

Production teams, control methods and performance: Results of a survey

Lars Bengtsson, Mandar Dabhilakar, Camilla Niss
University of Gävle
S-801 76 Gävle, Sweden

E-mail: lbn@hig.se, mdr@hig.se, cns@hig.se

Abstract. The paper presents a survey covering 200 companies within the Swedish engineering industry. The results show that the concepts of team work and process orientation are widespread and intimately connected. Some positive correlations between the work content of the teams and the management control methods as well as the performance of the companies are identified and analysed.

1. INTRODUCTION

Since the end of the 1990's, the concepts of Process Management (Melan 1992) and Balanced Scorecard (Kaplan & Norton 1996) have had a strong impact in Sweden (Ernst & Young 1998). In process-oriented organisations, target-oriented work teams, which ideally consist of qualified, skilled and flexible personnel, are regarded as a basic building block (Rentzhog 1996). The focus on value-adding processes provides the work teams a key role in production. Case studies show that the establishment of process-oriented and team-based work organisation affects traditional control methods (Mohrman et al 1995; Bengtsson et al 2000).

The objective of this paper is three-fold. First, to point out the distribution of qualified production teams and process-oriented organisations within the Swedish engineering industry. Second, to analyse how this affects the design of management control methods in regards to the strategies and structures of improvement, the performance measurement systems and the wage system. Third, to investigate how different forms of organisation relate to performance in terms of quality, productivity, on-time delivery, lead times and costs.

2. METHODOLOGY

The paper is based on a survey conducted during the spring of 1999 (Dabhilakar & Niss 2000). The survey was sent to the production managers at 200 randomly selected companies within the Swedish engineering industry. The total population consisted of 2297 engineering companies having more than 20 employees. The survey included in total 274 questions, covering eight different areas. The first 21 questions concerned company data and the distribution of production teams. The subsequent questions covered team tasks and internal organisation, target orientation, balanced scorecard, continuous improvements, change strategies and performance. Each question considered the situation in 1999 and the expected situation in 2001. There are two different response rates. The original survey was sent out by mail. After two reminders and the removal of companies without production the response rate became 55%. Telephone interviews of production managers at the remaining companies, covering the first 21 questions, were conducted. The response rate was 92%.

Theoretically, the survey mainly relates to the theories of Process Management (Melan 1992; Rentzhog 1996) and how to design team-based organisations (Mohrman et al 1995). The definition of production team used in the survey was: "A team is a stable group of people that work together and have a common responsibility for certain production tasks". The definitions of other concepts used in the survey are given in connection with the results.

The validity and reliability is affected by the fact that the survey was answered by the production manager. This means that all data presented express the manager's conception, which can differ from the actual reality.

Another problem is that each company is treated as if they only have one kind of team and one kind of control method. There may be internal variations and correlation that we cannot discern in this survey. However, the figures on spreading have to some extent been validated by comparisons with other studies.

3. RESULTS AND ANALYSIS

3.1 The distribution of production teams and process orientation

The survey shows that 70% of the companies have production teams. The corresponding share of blue collar workers that actually work in teams is 76%. The validity of the latter figure is confirmed by data from local metalworkers unions saying that 85% work in teams (Metall 1999). Among companies employing more than 200 persons, 98% have production teams.

The respondents were furthermore asked for which of 18 different tasks the teams are responsible. These tasks relate to a model describing four levels of responsibility (Bengtsson, 1999): (1) Direct and value-added work, (2) Planning and follow-up as well as internal and external coordination, (3) Team-related improvements of products and processes and (4) Involvement in strategic change processes outside the team. As shown in Table 1, most companies state they have production teams that are responsible for tasks on levels 2 and 3. The most common administrative tasks are responsibility for internal division of labour, detailed scheduling and coordination, but also follow-up and improvement work. The companies express a clear ambition to increase the work content of the teams until 2001, with a higher involvement in formulating strategies and target setting.

Table 1. Tasks in production teams (share of companies)

n=80					
Tasks	1999	2001	Tasks	1999	2001
Level 1			<i>Level 2, continued</i>		
Direct operative work	100%	100%	Follow-up quality	59%	77%
Setting	81%	68%	Follow-up targets	59%	77%
Testing, quality inspection	83%	84%	Responsible for budget	20%	44%
Process planning, programming	38%	52%			
Maintenance	63%	72%			
			Level 3		
Level 2			Improvement work	75%	80%
Internal division of labour	79%	80%	Engineering work	45%	67%
Detailed scheduling	65%	78%			
Coordination with other teams	58%	76%	Level 4		
Order directly from customer	24%	32%	Participation in formulating:		
Order materials from supplier	46%	62%	Team strategies and targets	36%	76%
Lending personnel (in/out)	46%	65%	Business strategies and targets	13%	37%

In order to make a correlation analysis we divided the companies into two groups: Companies with "less advanced" production teams and those with "more advanced" teams. More advanced teams are defined to be responsible for eight or more tasks at level 2-4 in Table 1.

Based on the concepts formulated by Melan (1992) and Rentzhog (1996), the actions towards forming a process-oriented structure were measured. 22% of the companies state that they are not process oriented at all. All other companies have made one or several actions in line with process management. The criteria and results were: identified their core and support processes (68%), documented their internal processes (56%), identified customers and suppliers to the processes (46%), use specific process measurements (35%) which are used to improve processes (32%) and appointed process owners (29%). 15% of the companies have recognised production teams as process owners. This share will increase according to the stated ambitions for 2001. One out of four companies has furthermore reorganised and formed a process-oriented structure.

According to the theories used, teams are important when implementing process management. To investigate this, we formed two equally sized groups of "less process oriented" and "more process oriented" companies (the latter group fulfilled at least four of the criteria mentioned above). A correlation analysis show that 62% of the companies with more advanced production teams also are more process oriented (according to the definitions used). Correspondingly, 60% of the companies with less advanced teams are less process

oriented. The correlation is significant ($X^2 < 0.1$). This analysis thus supports the theory and indicates the importance of team development when implementing process management.

3.2 Team work and management control methods

Traditionally, improvement work has been a task performed mainly by managers and engineers as part of their ordinary work or within temporary teams (Nilsson 1999). The survey shows that this is still valid in the most of the companies (55%). The TQM-inspired idea of involving all personnel seems, however, to have had an impact. In 45% of the companies, continuous improvement is carried out either solely by the production teams (14%) or by both production teams and temporary improvement teams (30%). In the companies with more advanced production teams, the teams seem to have a more important role in improvement.

Table 2. Control methods used
(share of companies: total share and share of those with less and more advanced teams)

n=80	Total	Less adv.	More adv.		Total	Less adv.	More adv.
Performing continuous improvements				Performance measurements			
Mainly by separate improvement teams	55%	60%	48%	Target-oriented teams***	62%	46%	87%
Mainly by production team	14%	17%	10%	Balanced scorecard (BSC)	32%	28%	39%
Mixed forms	30%	23%	42%	Team-based BSC (of those who have BSC, n=21)	43%	40%	45%
Strategies of continuous improvements				Wage system for teams, rewarding			
Traditional strategy	57%	62%	52%	Multi-skilled personnel*	67%	50%	73%
Organic strategy**	22%	13%	35%	Productivity**	26%	6%	33%
Mixed strategy	21%	26%	13%	Process-oriented performance	21%	11%	25%
(*=($p < 0.1$), **=($p < 0.05$), ***=($p < 0.01$))				Bonus on unit/company level	25%	22%	26%

Based on case studies, Hart et al (1996) conclude that companies can apply three different strategies when implementing continuous improvements in production teams. The traditional strategy means that management controls what, how, when and by whom. The organic strategy means that management sets targets and the teams decide what, how and when improvements should take place. The third strategy is a mixture of the other two. The results show that 57% of the companies apply a traditional strategy while 22% practice the organic strategy. The organic strategy is significantly more common in companies with more advanced production teams. The ambition for 2001 is to apply the organic strategy even more.

The concept of target-oriented production teams has reached most companies (62%). The share among companies with more advanced production teams is significantly higher. Variants of the concept of Balanced Scorecard (BSC) have been implemented in 32% of the studied companies. These companies have mainly applied the scorecards at the top management level. But, more than 40% of these also use BSC on the production team level. The results furthermore show that the teams in some of these companies design their own scorecards, which indicates a decentralised application of BSC (Ewing & Lundahl, 1996).

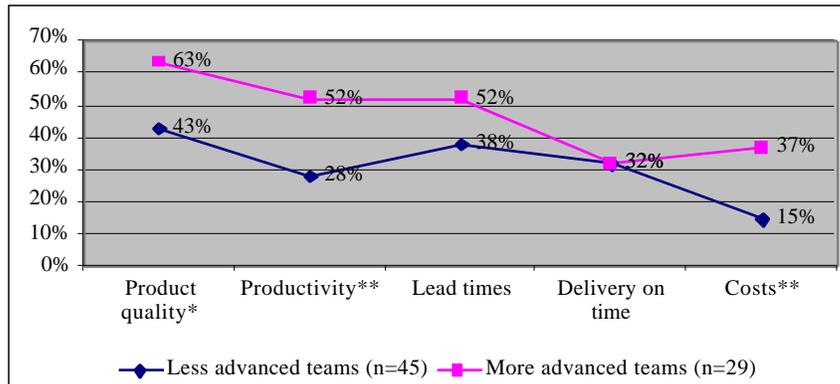
The answers on wage systems show that most companies reward personnel that are multi-skilled (67%). In about one out of four companies, the teams are rewarded for team performance concerning productivity and/or process-oriented measurements, e.g. lead times and quality. In equally as many companies, the teams have a bonus based on the results of the entire workshop or company. The design of wage systems thus seems to focus more on obtaining flexibility among personnel than rewarding process-oriented performance.

3.3 Team work and performance

The third question concerned whether process-oriented companies with more advanced production teams come out better when measuring performance. To investigate this the production managers were asked to estimate the improvements made (as a percentage) between 1997 and 1999 for five key measurements. The results in Figure 1 show that companies with more advanced production teams have improved their performance more compared to companies with less developed teams. (Example: 63% of the companies with

more advanced teams state they have improved product quality more than 10% since 1997). The differences are significant for quality, lead times and on-time delivery. The results thus indicate a positive correlation between expanded work content in teams and performance improvements. An additional analysis shows that companies which are both process oriented and have more advanced teams present even better performance. The impact of team development compared to the impact of other projects within the company is, however, an open question.

Figure 1. Correlation between team development and performance
(Share of companies with specified teams that have improved performance at least 10% 1997-1999)



4. CONCLUSIONS

The survey shows a substantial increase in qualified production teams and process-oriented organisation among the engineering companies. These trends are intimately connected. Furthermore, the analysis shows that the studied control methods and the work content of the production teams correlate. The companies with more advanced production teams have, to a significantly higher extent, implemented the concept of target-orientation, an organic strategy for controlling continuous improvements and wage systems that reward multi-skilled personnel and productivity, compared to companies with less advanced teams. However, the correlations vary. There are several possible interpretations of this. One explanation is that changes take time. The actual correlation, but even more an analysis of the expressed ambitions for 2001, supports this interpretation. Another interpretation is that the design of control methods is affected by several strategies and interests within the company, of which team development is only one. The current use of certain control methods thus expresses a balance between those different strategies and interests. The results finally indicate a positive correlation between expanded work content in teams and performance improvements. This applies particularly to quality, productivity and costs.

REFERENCES

- Bengtsson, L., 1999, Team-based control in process organisations. *Proceedings of the International Conference on TQM and Human Factors*, June 15-17, Linköping University, pp. 203-209.
- Dabhilakar, M. and Niss, C., 2000, Spridning av team och nya styrformer. In: Bengtsson et al, *Teambaserade styrformer vid processorientering*. Book manuscript. University of Gävle, forthcoming.
- Ernst & Young Management Consulting, 1998, *Strategier för tillväxt*. Ernst & Young, Stockholm.
- Ewing, P. and Lundahl, L., 1996, *The Balanced Scorecards at ABB Sweden - the EVITA projects*. EFI Research Paper 6567, Stockholm School of Economics, Stockholm.
- Hart, H., Berger, A. and Lindberg, P., 1996, *Ständiga förbättringar - ännu ett verktyg eller en del av arbetet i målstyrda grupper?* Arbetslivsinstitutet, Solna.
- Kaplan, R. and Norton, D., 1996, *The Balanced Scorecard - Translating Strategy into Action*. Harvard Business School Press, Boston.
- Melan, E. H., 1992, *Process Management*. McGraw-Hill, New York.
- Metall, 1999, *Utvärdering av det goda arbetet*. Svenska Metall, Stockholm.
- Mohrman, S. A., Cohen, S. G. and Mohrman, A. M., 1995, *Designing Team-Based Organizations. New Forms for Knowledge Work*. Jossey-Bass Inc., San Francisco.
- Nilsson, T. (ed.), 1999, *Ständig förbättring*. Arbetslivsinstitutet, Solna.
- Rentzhog, O., 1996, *Core Process Management*. Division of Quality Technology, Linköping University.