



4th International Conference on Modern Research in
Engineering, Technology and Science (ICMEST'21)

Development of Competency Analysis System for Sewing Operators in Clothing Industry

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16-18 July 2021
Amsterdam, Netherlands

CAS

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Material

Method

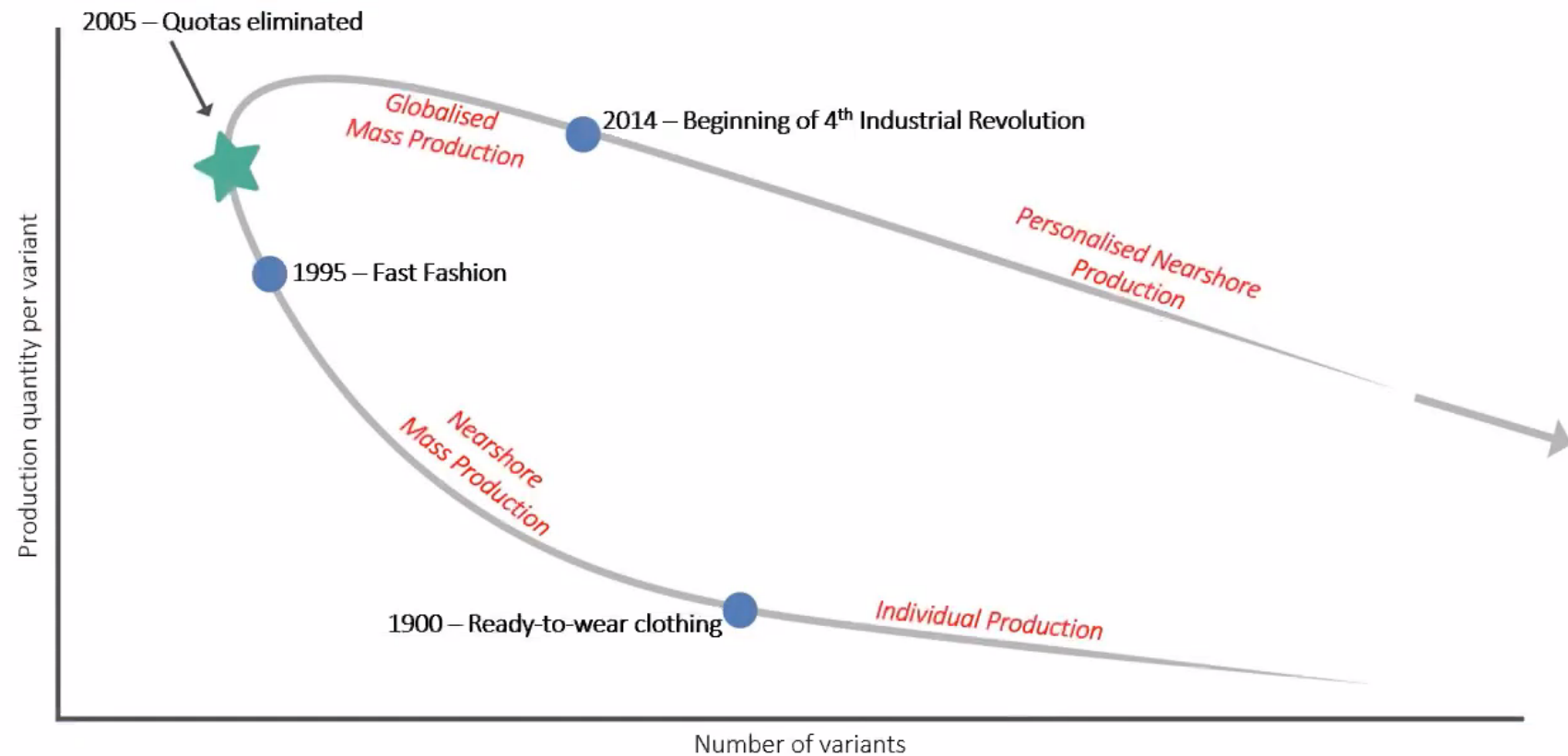
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Operational Efficiency: Apparel “Boomerang”



Company's Sewing Production Lines

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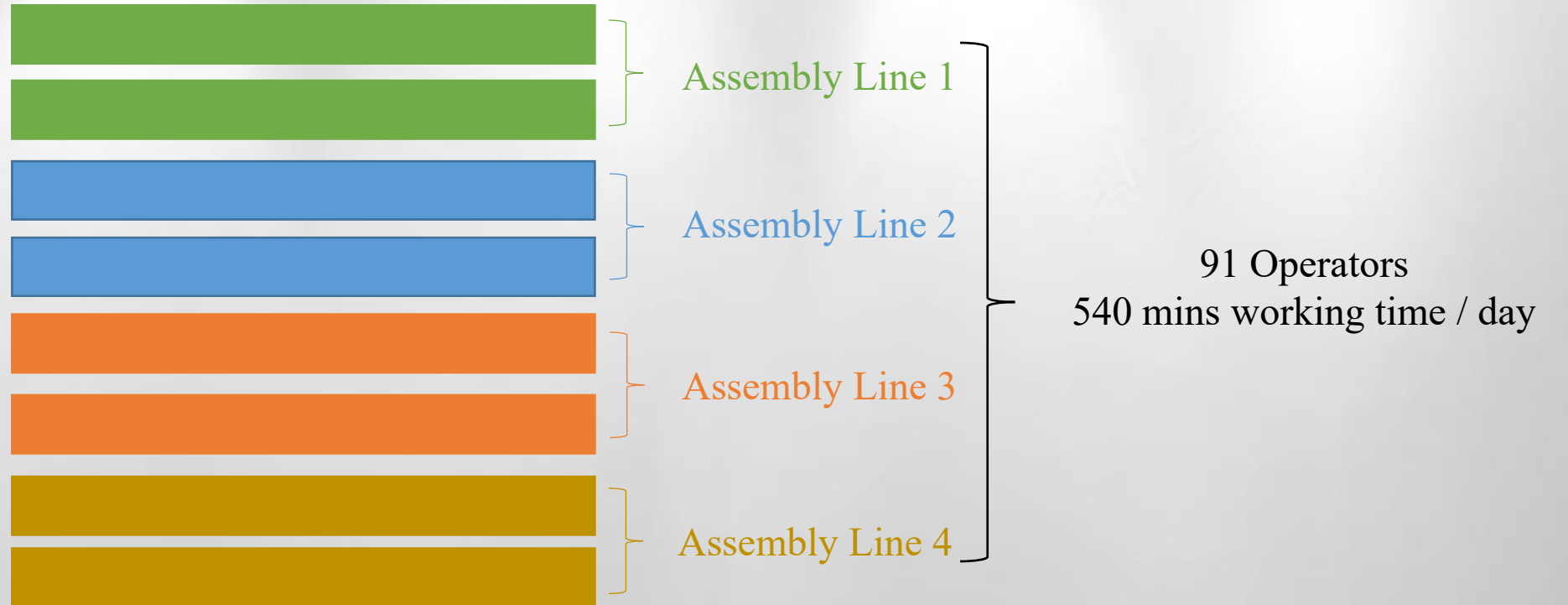


Table1. Line Balancing Example of the Company

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Station No	Operation	Machines	Cycle Time (min)	Achived Amount (piece)	Required Time (min)	Idle Time (min)	Operator No
1	1st shoulder stitch	Overlock Machine	0,14	3500	490	50	1
2	Collar tape	Cover Stitch Machine	0,3	1800	540	-	2
				1700	510	30	3
3	2nd shoulder stitch	Overlock Machine	0,17	3176	540	-	4
				324	55	485	5
4	Labelling	Lock Stitch Machine	0,1	3500	350	190	6
5	Sleeve tape	Cover Stitch Machine	0,5	1080	540	-	7
				1080	540	-	8
				1080	540	-	9
				260	130	60	6
6	Side seam	Overlock Machine	0,25	2160	540	-	10
				1340	335	150	5
7	Hem cover stitch	Cover Stitch Machine	0,4	1350	540	-	11
				1350	540	-	12
				416	320	220	13
Total Time			1,86				

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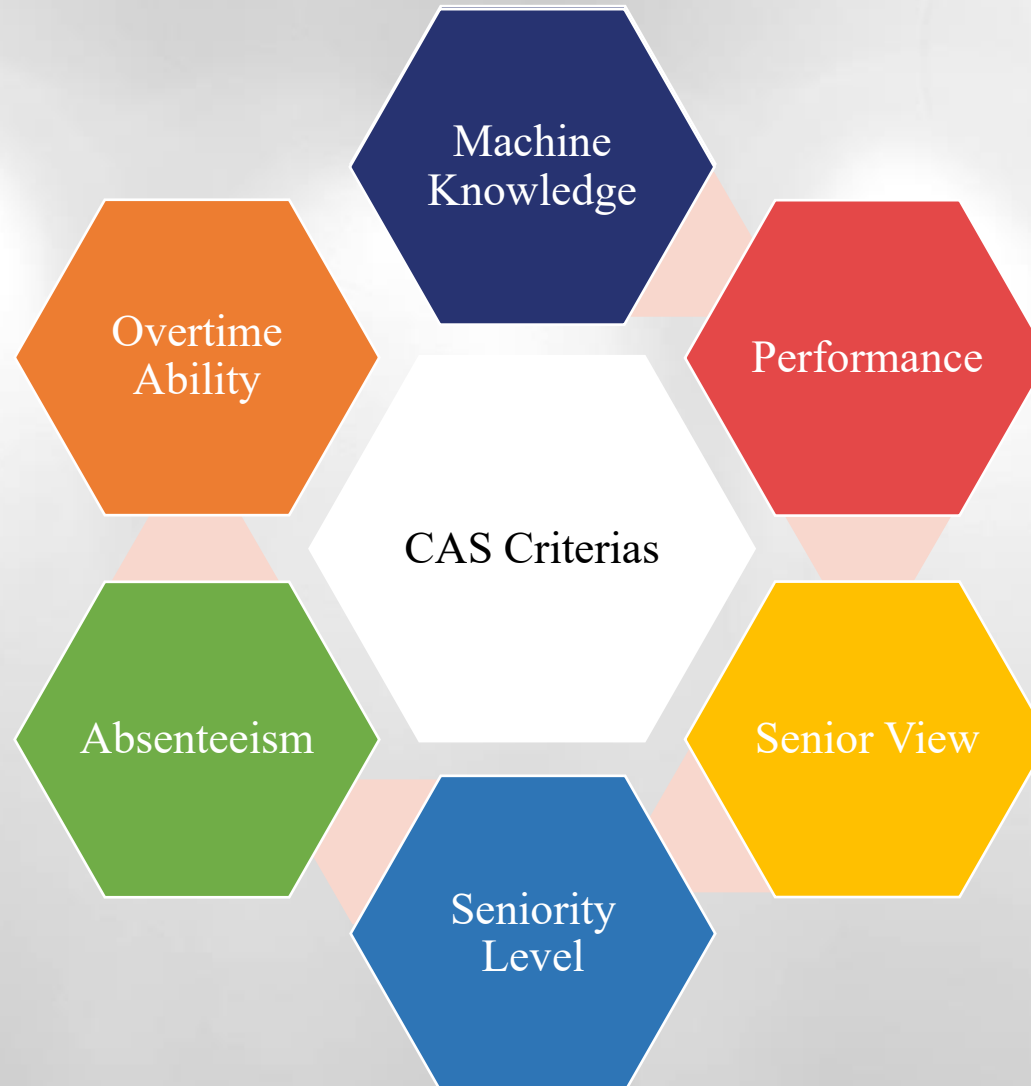


Table 2. Machine & Operation Groups

Machine Type	Operation Name	Operation Difficulty Level
Lockstitch Machine	Nape Triangle Seam	3
Lockstitch Machine	Triangle Label Stitching	3
Lockstitch Machine	Pocket Seam	2
Lockstitch Machine	Nape Heading Tape Stitching	4
Lockstitch Machine	Washing Instruction Stitching	1
Lockstitch Machine	Zipper Attaching	5
Lockstitch Machine	Sleeve End Stopstitch	2
Lockstitch Machine	Fly Long Stitching	2
Lockstitch Machine	Fly Envelope Stitching	5
Lockstitch Machine	Collar	4
Lockstitch Machine	Slit	4
Overlock Machine	Hem Rib	3
Overlock Machine	Sleeve Rib	3
Overlock Machine	Sleeve Setting	2
Overlock Machine	Blind Seam	2
Overlock Machine	Shoulder Seam	1
Overlock Machine	Collar + Hood Seam	3
Overlock Machine	Side Seam	3
Cover stitch Machine	Binding	1
Cover stitch Machine	Hem + Sleeve Covering Seam	4
Cover stitch Machine	Tracking Sticth	3
Cover stitch Machine	Trimming Flatlock Stitching	3
Chain stitch Machine	Rubber Seam	2
Chain stitch Machine	Shoulder Chain Stitch	2
Flat seaming (Lock) Machine	Lock	3

Table 3. Machine Knowledge Point Scale

Machine Knowledge	Point
Low	1
Intermediate	2
High	3

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Machine Knowledge

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Lockstitch Machine	Slit	4
Overlock Machine	Hem Rib	3
Overlock Machine	Sleeve Rib	3
Overlock Machine	Sleeve Setting	2
Overlock Machine	Blind Seam	2
Overlock Machine	Shoulder Seam	1
Overlock Machine	Collar + Hood Seam	3
Overlock Machine	Side Seam	3
Cover stitch Machine	Binding	1
Cover stitch Machine	Hem + Sleeve Covering Seam	4
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Machine Knowledge

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Performance expresses the average daily net production rate in line with the operator's targets.



- Targeted produce units in a day: 1.000
- Realised operations: 950
- Faulty productions: 50
- Performance: %90

Performance

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Seniority Level: It expresses the operator's working years (seniority) in the company.

Seniority
Level



Senior View: Expresses the operator's senior (such as the foreman/chief) comments about the operator.

Senior View

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Overtime Ability: It refers to the flexibility of the operators to stay overtime.

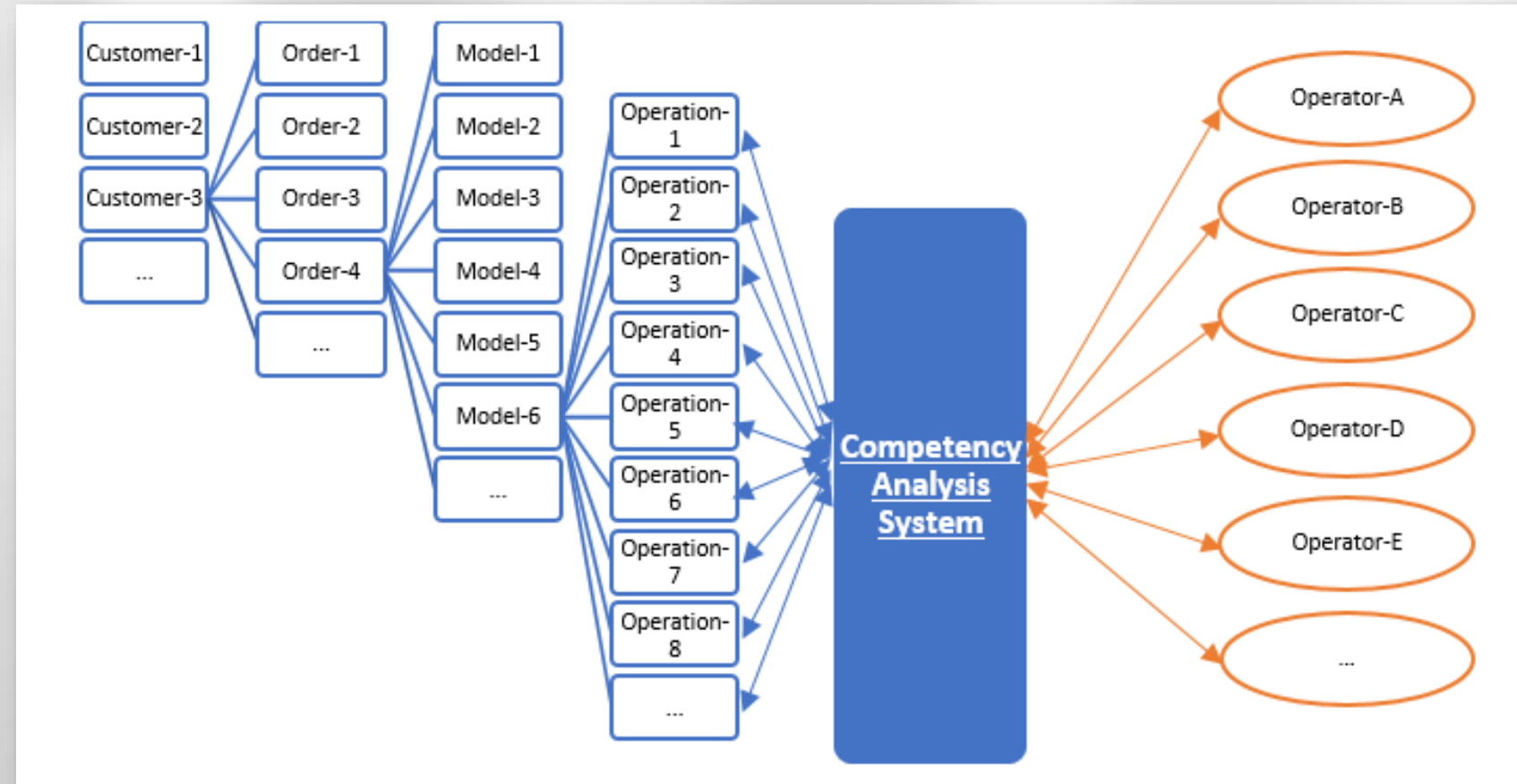
Overtime
Ability



Absenteeism: It refers to the number of days that operator is absent on average per month.

Absenteeism

Figure 1. The line balancing scheme with the competency analysis system



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CAS**Introduction****Material****Method****Findings****Results & Evaluations****Acknowledgement****References****Table 4. Saaty scale (Saaty, 2007)**

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
3	Moderate Importance	Experience and judgment slightly favor one activity over another
5	Strong Importance	Experience and judgment strongly favor one activity over another
7	Very Strong Importance	Experience and judgment very strongly favor one activity over another
9	Extreme Importance	Experience and judgment extreme strongly favor one activity over another
2,4,6,8	Intermediate Values	Intermediate values between the two adjacent judgments

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- Pairwise comparisons of the criteria (Questionnaire)



- Company production managers
- Production engineers
- Academicians

Table 5. The weights of the criterion

Criteria	Weight Value
Machine Knowledge	0,412
Performance	0,248
Senior View	0,076
Seniority Level	0,046
Absenteeism	0,134
Overtime Ability	0,084

Table 6. The CAS score of the operators

Operator no	Operator's line (team) number	Machine knowledge	Performance	Absenteeism	Overtime ability	Senior view	Seniority level	CAS score
1	1	35	83	85	35	100	65	60
2	1	61	86	76	31	65	45	66
3	1	26	89	76	35	100	39	55
...	...	...	...	...	...	...	...	...
89	4	13	85	79	18	30	1	41
90	4	46	84	78	18	65	1	57
91	4	72	81	80	13	100	1	69
		0,412	0,248	0,134	0,084	0,076	0,046	59



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Table 7. The CAS score of the lines (teams)

Line No	Average CAS Score
1	62,77
2	61,28
3	55,86
4	56,02

The average
CAS score of
91 operators is
58,97



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✓ All operators can be evaluated objectively

✓ The balancing level of each line can be evaluated, and each line can be compared with the others easily.



✓ The areas where operators are weak can be easily identified and training can be taken to eliminate the weakness in this direction.

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The result of the study is 15% reduction in model setup times has been achieved at the Company's Izmir branch.



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*This article was supported by the TUBITAK 1501 (Industrial R&D Support) program
(Project No:3189129) with the collaboration of Ege University.*

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