Organizational and technological concepts that enable quality costs monitoring

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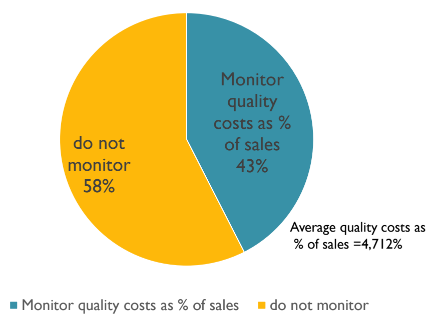
Motivation

- Lack of empirical research that address quality cost monitoring (exception is Pires et al. (2013) who showed that only 53,1% of companies monitor quality costs)
- Desai (2008) and Srivastava (2008) state that even a small reduction in quality costs will impact the overall financial goal of a company



Competitive priorities

Competitive factor	Importance (1- most important, 6 – unimportant)
quality	1,65
customized products	3,01
price	3,16
delivery on time, short delivery	3,16
service	4,98
innovation, technology	5,04

Still no definition as to what is measured under quality costs

	(textile industry) Schiffauerova and Thomson (2006)	wood-processing Swedish manufacturing company Setijono and Dahlgaard (2008)	Cheah et al. (2011) Case study artificial wooden planks	Omachonu et al. (2004)	Turkish manufacturing company Kirlioğlu and Çevik (2013)	footwear company Sansalvador and Brotons (2013)
Total prevention cost	12%	2,5%	16,8%		They provided also all those costs but in % of quality costs so comparison is impossible	
Total appraisal cost	16%	15,5%	17,5%			
Total internal failure cost	64%	53%	65,7%			
Total external failure cost	8%	29%				
Total cost of quality in relation to sales	7,56%.	4%	5,64% (additional 8.78% of sales are invisible quality costs)	3.67%	1,61%	5,5%

Data collection

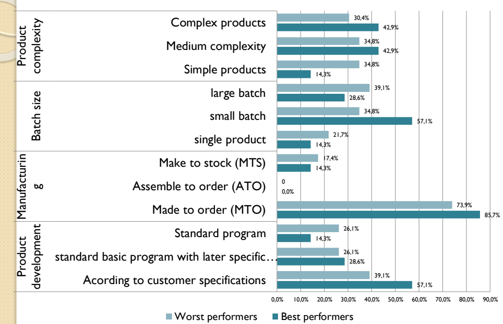
- Questionnaire design by Fraunhofer ISI Institute, Karlsruhe
- European Manufacturing Survey (14 European countries involved) http://www.isi.fraunhofer.de/isi-en/i/projekte/fems.php
- Only Croatian data is presented
- Sent to 1541 companies with over 20 employees
- 120 responses received
- 8% response rate

Distribution of the sample according to size and industry

Number of employees	Percentage
< 50	36,7
50 - 250	40,8
> 250	22,5

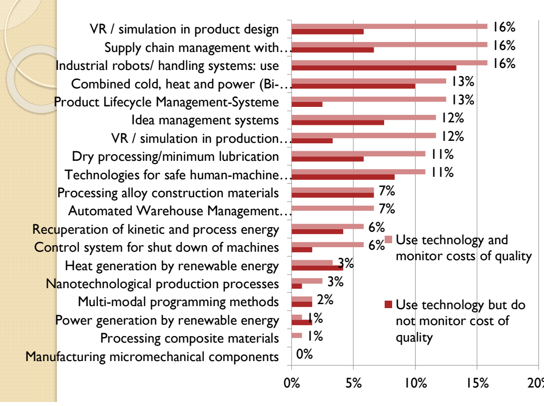
Industry	Frequency	Percent
10 Food	12	10,0
11 Beverages	2	1,7
13 Textile	8	6,7
14 Clothes	3	2,5
15 Leather	4	3,3
16 Wood	11	9,2
17 Paper	5	4,2
18 Printing	3	2,5
20 Chemicals	6	5,0
21 Pharmaceutics	2	1,7
22 Rubber and plastics	3	2,5
23 Nonmetallic	10	8,3
24 Metal	6	5,0
25 Metal products except machinery	15	12,5
26 computers and optical instruments	3	2,5
27 electronic equipment	9	7,5
28 Machinery	6	5,0
29 vehicles	3	2,5
30 Other transportation	5	4,2
31 furniture	4	3,3
Total	120	100,0

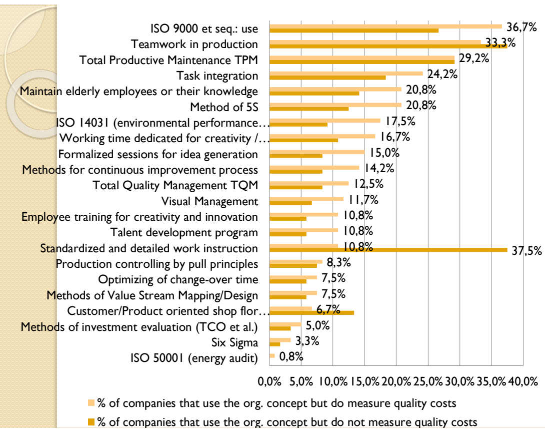
Characteristisc of production



Used technology

Technology	Usage	Mean introduction date	Level of usage (1-low, 2-medium, 3-high)
Industrial robots/ handling systems	30,6%	2003	2,4
Automated Warehouse Management Systems (internal)	7,1%	2002	2,9
Technologies for safe human-machine cooperation	21,2%	2003	2,4
Multi-modal programming methods	2,4%	2003	2,8
Processing alloy construction materials	12,9%	2001	2,3
Processing composite materials	1,2%	2005	2,0
Manufacturing micromechanical components			
Nano technological production processes	1,2%	2002	2,5
Supply chain management with suppliers/customers	23,5%	2003	2,3
VR / simulation in production reconfiguration	14,1%	2006	2,2
VR / simulation in product design	24,7%	2002	2,4
Product Lifecycle Management-System	15,3%	1999	2,3
Idea management systems	17,6%	2003	2,6
Dry processing/minimum lubrication	18,8%	2000	2,3
Control system for shut down of machines	8,2%	2003	2,2
Recuperation of kinetic and process energy	14,1%	1999	1,8
Combined cold, heat and power (Bi-/Tri generation)	29,4%	1998	2,1
Power generation by renewable energy	2,4%	2001	2,0
Heat generation by renewable energy	7,1%	2005	2,2





Statistical difference only on Return on sales before tax between those who monitor and do not monitor quality costs

Record of quality costs	Inputs [Million Euro]	Depreciation of machines/equip. [Mill. Euro]	Share of staff costs of turnover [%]	Degree of capacity utilization [%]	consumed material as percentage of revenues	Turnover in [Million Euro]	Return on sales before tax	Product complexity
NO	11,5663	,8875	26,13	35,59	71,30	19,681	1,05	1,96
YES	9,6778	,9404	21,06	48,39	45,90	16,077	1,67	2,22
Total	10,6421	,9146	23,64	41,87	58,86	17,931	1,36	2,09

If all technology and organizational concepts (only of those who monitor quality costs) are entered into regression analysis as independent variable, and return on sales as a dependent variable the model is not significant

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,985[a]	,970	,735	,666	,970	4,124	39	5	,059

b. Dependent Variable: Return on sales before tax

Excluding all insignificant technologies and organizational concepts

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,728[a]	,530	,311	1,074	,530	2,417	14	30	,021

a. Predictors: (Constant), Combined cold, heat and power (Bi-/Trigeneration), Formalized sessions for idea generation, Methods of Value Stream Mapping/Design, Processing composite materials, Optimizing of change-over time, Idea management systems, Total Productive Maintenance TPM, Task integration, Methods of investment evaluation (TCO et al.), Total Quality Management TQM, Teamwork in production, VR / simulation in product design, Visual Management, Method of 5S

b. Dependent Variable: Return on sales before tax

Analyzing we see that organizational concepts dominate

	Standardized Coefficients Beta	Sig.	Collinearity Statistics: Tolerance	VIF
(Constant)		,101		
Methods of Value Stream Mapping/Design	-,365	,020	,715	1,399
Optimizing of change-over time	-,208	,165	,732	1,367
Total Productive Maintenance TPM	,137	,018	,588	1,699
Total Quality Management TQM	-,073	,654	,600	1,667
Method of 5S	,477	,001	,475	2,106
Task integration	-,257	,132	,566	1,766
Teamwork in production	,418	,001	,565	1,771
Visual Management	,118	,049	,515	1,943
Methods of investment evaluation	,204	,203	,636	1,572
Formalized sessions for idea generation	,041	,065	,477	2,096
Processing composite materials	,107	,303	,629	1,590
VR / simulation in product design	,017	,267	,534	1,872
Idea management systems	-,162	,259	,785	1,273
Combined cold, heat and power	-,239	,165	,557	1,796

Conclusion

- Monitoring quality costs does in fact augment return on sales
- Those that do monitor quality costs have the greatest benefits (greatest return on sales) from using dominantly organizational concepts, and especially those connected with the Total Quality Management approach and not so much by technology

THANK YOU FOR LISTENING

I'll be happy to answer any question