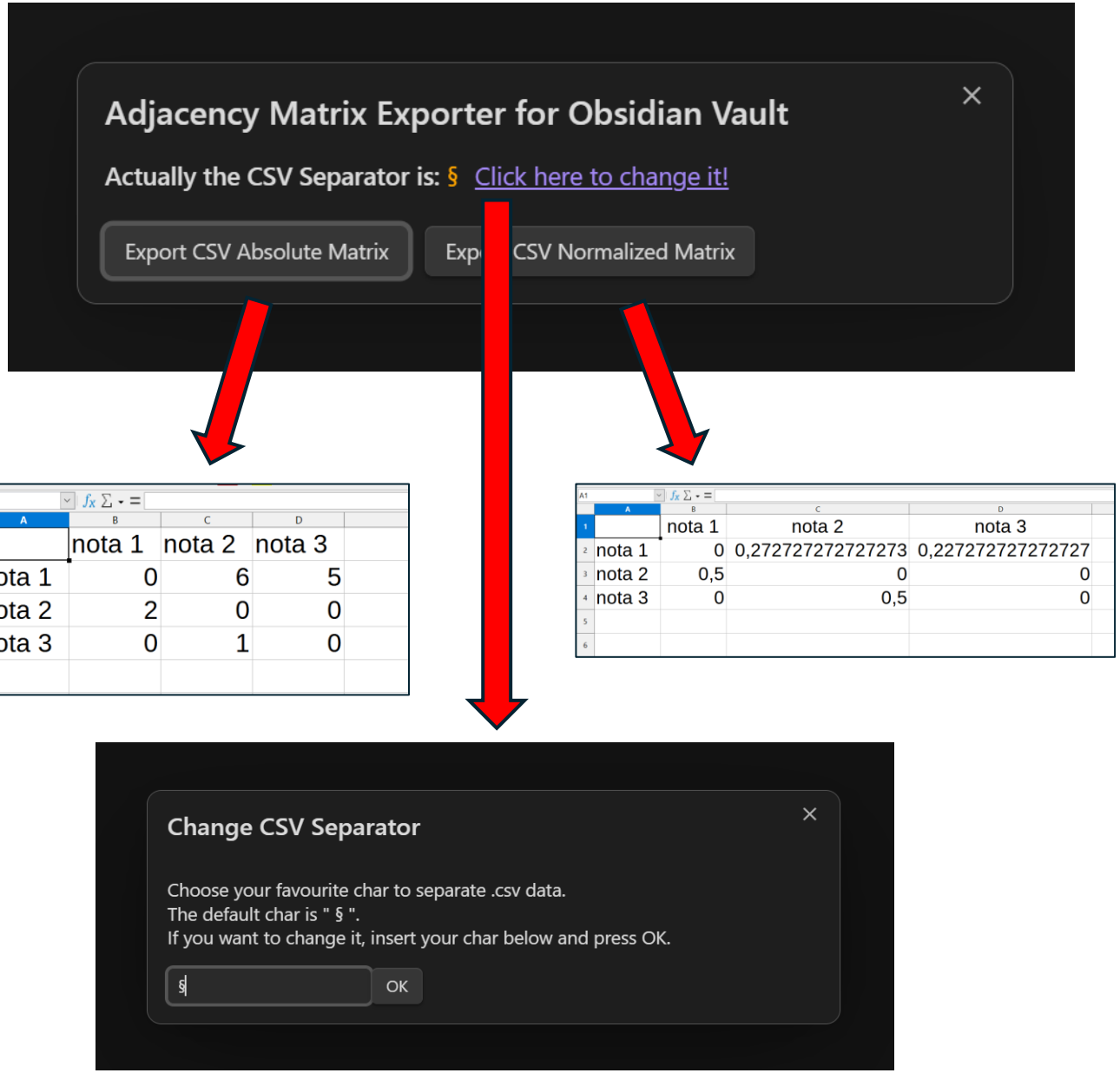


Canvas functionality



Plugin «Adjacency Matrix Exporter»

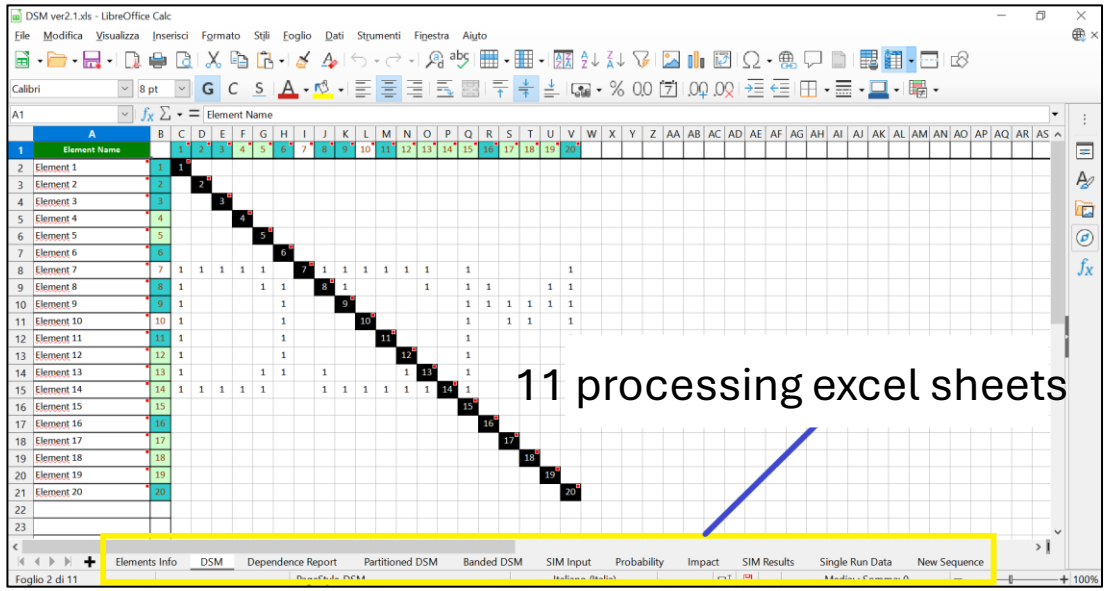
Plugin «Adjacency Matrix Exporter»



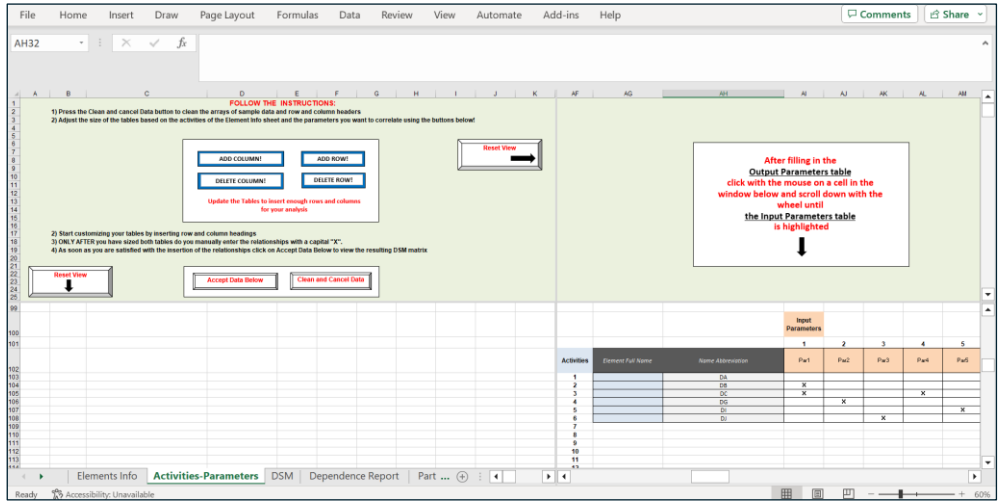
	nota 1	nota 2	nota 3
nota 1	0	6	5
nota 2	2	0	0
nota 3	0	1	0

	nota 1	nota 2	nota 3
nota 1	0	0,272727272727273	0,227272727272727
nota 2	0,5	0	0
nota 3	0	0,5	0

New Excel worksheet

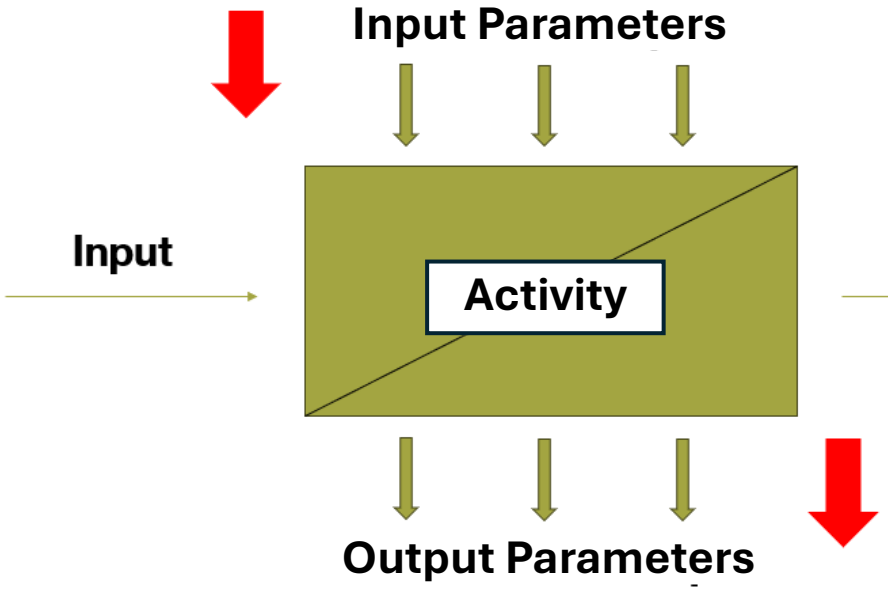


MIT Excel worksheets

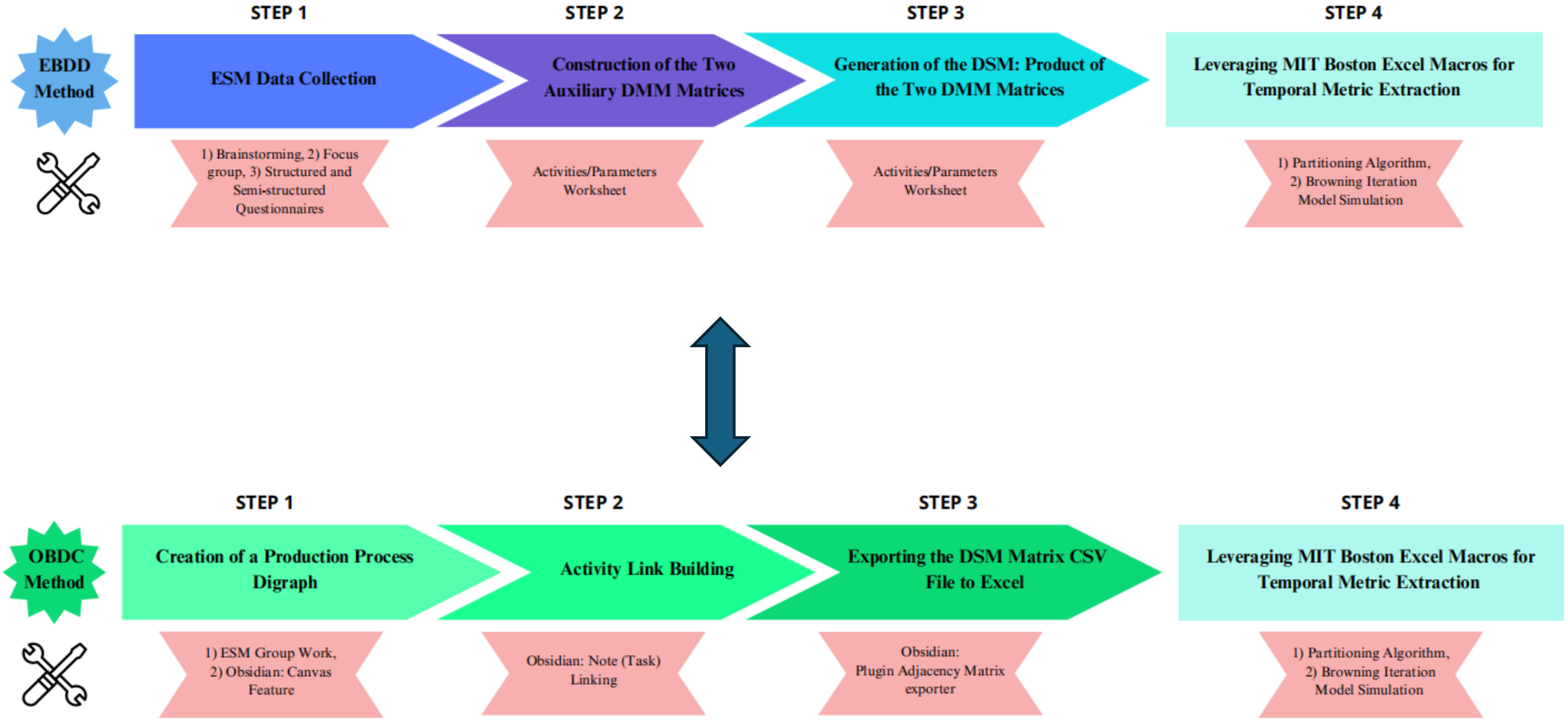


Excel activities/parameters worksheet

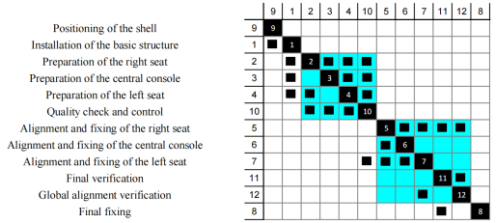
	DA	DB	DC	DG	DI	DJ
DA						1
DB	1		1			
DC	1	1				
DG	1		1			1
DI		1	1			1
DJ	1			1		

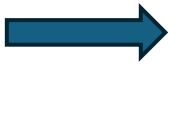


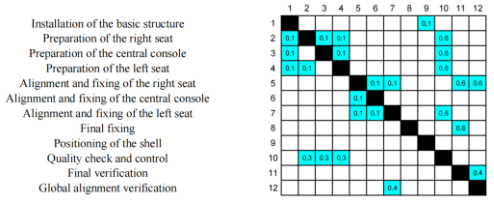
	1	2	3	4	5	6	7	8	9	10	11	12
Installation of the basic structure	1											
Preparation of the right seat	■	■	■	■						■		
Preparation of the central console	■	■	■	■						■		
Preparation of the left seat	■	■	■	■						■		
Alignment and fixing of the right seat					■	■	■				■	■
Alignment and fixing of the central console					■	■						
Alignment and fixing of the left seat					■	■	■			■		
Final fixing								■			■	
Positioning of the shell									■			
Quality check and control		■	■	■						■		
Final verification											■	■
Global alignment verification							■					

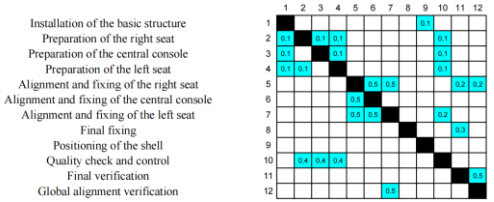

STEP 1
STEP 2
STEP 3
STEP 4
EBDD Method
ESM Data Collection
Construction of the Two Auxiliary DMM Matrices
Generation of the DSM: Product of the Two DMM Matrices
Leveraging MIT Boston Excel Macros for Temporal Metric Extraction
1) Brainstorming, 2) Focus group, 3) Structured and Semi-structured Questionnaires
Activities/Parameters Worksheet
Activities/Parameters Worksheet
1) Partitioning Algorithm, 2) Browning Iteration Model Simulation
STEP 1
STEP 2
STEP 3
STEP 4
OBDC Method
Creation of a Production Process Digraph
Activity Link Building
Exporting the DSM Matrix CSV File to Excel
Leveraging MIT Boston Excel Macros for Temporal Metric Extraction
1) ESM Group Work, 2) Obsidian: Canvas Feature
Obsidian: Note (Task) Linking
Obsidian: Plugin Adjacency Matrix exporter
1) Partitioning Algorithm, 2) Browning Iteration Model Simulation

Traditional Process

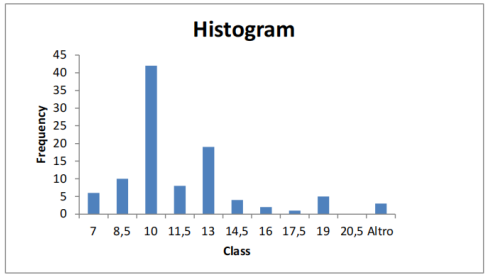








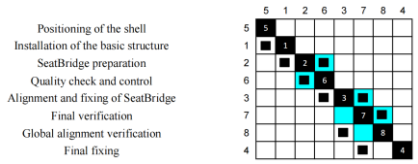
Activities		Duration (minutes)			
ID	Name	BCV	MLV	WCV	IC
PT2	Installation of the basic structure	0,9	1,0	1,2	0,2
PT3	Preparation of the right seat	0,1	0,2	0,3	0,2
PT4	Preparation of the central console	0,1	0,2	0,4	0,2
PT5	Preparation of the left seat	0,1	0,2	0,4	0,3
PT6	Alignment and fixing of the right seat	0,5	0,8	0,9	0,3
PT7	Alignment and fixing of the central console	0,9	1,0	1,2	0,3
PT8	Alignment and fixing of the left seat	0,7	0,8	1,0	0,4
PT9	Final fixing	0,1	0,2	0,4	0,4
PT12	Positioning of the shell	0,1	0,2	0,5	0,5
PT13	Quality check and control	0,1	0,2	0,6	0,5
PT15	Final verification	0,1	0,2	0,3	0,6
PT17	Global alignment verification	0,1	0,2	0,5	0,6

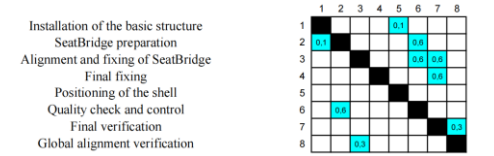


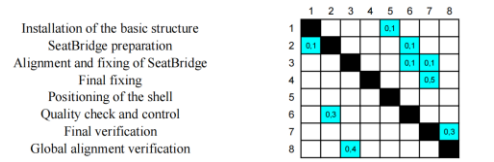
TEMPORAL VALUES FOR SIMPLIFIED TRADITIONAL PROCESS

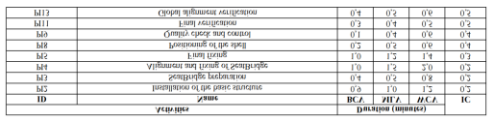
weighted mean	11
mean	14
median	14
mode	10

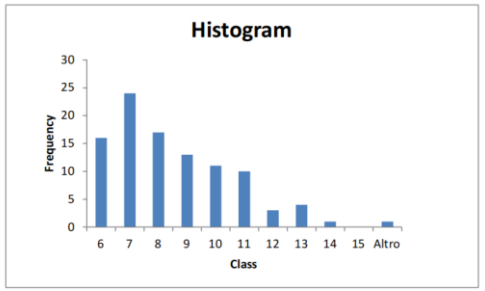
Innovative Process





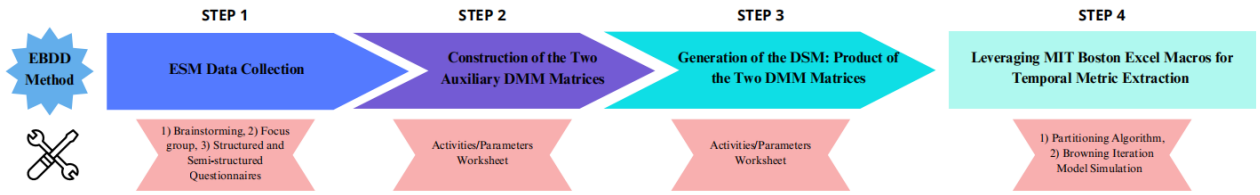


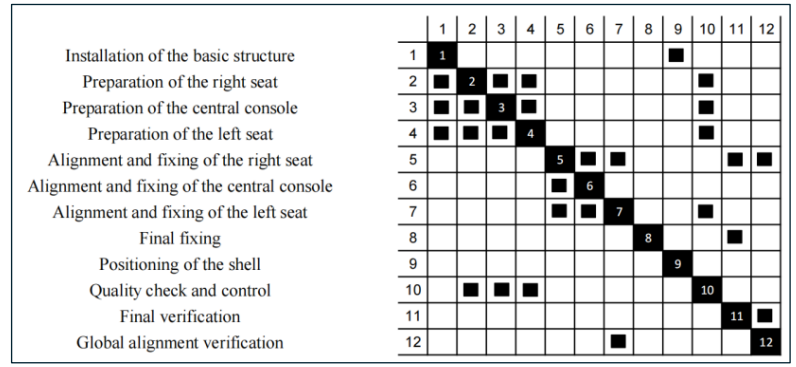




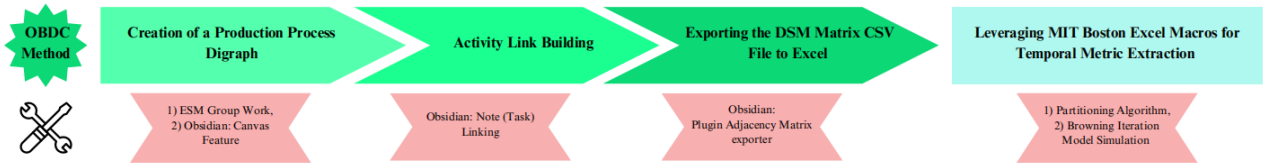
TEMPORAL VALUES FOR SIMPLIFIED INNOVATIVE PROCESS

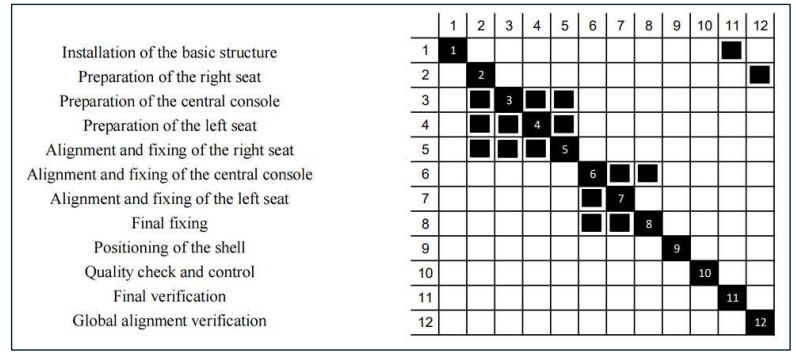
weighted mean	8
mean	11
median	11
mode	6





Traditional Process with EBDD Method





Traditional Process with OBDC Method

	Easy of use	Tools used	Number of phases	Characteristics of the produced DSM	Strengths	Weaknesses
OBDC Method	Medium/High	Obsidian, Plugin Adjacency Matrix Exporter, Canvas feature, MIT Excel Macros	4	Low number of relationships	Study of traditional processes, use of Subject Matter Experts (SMEs) in the examined production process	Innovative processes, highly impactful expert perspectives
EBDD Method	High	Activities/Parameters worksheet, MIT Excel Macros	4	High number of relationships	Study of innovative processes, depth of analysis, use of external consultants, flexibility, modularity	Traditional processes, potential distance of experts from the analyzed production sector

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Thank you for your attention!

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Github: https://github.com/danielegrazzini/DSM).