Competitive priorities of high and low performers in global manufacturing: results from GMRG 2008 data

Prof. Lovorka Galetić, PhD, lgaletic@efzg.hr, tel. 0038512383264

Jasna Prester, PhD, jprester@efzg.hr, tel. 0038512383261

University of Zagreb

Faculty of Business and Economics

Department Organization and management

10000 Zagreb, Croatia

Abstract:

Based on a large scale manufacturing study pursued by members of Global Manufacturing Research Group we aim to find answers on several questions. (1) do trade-offs between core competences still exist, (2) which best practices use best performers. We divided our sample according to profit margin into three groups. We show that order of importance of competitive priorities have changed since last researches. Through correlation analysis we showed that for high performers correlation between competitive priorities are extremely high (over 0,5) unlike the middle performers and unlike low performers who experience trade-offs between competitive priorities. Finally we looked at used best practices and find the biggest differences in usage of Six sigma methodology, ISO 14000, cellular manufacturing, JIT and finally factory automation. Our findings are in accordance with the integrative model described in Boyer and Lewis (2002, pp. 11).

Keywords: *Competitive priorities, manufacturing best practices, manufacturing*

Introduction:

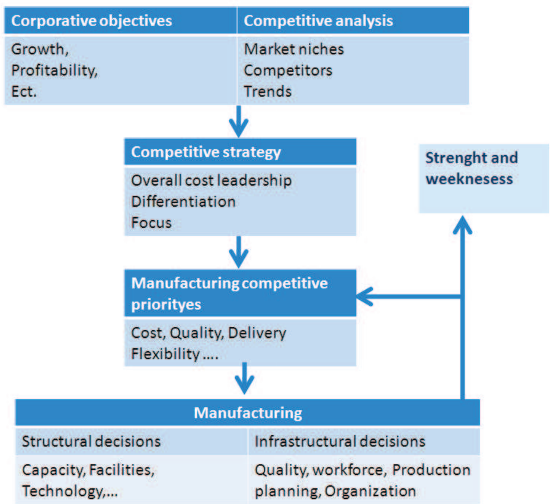
With intensified global competition, manufacturing facilities will, out of necessity, and either implicitly or explicitly, develop competitive manufacturing strategies that naturally will meet with varying degree of success. Manufacturing strategies are subject to change in response to competitive, dynamic markets and/or in response to change in corporate strategy (Noble, 1997, pp. 85). With change of the manufacturing company's environment or some internal changes the manufacturing strategies will also change. In such a competitive scenario companies have to search for new processes, new materials, new vendors, new shop floor design and new channels to deliver the product and services at a competitive price (Dangayach and Deshmukh, 2006, pp. 254). Today's manufacturers can no longer view themselves as closed systems focused only on efficiency. They must operate as a customer-focused, yet technology-based open operational systems Gomes *et al.* (2006, pp. 144). What the best performers do and which best practices or manufacturing procedures do they use? This is a serious question and Minnor *et al.* (1994) warns that such studies have to be done periodically especially because of changing environment. Minarro-Viseras *et al.* (2005, pp. 152) warn that manufacturing core competences are a neglected topic and say that operation function is viewed as: "merely as a collection of resources and constraints. It was expected to fulfill, as efficiently as possible, the production targets generated by the marketing strategy within the capacity and capital expenditure constraints imposed by the financial strategy". Englyst (2007, pp.934) warns that manufacturing today has to be considered as a strategic issue because: "Two of the most notable challenges are increased levels of complexity and uncertainty, which cannot be ignored or reduced, but need to be addressed. This suggests a dynamic systems view focusing on interdependencies and complementarities of roles and tasks within the manufacturing system. The increased global operation, both with respect to markets and supply, has broadened the scope of manufacturing. At the same time, the drastic reductions in product lifecycles and delivery times have eliminated inventories and, as a consequence, have called for management of interdependencies among subsystems." Ward and Duray (2000, pp. 123) prove that the relationship between competitive strategy and performance is mediated by manufacturing strategy and they find no other study linking competitive strategy and manufacturing strategy. Ahmad and Schroeder (2002, pp. 84) present an exploratory study on how manufacturing companies compete but warn that more empirical research is needed for further understanding. Same argue (Dangayach and

Deshmukh, 2001, pp. 884) that manufacturing strategy is still under researched and that it is still not clear what constitutes manufacturing strategy.

Manufacturing core competences

The primary reason to clarify manufacturing capabilities and objectives is making sure that the corporate strategy is achieved. For example if the business strategy is low cost, than manufacturing strategy should also focus on cost. The choice of the competitive strategy should be a result of careful analysis of the environment (customers, suppliers, competitors, ..) and the strength and of the company itself. Methods for these analyses are described in Porter (1998) (see Figure 1).

Figure 1: How manufacturing core competences are derived



As far as corporate strategy is concerned we find in the literature (1) market based strategies and (2) resource based strategies. Market based view proposes that firms gain competitive advantage through identifying markets or market niches and then aligning the firm with these opportunities.

Source: Hörte *et al* (1987, p.1574), and Boyer and Lewis (2002, pp. 10)

The other extreme is Porters (1998) view by which we first analyze the industry, chose strategy and then align firm's allocation of resources to the chosen strategy.

Competitive advantage is thus created not by privileged end-product market position, but by distinctive, valuable firm-level resources that competitors are not able to reproduce. Firms therefore sustain competitive advantage through developing distinctive competences which later were renamed into core competences (Brown and Blackmon, 2005, pp. 795)

It was long believed (Skinner, 1969, pp. 5) that manufacturing cannot pursue all competitive priorities all at once and that there exists a trade-off that companies have to make. At first, scientists started reporting evidence of companies pursuing aggressively in several manufacturing competitive priorities and started to question the – till then unquestioned – trade-off approach (Ferdows K., De Meyer A., 1988).

According to Sarmiento *et al.* (2007, pp. 368) manufacturing capabilities can be referred to as the ability of a production system to compete on basic dimensions such as quality, cost, flexibility and time. Short delivery cycles, superior product quality and reliability, dependable delivery promises, ability to produce new products quickly, are performance areas which can be a source of competitiveness for manufacturing companies. Hui (2004, pp. 605) also mentions time as most important competitive priority: "time compression increases productivity, improves quality, reduces cycle times and speeds innovative products to market."

Today three new manufacturing capabilities theories exist. According to Boyer and Lewis (2002, pp. 11) we can find in the literature (1) the trade-off model, (2) the cumulative model and (3) the integrative model. The trade-off model basically suggests that a company cannot excel in one competitive priority without jeopardizing some other competitive priority. For example excelling in quality by the trade-off theory, a company could not lead in costs. The cumulative model was introduced by Corbett and Van Wasenhove (1993). They argument that because of advances in technology, (specifically advanced manufacturing technologies), companies are able to produce products with greater precision, speed and efficiency. But there is a catch in the theory because companies build up their competences, but the build-up of competences should be done sequentially, first building quality, dependable delivery, followed by low cost and then at the end flexibility. Each successive capability becomes a primary focus only after minimal levels of preceding capability has been achieved. The third model is the integrative model which states that elements of booth preceding models are valid but the trade-offs change with time. Manufacturing technology is much more sophisticated than it was 25 years ago and it is the advances in technology that change the nature of trade-offs. When a plant is able to improve on the quality dimension, all other capabilities benefit from these improvements. Processes become more stable and reliable, and less time and cost is required for rework. Improving quality will cause other capabilities, especially cost, to follow. With regard to delivery, reducing lead-time, set-up time and delivery time depend on reliable processes and a constantly high level of product quality. Being able to manufacture at high speed improves the flexibility of the operation since less time is required to respond to different external influences and adjust to changed requirements. Reducing required times within the production process helps in reducing costs through higher productivity and lower inventory levels. Therefore, improving delivery capabilities provides a direct benefit for cost and flexibility (Größler and Grübner, 2006). Boyer and Lewis (2002, pp. 10) are proponents of integrative model but they report that trade-offs still exist. Noble (1995, pp. 12) reports negative correlation between delivery and flexibility and offers the explanation that in order for delivery to be reliable, inventory levels have to be higher which then reduces flexibility. In later work Noble (1997, pp. 93) finds negative correlation not only among delivery and flexibility but also delivery and innovation. Kathuria (2005, pp. 5) finds a positive relation between flexibility and all others competitive priorities. Mapes *et al.* (1997, pp. 1028) find negative correlation between flexibility and all other competitive priorities including innovation.

Größler and Grübner (2006, pp. 459) pose three unresolved research questions: of which nature, strength and direction are these trade-offs? What dynamic consequences result from these trades-offs? Are there capabilities that support each other, i.e. capabilities between which no trade-offs or even cumulative effects exist? They find that trade-offs still exist but their amplitude has decreased due to technological and organizational improvements. They analyzed only the four core competences and find positive correlation between all capabilities except between cost and flexibility.

The second question is which core competences are dominant and most important to analyze? Most textbooks and researchers named only the basic four: (1) quality, (2) costs, (3) dependable delivery and (4) flexibility. Yet, in recent Operations management textbooks new competitive priority (5) innovation has emerged (see Chase *et al,* 2006, pp. 26-27). Größler and Grübner (2006, pp. 458) report two additional competences, that is innovativeness and environment soundness.

Leachman *et al.* (2005, pp. 851) in introduction of their work state that companies have to first identify their core competences and then rate their competitive priorities relative to their competitors. Which are core manufacturing competences is still not answered (Boyer *et al.* 2005, pp. 444). So the question is: which are today's dominant manufacturing core competences. Manufacturing core competences are changing in numbers and in their relative importance in time. For example in Minnor *et al.* (1994, pp. 17), four core competences are investigated – cost, quality, delivery and flexibility and flexibility in that research emerged as most important competitive priority.

Table 1: Importance of competitive priorities from three researches

Dangayach and Deshmukh, (2006, pp. 259)	Boyer and Lewis (2002, pp. 13)	Acur *et al.* (2003, pp. 1123) for Europe
1. Quality (4,07)	1. Quality (6,49)	1. Quality (4,22)
2. Delivery (3,84)	2. Delivery (6,46)	2. Delivery (4,12)
3. Innovation (3,91)	3. Cost (5,61)	3. Cost (3,72)
4. Flexibility (3,60)	4. Flexibility (5,60)	4. Flexibility (3,26)
5. Cost (2,86)		5. Innovation (3,21)
5-point Likert scale	7 –point Likert scale	5-point Likert scale

Flynn and Flynn (2004, pp. 447) find that competitive priorities significantly differ by country and by industry.

Research methodology

The sample is consisted of 1386 manufacturing companies. Each participating country obtains the questionnaire from the Global Manufacturing Research Group (GMRG) and translates it to its native language. 21 countries participated in the round ending in 2008. Those countries in alphabetical order are: Albania, Australia, Brazil, China, Croatia, Fiji, Finland, Germany, Ghana, Hungary, Ireland, Italy, Korea, Macedonia, Mexico, Nigeria, Poland, Sweden, Swiss, Taiwan and USA. The data collection method differs from country to country but the dominant method was mailing the survey, and phoning companies and asking for their involvement in the study. The questionnaire had 10 condensed pages and the data gatherers had to get really involved to obtain responses from companies. The population sample is the whole manufacturing with over 20 employees because it is believed that smaller companies in terms of number of employees do not have institutionalized manufacturing strategies development. It is not that they don’t follow for example Porters (1998) generic strategies but rather that the strategy decisions often reside in only one person’s decisions. The definition of size, industry and collection criteria for a research study enters the minimal criteria for comparison of similar studies (Minor *et al.*, 1994, pp. 7).

Figure 2: Descriptive statistics of GMRG sample

Figure 2a: Distribution of the GMRG sample by size of companies

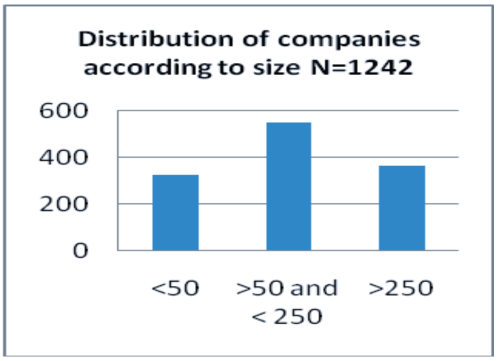


Figure 2b: Distribution of the GMRG sample by country of origin of companies

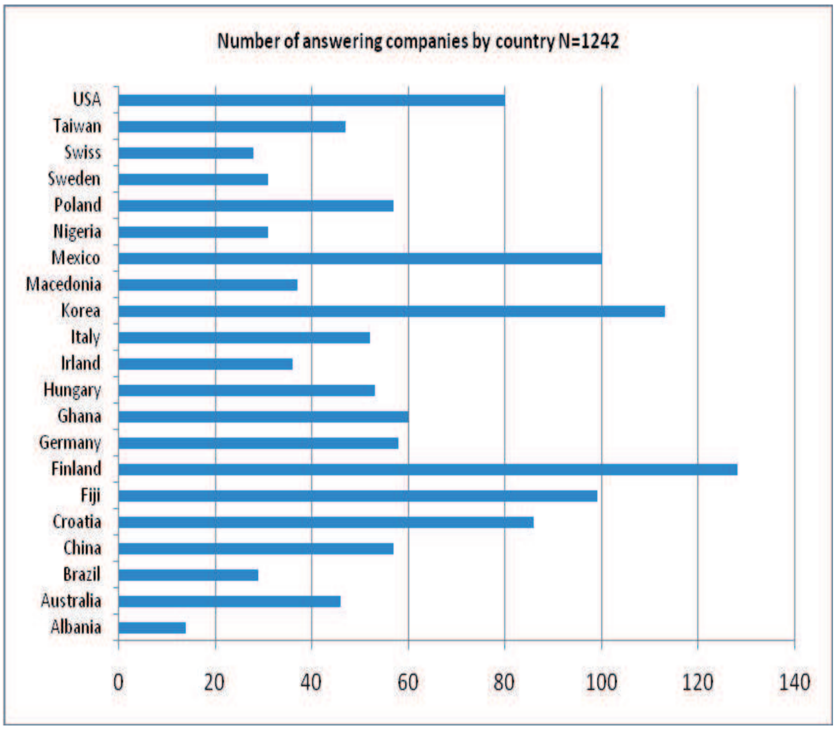
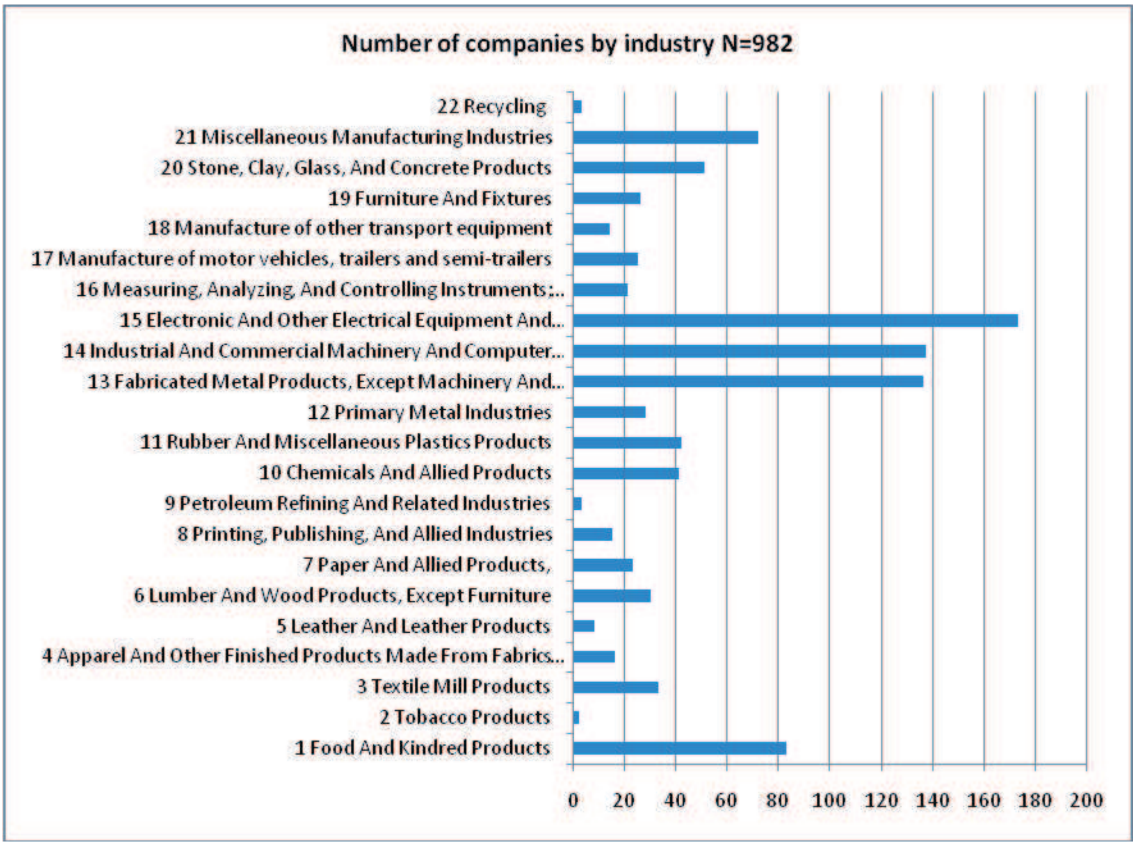


Figure 2c: Distribution of the GMRG sample by industries



Results

Since our main idea is to investigate manufacturing core competences and to give some prescriptions on the grounds of best performers, we divided our sample in three groups; high performers, middle performers and low performers. The divisions were done on the variable sales margin which in turn was obtained as 1- total material costs and total labor cost as percentages of sales. This new variable could range from negative (companies incurring loses) to maximum 1 (that would mean that the company had no material and labor costs). The division was grounded on the ABC analysis. We defined top performers as ones having profit margin over 0.8. The medium performers have profit margins less then 0.8 but higher then 0.2. Low performers are ones with profit margins less then 0.2 and can go into negative. The analysis has shown the following frequencies:

Table 2: Division of the sample according to profit margin

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low performers	351	25,3	32,1	32,1
	Middle performers	729	52,6	66,6	98,7
	High performers	14	1,0	1,3	100,0
	Total	1094	78,9	100,0	
Missing	0	292	21,1		
Total		1386	100,0		

It turns out that we only have only 1,3% of high performers, 66% of middle performers and 32,1% of low performers. 21,1% of the overall sample did not provide data necessary for this analysis. Therefore we will first investigate the characteristics of these high performers.

Table3a and b: High performers according to countries and industry

Country	**N**
Brazil	1
Canada	1
China	2
Fiji	1
Germany	1
Hungary	1
Korea	1
Mexico	3
Nigeria	1
Taiwan	2
Total	14

Industry	**N**
1 Foods	1
10 - Chemical	1
13 Fabricated metal products	1
14 Industrial and commercial machinery	3
15 Electronics	3
21 Miscellaneous	1
Total	10

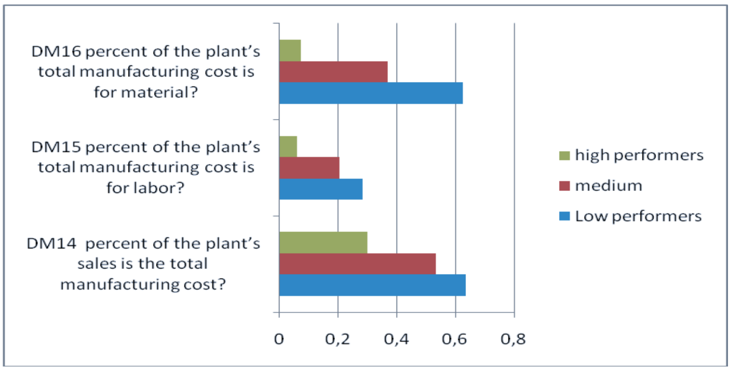
Our separating variable was 100% of sales – DM15(labor) – DM16(materials). It is only natural that we will actually obtain the distribution in which high performers have lower input costs. According to Tables 3a and 3b, the input expenses in percentage of sales do not depend on country (for example low wage countries) or industries (we find process industries as well as electronics and miscellaneous industry).

Table 4: Demographics of high, middle and low performers

Performers	Total plant employees	Production workers	Total engineers	Ave age production equipment	% sales invested in new manufacturing equipment	% sales from products from last two years
Low	535	410	77	12,2	0,15	0,30
Middle	445	303	59	11,3	0,19	0,35
High	**601**	**301**	**39**	**12,6**	**0,22**	**0,42**
Total	476	337	64	11,6	0,18	0,33

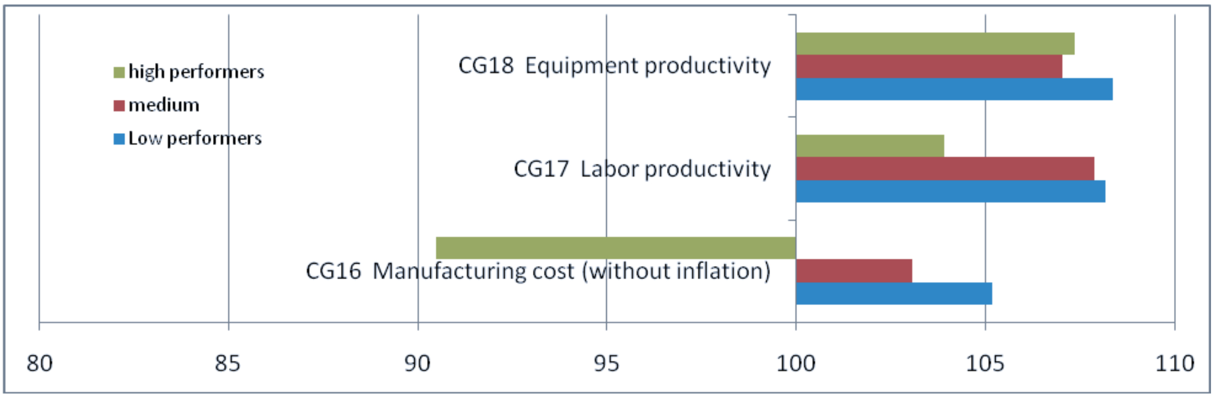
From Table 4. We see that high performers are in fact big companies but they do not necessary have the highest number of production workers or engineers. In fact high performers invested most in manufacturing equipment which might explain that they automated production so they don't need as much production workers and total production is cheaper (but naturally necessitate higher initial investments). Probably high performers have almost half of employees working on ways to innovate products, because as we can see from Table 4, last column, high performers generate almost 42% of sales from new products.

Figure 3: Costs as % of sales for three groups of performers



Even for middle performers all costs as % of sales are more then double then high performers. The biggest difference is in cost of materials.

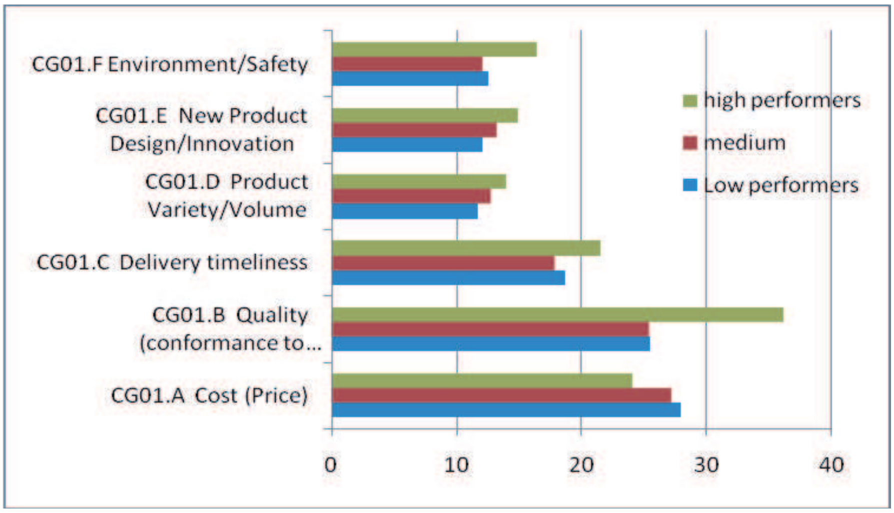
Figure 4: Rise and fall in productivity



From Figure 4. We see that there is almost no difference in equipment productivity probable meaning that they use their equipment almost alike. The difference becomes significant for labor productivity. High performers interestingly report the lowest raise in labor productivity. Still, there is a significant fall in overall manufacturing cost productivity for high performers. This is interesting, because it shows that we have a missing link between high performers and the rest. If all production systems input material in which people and machines transform these raw materials into products, than how come high performers using the same input have so much lower total manufacturing costs?

Next, let us look at competitive priorities. The responders had to evaluate on a scale from 1-100 the importance of competitive priorities (but the sum had to add up to 100).

Figure 5: Competitive priorities



What is readily seen is that high performers value quality the most, than comes cost and then delivery. For middle performers the first two priorities are in reverse order that is cost is the first priority.

Table 5: Correlations between competitive priorities

		CG01.A Cost (Price)	CG01.B Quality (conformance to specifications)	CG01.C Delivery timeliness	CG01.D Product Variety/ Volume	CG01.E New Product Design/ Innovation	CG01.F Environment/ Safety
CG01.A Cost (Price)	Low	1	0,16	0,04	0,19	-0,05	0,25
	Middle	1	0,09	0,08	0,12	0,07	0,15
	High	1	0,50	0,51	0,66	0,51	0,60
CG01.B Quality (conformance to specifications)	Low performers		1	0,36	0,36	0,23	0,46
	Middle		1	0,40	0,31	0,24	0,38
	High Performers		1	0,59	0,60	0,45	0,61
CG01.C Delivery timeliness	Low performers			1	0,50	0,29	0,55
	Middle			1	0,52	0,22	0,53
	High Performers			1	0,89	0,75	0,86
CG01.D Product Variety/Volume	Low performers				1	0,57	0,72
	Middle				1	0,44	0,57
	High Performers				1	0,89	0,94
CG01.E New Product Design/Innovation	Low performers					1	0,54
	Middle					1	0,45
	High Performers					1	0,79
CG01.F Environment/Safety	Low performers						1
	Middle						1
	High Performers						1

As we can see from Table 5. high performer's competitive priorities are all highly correlated (all correlations over 0,5) meaning that the cumulative model is valid and that it is possible to better some competitive priority without jeopardizing some other competitive priority. The same is true for middle performers but the correlations are lower. Trade-offs exists for low performers especially between new products and costs.

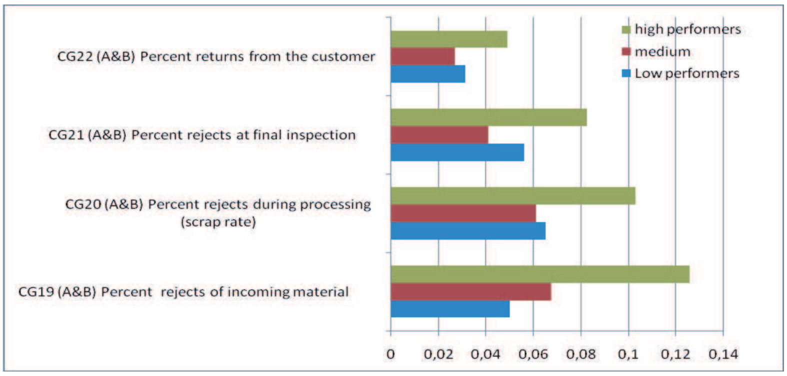
As we can see already our findings differ from researches laid out in Table 1. For the majority of companies cost became the first priority and that means that they have to look very carefully to make their production systems as efficient as possible.

Table 6: Importance of competitive priorities from three researches

Dangayach and Deshmukh, (2006, pp. 259)	Boyer and Lewis (2002, pp. 13)	Acur *et al.* (2003, pp. 1123) for Europe	Our study (High performers)
1. Quality (4,07)	1. Quality (6,49)	1. Quality (4,22)	1. Quality (28,7)
2. Delivery (3,84)	2. Delivery (6,46)	2. Delivery (4,12)	2. Cost (27,7)
3. Innovation (3,91)	3. Cost (5,61)	3. Cost (3,72)	3. Delivery (18,8)
4. Flexibility (3,60)	4. Flexibility (5,60)	4. Flexibility (3,26)	4. Innovation (17,2)
5. Cost (2,86)		5. Innovation (3,21)	5. Environment (15,2)
5-point Likert scale	7 –point Likert scale	5-point Likert scale	100 points in total

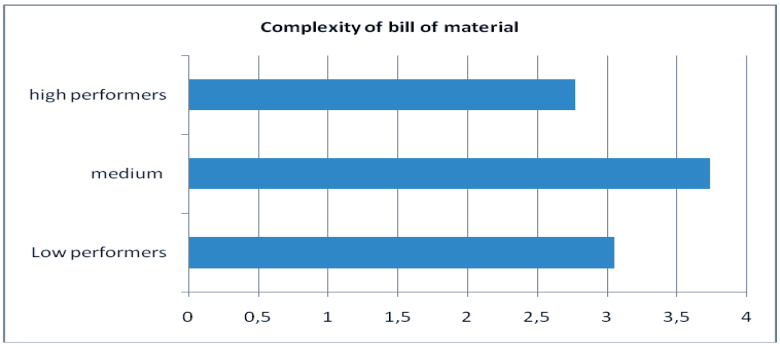
As we can see for high performers, similar as other studies quality is the first priority. The difference to previous studies is that cost became the second most important priority. Since quality is the top priority we looked at performance indicators tied up with quality issues.

Figure 6: Performance indicators tied to quality issues



From figure 6. we can see that high performers have significantly higher rates of reject of incoming material, scrap, reject at final inspection but also returns from customers. It seems that these high performers are serving a market niche where quality is the top priority, have higher standards than other performers which explains higher rejects during the production process. We checked if high performers make more complex products and that that might be the reason why they have higher rejects. However the regression analysis of percent of reject on complexity of bill of material reveals that the regression model is insignificant (R=0,015, R2=0,00). Correlations between bill of material and percent of rejects are also insignificant (r=0,015).

Figure 7. Complexity of bill of material



Finally we looked at operative best practices to see why best performers so much better then the rest are. In Figure 8. we depict all best practices and in Figure 9. we depict only the difference in usage of best practices between high and medium performers. From these figures the biggest difference is in usage of Six sigma methodology. Six sigma methodology has very strict acceptance rates for quality (3,4 defect per million produced products) and this might explain why the reject rates from high performers are so much larger then from the rest of performers.

Figure 8: The level of usage of best practices

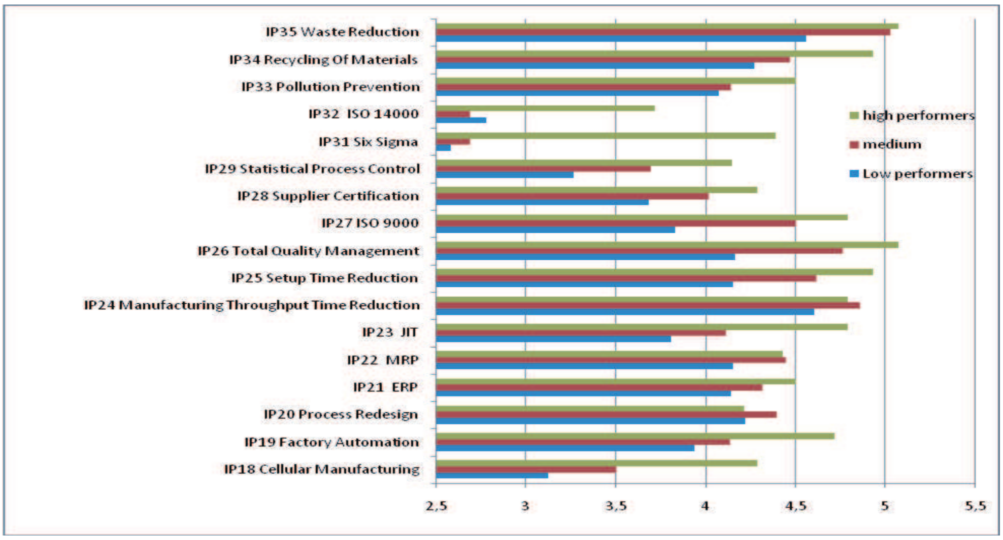
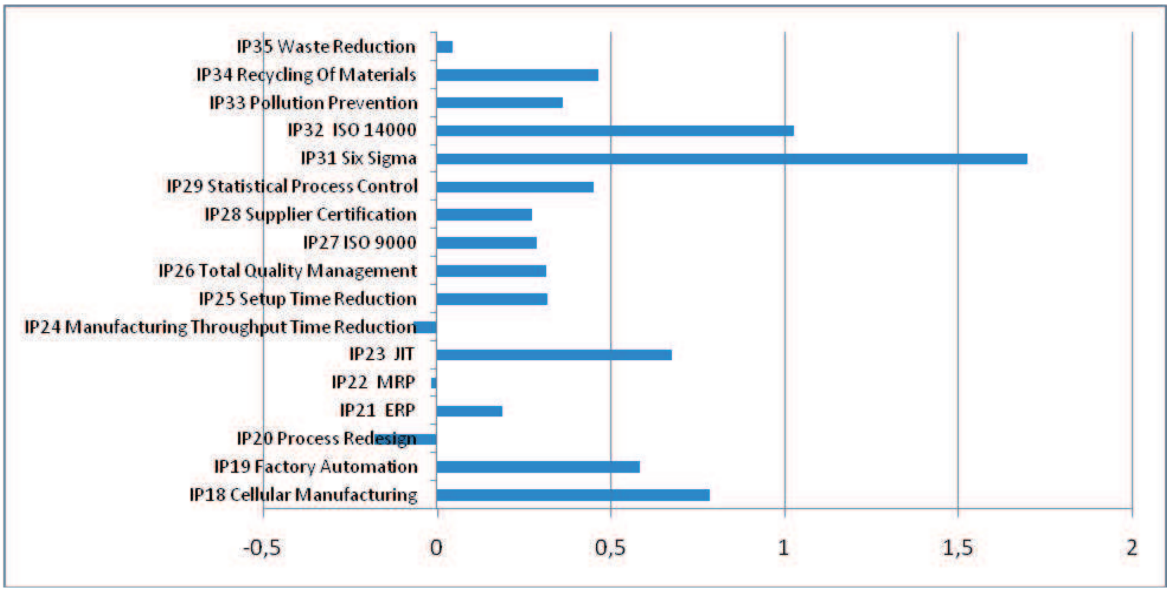


Figure 9: The difference in usage of practices between high and middle performers



The level of usage was measured on 7-point Likert scale. If one looks closely the biggest differences are actually on quality issues, which are further reinforced by t-test for testing differences between means (Table 7.). It can be suggested that low performers should pay more attention to quality programs. But to cite Demeter (2003, pp. 206) it is not enough to implement practices but one should do it through careful planning of implementation. Joshi *et al*. (2003, pp. 354) comment that if a company carefully implements these practices, strategy alignment would be naturally achieved.

Table 7: t-test for Equality of Means

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
IP31 Six Sigma	3,02	0,08	3,09	687	0,00	**1,70**
IP32 ISO 14000	8,08	0,00	1,84	707	0,07	**1,03**
IP18 Cellular Manufacturing	1,85	0,17	1,56	698	0,12	**0,79**
IP23 JIT	2,24	0,13	1,34	708	0,18	0,67
IP19 Factory Automation	0,89	0,35	1,25	720	0,21	**0,58**
IP34 Recycling Of Materials	0,34	0,56	1,02	712	0,31	0,46
IP29 Statistical Process Control	0,88	0,35	0,85	708	0,40	**0,45**
IP33 Pollution Prevention	0,35	0,56	0,77	717	0,44	0,36
IP25 Setup Time Reduction	0,02	0,88	0,68	714	0,49	**0,32**
IP26 Total Quality Management	1,21	0,27	0,64	712	0,52	**0,31**
IP27 ISO 9000	0,37	0,54	0,47	716	0,64	**0,29**
IP28 Supplier Certification	0,80	0,37	0,50	711	0,62	**0,27**
IP21 ERP	0,43	0,51	0,38	709	0,71	0,19
IP35 Waste Reduction	0,08	0,78	0,05	715	0,96	0,05
IP22 MRP	0,29	0,59	-0,03	707	0,97	-0,02
IP24 Manufacturing Throughput Time	0,00	0,98	-0,16	712	0,87	-0,07
IP20 Process Redesign	0,03	0,86	-0,31	714	0,76	-0,18

Discussion and conclusion:

Due to changing environment we believed that we would find a change in competitive priorities and as Minnor *et al.* (1994) say such studies have to be done periodically. Also we draw on opinion of Ahmed and Schroeder (2002, pp. 84) that such studies have to be done in order to better understand the manufacturing strategy process.

We found that to low middle and high performers, cost and quality are most important manufacturing core competences. However, quality is most important to high performers and then cost, while to low and middle performers first priority is cost and then quality. Delivery is for all three groups in the third place. We obtained different results then studies Dangayach and Deshmukh, (2006, pp. 259), Boyer and Lewis (2002, pp. 13), Acur *et al.* (2003, pp. 1123) for Europe who all report quality to be the most important competitive priority, followed by reliability.

Correlation analysis between competitive priorities shows that for high performers all manufacturing competitive priorities are positively correlated, what in a way gives affirmation to the integrative model of manufacturing competences defined in Boyer and Lewis (2002, pp. 11) and Corbett and Van Wasenhove (1993, pp. 117). On the contrary one finds negative relationships, that is, trade-offs within the low performer's sample. There is a negative correlation between cost and innovation. One can assume that those low performers have not yet passed the quality level that reduces waste, leads to more reliable delivery and flexibility, which finally has an impact on cost.

Manufacturing practices or "best practices" are those that the best performers do, and as such should be something worth implementing in a manufacturing. Manufacturing best practices were measured on 7-point Likert scale that went from 1 – not using it to 7 – extensively use it. Our t-test showed statistically significant differences in usage of these practices between high and middle performers and especially with practices dealing with quality. So, one can conclude, that low performers have to continue their journey in introducing and using quality practices to a greater extent.

There is also a limitation to this research. We divided our sample on low, middle and high performers according to profits as a percentage of revenues. If we follow Hon (2005) that manufacturing performance is multidimensional, including cost, productivity and quality performance measures, then one should further explore and construct a performance measure that would take into account all these tree measure and then see more clearly differences in "best" manufacturing practices.

References:

Acur N., Gertsen F., Sun H., Frick J., (2003), The formalization of manufacturing strategy and its influence on the relationship between competitive objectives, improvement goals, and action plans, *International Journal of Operations and Production Management*, Vol. 23, No. 10, pp. 1114-1141

Ahmad, S., Schroeder, R.G. (2002), "Dimensions Of Competitive Priorities: Are They Clear, Communicated, And Consistent?", *The Journal of Applied Business Research,* Vol. 18, No. 1, http://www.cluteinstitute-onlinejournals.com/PDFs/20027.pdf

Boyer, K.K., Lewis, M.W. (2002), "Competitive priorities: Investigating the need for trade-offs in operations strategy", *Production and Operations Management*, Vol. 11, No. 1, pp. 9-20

Boyer, K.K., Swink, M., Rosenzweig, E.D. (2005), "Operations Strategy Research in the POMS Journal", *Production and Operations Management*, Vol. 14, No. 4, pp. 442-449

Brown, S., Blackmon, K. (2005), "Aligning Manufacturing Strategy and Business Level Competitive Strategy in New Competitive Environments: The Case for Strategic Resonance", *Journal of Management Studies*, Vol. 42, No. 4, pp. 793-815

Chase, R.B., Jacobs, F.R., Aquilano, N.J. (2006), *Operations management for Competitive advantage,* 11e, McGraw Hill

Corbett, C., Van Wassenhove, L., (1993), "Trade-Offs? What Trade-Offs? Competence and Competitiveness in Manufacturing Strategy", *California Management Review* 35 (1993), pp. 107–122

Dangayach, G.S., Deshmukh, S.G. (2001), "Manufacturing strategy: Literature review and some issues", *International Journal of Operations and Production Management*, Vol. 21, No. 7, pp. 884-932

Dangayach, G.S., Deshmukh, S.G. (2006), "An exploratory study of manufacturing strategy practices of machinery manufacturing companies in India", *Omega*, No. 34, pp. 254-273

Demeter, K., (2003), "Manufacturing strategy and competitiveness", *International Journal of Production Economics,* No. 81-82, pp. 205-213

Dutta, S., Narasimhan, O., Rajiv, S. (2005), "Conceptualizing and measuring capabilities: methodology and empirical application", *Strategic Management Journal*, Vol. 26 pp.277-85

Englyst, L. (2007), "Strategic roles of manufacturing", *Journal of Manufacturing Technology Management*, Vol. 18, No. 8., pp. 933-948

Ferdows, K., De Meyer, A. (1988), "European Manufacturers: The Dangers of Complacency", *Columbia Journal of World Business,* vol. 23 no. 3 (1988), pp. 15–23

Flynn, B.B., Flynn, E.J. (2004), "An exploratory study of the nature of cumulative capabilities", *Journal of Operations Management,* No. 22, pp. 439-457

Frantzen, D., (2008), "Technology, competitiveness and specialization in OECD manufacturing", *Journal of Economic Studies,* Vol. 35, No. 1, pp. 44-68

Gomes, C.F., Yasin, M.M., Lisboa, J.V. (2006), "Performance measurement practices in manufacturing firms: an empirical investigation", *Journal of Manufacturing Technology,* Vol.17, No. 2., pp. 144-167

Größler, A., Grübner, A. (2006), "Empirical model of the relationships between manufacturing capabilities", *International Journal of Operations and Production Management*, Vol. 26, No. 5, pp. 458-485

Hon, K.K.B. (2005), "Performance and Evaluation of Manufacturing Systems", *CIRP Annals - Manufacturing Technology,* Vol. 54, No. 2., pp. 139-154

Hörte, S.Å., Lindberg, P., Tunälv, C. (1987), "Manufacturing strategies in Sweden", *International Journal of Production Research*, Vol. 25, No. 11, pp. 1573-1586

Hui, L.T. (2004), "Business timeliness: the intersection of strategy and operations management", *International Journal of Operations and Production Management*, Vol. 24, No. 6, pp. 605-624

Joshi, M.P., Kathuria, R., Porth, S.J. (2003), "Alignment of strategic priorities and performance: an investigation of operations and strategic management perspectives", *Journal of Operations Management,* No. 21, 353-369

Kathuria, R. (2005), "Competitive priorities as trade-offs or mutually supportive: can we call the question yet?", *Academy of Management Best Conference Paper,* http://om.aomonline.org/dyn/award/Best%20paper%202005%20OMC.pdf

Leachman, C., Pegels, C.C., Shin, S.K. (2005), "Manufacturing performance: evaluation and determinants", *International Journal of Operations and Production Management*, Vol. 25, No. 9, pp. 851-874

Mapes, J., New, C., Szwejczewski, M. (1997), "Performance trade-offs in manufacturing plants", *International Journal of Operations and Production Management*, Vol. 17, No. 10, pp. 1020-1033

Minarro-Viseras, E., Baines, T., Seeney, M. (2005), "Key success factors when implementing strategic manufacturing initiatives", *International Journal of Operations and Production Management*, Vol. 25, No. 2, pp. 151-179

Minor, E.D. III., Hensley, R.L., Wood, D.R. Jr. (1994), "A Review of Empirical Manufacturing Strategy Studies", *International Journal of Operations and Production Management*, Vol. 14, No. 1, pp. 5-25

Noble, M. A. (1997), "Manufacturing competitive priorities and productivity: an empirical study", *International Journal of Operations and Production Management*, Vol. 17, No. 1, pp. 85-99

Noble, M.A. (1995), "Manufacturing strategy: Testing the cumulative model in a multiple country context", *Decision Sciences*, Vol. 26, No. 5, pp. 693 – 721, http://findarticles.com/p/articles/mi_qa3713/is_199509/ai_n8713926/pg_12/?tag=content;col1

Porter, M.E., (1998), *Competitive Strategy: Techniques for Analyzing Industries and Competitors,* Free Press

Sarmiento, R., Byrne, M., Contreras, L.R., Rich, N. (2007), "Delivery reliability, manufacturing capabilities and new models of manufacturing efficiency", *Journal of Manufacturing Technology Management*, Vol. 18, No. 4., pp. 367-386

Schroeder, R.G., Bates, K.A., Juntitila, M.A. (2002), "A resource-based view of manufacturing strategy and relationship to manufacturing performance", *Strategic Management Journal,* Vol. 23., pp. 105-117

Skinner, W. (1969), "Manufacturing: missing link in corporate strategy", *Harvard Business Review, May – June 1969,* Reprint No. 69312, pp. 156-67

Voss, C. A. (2005), "Paradigms of manufacturing strategy re-visited", *International Journal of Operations and Production Management*, Vol. 25, No. 12, pp. 1223-1227

Ward, P.T., Duray, R. (2000), "Manufacturing strategy in context: environment, competitive strategy and manufacturing strategy", *Journal of Operations Management,* No. 18, pp. 12