ICT-development, job content and profit levels in small and medium sized enterprises

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This paper focuses on conditions and relationships between factors in small and medium sized enterprises related to information technology levels and economic indicators. Data comes from an ongoing research and development project including about sixty small enterprises in the northern part of Norway and Sweden. Concepts and data analysis are multi-level – an individual level with leaders and co-workers in the enterprises as units of study, and an organisational level, with the enterprises as units of study. Some empirical results of company quality efforts, economic indicators, leadership, job content, and musculoskeletal problems are presented and discussed for ICT and non-ICT workplaces.

1. Introduction
Small business research has demonstrated that small enterprises are different from larger corporations concerning organisational structure and management, and that small firms do not represent homogenous categories (Storey 1994, Ylinenpää 1997, Vossen 1998). Some studies suggest that there is a critical cut-point around 20 employees, which has implications for how the firm is managed, organised and operated (Barth and Hörte 1999, Cagliano et al., 1999).

In recent years many researchers have focused on competence development and learning processes inside organisations, with little agreement between researchers about the nature of learning or of facilitating/inhibiting factors. Competence development is often regarded as a condition for improved competitiveness (Bartel 1994, Ferligoj et al., 1997), but some empirical studies show that business performance is negatively correlated with investments in developing a firm’s competence (Baldwin et al. 1994).

Workplace size is related to the incidence of occupational injuries, with workers in SMEs experiencing higher rates of major injuries than those in larger enterprises. Workplace size is also a strong determinant of the effectiveness of health and safety representation (Frick and Walters 1998). Research has also shown that there is a positive relation between work environment and quality development (Axelsson 1994, Eklund 1995). Axelsson (2000, p. 356) points out that ‘integrating ergonomics in continuous improvement activities can make a major difference for quality and may even act as a driving force for further improvements’.

Information technology levels in learning organisations are considered to be an enabling factor for strengthening productivity, innovation and competitive power (Adler 1992). Information technology support is both an important condition for higher employee participation in problem solving and product development, and a factor in creating structural change and organisational redesign. Historically, small enterprises have not adopted IT as much and as fast as larger companies, but in the 1990s SME executives seem to have become more interested in IT systems (Igbaria et al., 1998, Silliance et al., 1998).

In two earlier studies (Vinberg et al., 1999, Vinberg et al., 2000), we looked at relationships at company level between competence indicators and profit and health levels in a research project studying small business enterprises. Concerning leader change competence and profits we found a
strong positive correlation, while there was a negative correlation between leader change competence and learning problems experienced by employees. Other results were that information technology levels and competence drive (indicated by the company having an ongoing program) go together with higher levels of educational investments. Another finding was that a flat organisational structure, leader and co-worker change competence and leader change motivation are interrelated, and that these aspects also are related to company profits. These findings are similar to other research on organisational development in large companies (MacDuffie 1995, Pfeffer 1998).

In this article we will develop these findings by using both individual and organisational level data from an ongoing research and development project including sixty small and medium sized enterprises. Data used here are part of the first measurement in a before-after design with a reference group. Interventions and a second measurement period will result in a quasi-experimental database in the autumn next year.

2. Purpose, data and study design
The main purposes of this part of the research project is 1/ to analyse relationships between ICT-levels, change competence, health, psychosocial and ergonomic tension and economic indicators, 2/ to find out what empirical support a conceptual model may have, and also 3/ to contribute to the growing research literature concerning small enterprises.

A group of 25 small Swedish workplaces (19 small enterprises) from the IT-, manufacturing- and service sector participated in the study. In total, there were 37 leaders and 521 co-workers. Data was collected by questionnaires, interviews with leaders and register information. Concepts and data analysis are multi-level – an individual level with leaders and co-workers in the enterprises as units of study, and an organisational level, with the enterprises as units of study. In analyses on the organisational level, summary measures of individual data for the enterprises are used (for instance median or percentage levels of ergonomic and psychosocial tension and competencies) as well as genuine organisational level concepts such as rating (Dun & Bradstreet’s credit rating system) and number of organisational levels. Some empirical measures and statistical data analysis corresponding to the concepts are discussed in Vinberg et al (2000).

Since we sometimes mix organisational and individual data in this study, there is a risk for ecological and/or atomistic fallacies, to use the terminology introduced by Diez-Roux (1998). For instance, when organisational data are used in individual level data analyses, the lack of intra-company variation may bias the estimates. In forthcoming research with larger data sets we will use hierarchical multilevel regression methods (Bryk and Raudenbush 1992) as well as structural equation modelling of relations between several outcomes, since we believe these methods to be more adequate.

3. Results and discussion
In this section, some empirical results from the first measurement period are given.

Key persons in studied workplaces consider that the most important areas for change and improvements are: quality aspects, psychosocial conditions, educational investments, working environment, work organisation and leadership. Results from questioning the individuals (n=558) at the workplaces show that the working conditions can be improved: 91 % say that the job sometimes or often demands working very fast, 57 % say the job demands too great a work effort, 43 % feel that work often or sometimes holds contradictory demands, 20 % say that work does not give opportunities to learn, 48 % feel that work is monotonous and 49 % feel that work is psychologically demanding. These results indicate that the share of employees in this study exposed to heavy demands in their work are relatively high compared to results from surveys of the working conditions in Sweden (Statistics
Sweden and the National Board of Occupational Safety and Health 2000).

The mechanisms relating quality assurance efforts in a company and it’s economic or product quality results have been put in focus in recent ergonomic research, e.g. Axelsson (2000). Going further, one might ask if empirical relations between quality and economic outcomes found in large companies would tend to be similar or different in smaller companies. As a starting point in order to explore this research area we are studying correlations between summary indices of company quality efforts (ISO 9000 type efforts, TQM type efforts, work environment, environment) and different measures of the company’s economic well-being (profit level, credit rating). The two diagrams in figure 1 show the relationship at company level between the degree of use of quality systems and the company’s credit rating. For small non-ICT companies (in most cases traditional service- and industry businesses) the correlation between these variables is significant on the 5% level (r =0.637, p=0.048, n=10), while it is rather strong but not significant for small ICT companies (r =0.208, p=0.458, n=15). The relations between ergonomic tension and organisational aspects such as job content, organisational learning, quality efforts and leader competence is another related area where ergonomic research interest is growing. To explore these relations on the individual level (558 persons), a number of regression analyses have been done in the project.

Figure 1. Correlation between credit worthiness rating and use of quality systems in ICT and non ICT companies.

Table 1. Determinants of musculoskeletal tension.

<table>
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<th>Coefficients a</th>
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<th>Standardized Coefficients</th>
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<th>Sig.</th>
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a. Dependent Variable: MUSCULO
Table 1 shows the results from one of these with an index measure of musculoskeletal tension (six questions) as the dependent variable. The three explanatory variables JOBCONT (an index measuring the job content), RATING (the Dun & Bradstreet credit rating for the company where the person’s works) and DEVELEAD (an index measuring the leader's development competence) have significant coefficients in the assumed negative direction. This means that the more developing content the job has, the better the company credit rating is, and the more development competence the leader has, the less musculoskeletal tension there is among the co-workers. This finding is in line with similar results for large companies (see e.g. MacDuffie 1995), summarised for instance by Pfeffer (1998). The three variables in the analysis shown here explains about 12% of the variance in musculoskeletal tension, which could be seen as a rather large amount. 

The results in this study shows that conceptual differences may be important: the relationships in the ICT companies seem to be different from the relationships in other companies. In forthcoming research we will try to explore the mechanisms behind this results. Based upon this we will try to develop an integrated model for small and medium sized enterprises.

References