# Changes in control systems assessed by publicly employed dentists in comparison with other professionals

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In the public service sector in Sweden, including dentistry, changes in management control systems have occurred. The extent and content of such self-assessed changes are described and analyzed for dentists in relation to other academicians. A questionnaire was answered by 306 dentists in the Public Dental Health Service and 3600 other academicians in Sweden. The response rate was 67%–77%. Three areas of change were found in factor analysis: management by objectives, by dialogue, and by hierarchy. In logistic regression models, dentists reported fivefold increases in management by objectives as compared with other academicians. Reported increases in management by dialogue were less for dentists. Having a female supervisor was related to increase of management by hierarchy. It is concluded that clear changes in management style have occurred and that dentists are notable for increase of management by objectives. □ *Logistic regression; management; organizational changes; public sector; sex*

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Public administration in Sweden has during the last few years been through a period of turmoil, part of a general tendency towards change in traditional welfare systems in Western Europe (1). Greater decentralization and closer budget control have in Sweden been combined with ambitions to enhance the quality of services (2). New leadership styles have been part of this organizational change. Management by objectives, decentralization, customer orientation, increasing market orientation, result monitoring, and competition have all been popular concepts, also in the Public Dental Health Service (PDHS) (3–8). A common trait in this change in management doctrine has been changes in control systems, with intended effects on efficiency and—often unintended—effects on working conditions (9, 10).

Many control instruments are available for management in modern organizations, such as payment systems, management by goals, the number of decision levels, financial incentives, and variants of quality control and auditing/monitoring systems. One aspect of this development is management that promotes decentralization, meaning result monitoring at lower levels, dialogue rather than top–down management, and networking. Strategic decisions are moved 'up' in the organization, and decisions on day-to-day operations are moved 'down' in the hierarchy (11–14). In Sweden, the PDHS has been an experimental field for many different organizational and managerial ideas of this kind.

Professional groups, such as dentists, have a decisive role in implementing organizational changes at their workplaces. It is thus important to understand how such groups regard the changes in control systems and their effects. The objective of this study was therefore to investigate the self-assessments of professional groups, including and comparing dentists, concerning the extent and content of opinions about changes in organizational control systems. Common dimensions in these opinions will be sought through explorative factor analysis. Obtained factors will be analyzed in multivariable regression, controlling for social and demographic factors and with special regard to dentists.

## Materials and methods

### *Reference data*

In 1992 a questionnaire comprising questions about working conditions was given to a random sample of members of the Swedish Academicians' Union (SACO)—for example, lawyers, physicians, teachers, social workers, economists, and engineers—but not dentists. The sample comprised 5383 persons, with a gross response rate of 67%, or 3595 persons. They were 55% men and 45% women. For analysis of non-response, data on gender and profession were available. The response rate was higher for women (69%) than for men (63%) ($P \leq 0.0001$). Men were thus somewhat underrepresented in the sample. This was solved by separating the genders in the analyses. About 10% of the members of the union were students at the time of the study, with a considerably lower response rate. Discarding students from the sampling frame and responses, the net response rate was 74%. There were

Table 1. Aspects of control system among publicly employed Swedish academicians compared with dentists in Public Dental Health Service (PDHS). Percentages

| Control aspect | Swedish academicians | Dentists in PDHS | |
|---|---|---|---|
| No. of decision levels | | | |
| Increased | 26 | 23 | |
| No change | 38 | 36 | |
| Decreased | 24 | 33 | |
| Don't know | 13 | 8 | $P \leq 0.003$ |
| (*n*) | (2602) | (301) | |
| Management control | | | |
| Increased | 27 | 29 | |
| No change | 40 | 29 | |
| Decreased | 22 | 38 | |
| Don't know | 11 | 4 | $P \leq 0.000$ |
| (*n*) | (2605) | (303) | |
| Dialogue with management | | | |
| Increased | 30 | 26 | |
| No change | 42 | 47 | |
| Decreased | 17 | 19 | |
| Don't know | 12 | 8 | $P \leq 0.080$ |
| (*n*) | (2614) | (302) | |
| Patient/customer orientation | | | |
| Increased | 39 | 52 | |
| No change | 31 | 37 | |
| Decreased | 4 | 2 | |
| Don't know | 26 | 9 | $P \leq 0.000$ |
| (*n*) | (2469) | (300) | |
| Performance/result monitoring | | | |
| Increased | 40 | 81 | |
| No change | 41 | 17 | |
| Decreased | 4 | 1 | |
| Don't know | 14 | 1 | $P \leq 0.000$ |
| (*n*) | (2553) | (296) | |
| Competition as means to increase production | | | |
| Increased | 30 | 64 | |
| No change | 39 | 26 | |
| Decreased | 1 | 1 | |
| Don't know | 29 | 9 | $P \leq 0.000$ |
| (*n*) | (2516) | (301) | |
| Management by objectives | | | |
| Increased | 49 | 72 | |
| No change | 33 | 21 | |
| Decreased | 2 | 2 | |
| Don't know | 17 | 6 | $P \leq 0.000$ |
| (*n*) | (2568) | (302) | |
| Personal development interview | | | |
| Increased | 39 | 52 | |
| No change | 38 | 34 | |
| Decreased | 7 | 5 | |
| Don't know | 16 | 9 | $P \leq 0.000$ |
| (*n*) | (2567) | (302) | |

three-fourths public employees in the sample. These data constitute the reference data in the present study. The study is described in more detail in Refs. 15 and 16.

### *Samples of dentists*

Dentists were asked to fill out the same questionnaire supplemented with special questions. They were recruited as a random sample from the membership register of the Swedish Dental Association. Due to an administrative mistake female publicly employed dentists were not included in the sample frame. Therefore, a supplementary sample was recruited from that group. The questionnaire was distributed to them about 3 months later than in the main study. The first sample comprised 464 dentists, of whom 278 male and 34 female dentists responded (response rate: men, 66%; women, 77%). Of the responding male dentists, 134 (48%) worked in the PDHS and 112 (40%) in private practice. The rest were primarily teachers and researchers. The women in the first sample were all but one in private practice. The supplementary sample comprised 293 female PDHS dentists, of whom

201 responded (response rate, 67%). Of these responders 171 (85%) were women working in PDHS, whereas the rest were predominantly teachers and researchers. The study group of the present article consists of the dentists who were working in PDHS, 134 men and 172 women.

No information except gender was available for non-response analysis. Other similar studies of random samples of dentists with similar response rates (17, 18) have shown random non-response. In this case there might be a selection of persons with worse working conditions among responders. This cannot be examined.

### *Questionnaire*

The questionnaire contained questions on several variables.

Policy documents, information material for employees, articles in mass media, and current management literature were reviewed to identify concepts or expressions currently used to describe organizational modernization and innovation. From this, the following question was developed, with the intention of capturing the attitudes towards changes in control systems.

*Have there been any changes at your workplace in the following aspects during the past 5 years? (Answer even if you have worked for less than 5 years.)*

The following response alternatives were given, all with responses of 'Increased', 'No change', 'Decreased', 'Don't know'.

1. Number of decision levels
2. Management control
3. Dialogue with management
4. Customer/patient orientation
5. Performance/monitoring of results
6. Competition as means to increase production
7. Management by objectives
8. Personal development interview

The questionnaire also comprised questions aimed at measuring a set of social background variables.

Gender (male/female)

Age (in 5-year categories between 20 and 65 years)

Place of work (village/town/city)

Work experience (in years)

Gender distribution in work group (100% men/70% or more men/about equal distribution of men and women (between 30% and 70%)/70% or more women/100% women/no work in group)

Work position (responsible only for own work/responsible on a group level/responsible on a middle level/responsible on a higher level)

Gender of supervisor (male/female/has no supervisor)

Employer (12 different alternatives, categorized into public or private employment).

### *Statistical methods*

Chi-square was used for calculation of statistical significance in contingency tables. In a material of the size of that in the present study, even trivial differences become statistically significant; for this reason a measure of the strength of the association is necessary. Here, we have dichotomized the categoric variables and calculated odds ratios. Principal components analysis (PCA) with varimax rotation was used for data reduction. The number of factors was determined with the Kaiser criterion and through inspection of scree plots. Factor variables were constructed as summed indices, dichotomized for maximum discrimination. In multivariate analysis logistic regression was used with analysis of residual plots, outliers, and classification plots. Logit probabilities were calculated for stereotypic persons (20, 21). All data analysis was performed in SPSS.

## Results

The opinions concerning the various control aspects are stated for the publicly employed dentists and Swedish academicians in Table 1.

In relation to other academicians dentists reported a greater extent of changes in all but one of the control aspects. Checking results by including the privately employed academicians made only minor differences. Gender differences within the analyzed groups were generally very small, except that women chose the 'don't know' response alternative more often than men. The impression was that men respond 'no change' instead of 'don't know'.

The most conspicuous differences between dentists and the Swedish academicians were found for performance monitoring, competition, and management by objectives. The odds for a dentist to report increases in performance monitoring is 5.4 times greater than for other academicians. Similarly, the odds ratios for dentists to report increases in competition are 3.5, and increases in management by objectives are 2.5. In the reports on patient/customer orientation and personal development interview, the odds ratio for dentists to report increases is 1.60.

The questions about the various control aspects were put in PCA of the whole material, excluding the 'don't know' alternative (Table 2). The analyses were performed on the whole material and on two subgroups to check the stability of the factor solution. The exclusion of one alternative, plus internal non-response, reduced the material due to listwise deletion of missing data.

The first factor was interpreted as indicating an opinion that 'harder', more material criteria have held during the period asked for. It organized variation from the three items that have in common the goals and objectives of the work. Cronbach's $\alpha$ was 0.66. The second factor was interpreted as a 'softer' factor, relating more to dialogue and communication. Cronbach's $\alpha$ was 0.53. The third factor related more to the hierarchy and changes in decision levels. Cronbach's $\alpha$ was 0.40.

Table 2. Principal components analysis with varimax-rotated factor loadings >0.40 for the control questions. The whole material ($n = 1854$), publicly employed ($n = 1419$) and privately employed ($n = 423$) academicians, including dentists in PDHS

| Item | Factor 1 | | | Factor 2 | | | Factor 3 | | | Communality, |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Public | Private | Total | Public | Private | Total | Public | Private | Total |
| Competition as means to increase production | 0.84 | 0.84 | 0.86 | | | | | | | 0.72 |
| Management by objectives | 0.67 | 0.63 | 0.73 | | | | | | | 0.56 |
| Performance monitoring | 0.64 | 0.65 | 0.56 | | | 0.47 | | | | 0.55 |
| Dialogue with management | | | | 0.82 | 0.79 | 0.87 | | | | 0.67 |
| Personal development interview | | | | 0.67 | 0.70 | 0.61 | | | | 0.51 |
| Patient/customer orientation | | | | 0.52 | 0.50 | 0.54 | | | | 0.40 |
| No. of decision levels | | | | | | | 0.78 | 0.78 | 0.78 | 0.63 |
| Management control | | | | | | | 0.77 | 0.78 | 0.78 | 0.64 |
| Eigenvalue | 2.5 | 2.4 | 2.6 | 1.2 | 1.2 | 1.3 | 1.0 | 1.0 | 1.0 | |

There was a considerable amount of missing data, since 'don't know' was set as missing. The frequency of such responses was much higher among respondents with short work experience. Excluding those who had worked for less than 3 years, PCA was replicated to control the stability of the factor solution. The same result was obtained, and there were only minor changes in factor loadings. A further replication can be found in Table 2, in which the same factors as for the total material were found both for the publicly and privately employed. Responses on the items with major loadings on the three factors were summed into three new variables, dichotomized close to the median for maximum discrimination and set as dependent variables in three logistic regression models. The three new variables were named 'Objectives', 'Dialogue', and 'Hierarchy' to indicate in what direction increases in control systems were assessed by the respondents.

The three models were constructed with the same sets of independent variables, including the other control factors, to judge the interdependence of those factors. The focus of the models was to investigate the independent effect of being a dentist in the assessment of the changes in control systems. Since there were only publicly employed dentists in the sample, the models were run only for public employees. The results are given in Table 3.

Being a dentist in the PDHS was strongly and independently associated with statements of increases in control systems involving the objectives—that is, increased monitoring of results, customer orientation, and competition—and with decreases/no change in control systems involving dialogue. The two control systems variables 'Objectives' and 'Dialogue' were mutually intercorrelated. Of the other variables, work position and gender of superior were the only ones to have an independent association with any of the dependent variables.

Table 3. Logistic regression models for the three control factor variables, with background factors and dentist or not as independent variables. Results for publicly employed academicians, including dentists ($n = 1259$)

| Independent variables | Dependent variables | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 'Objectives' | | | 'Dialogue' | | | 'Hierarchy' | | |
| | | OR | *P* | | OR | *P* | | OR | *P* |
| Dentist | | 5.01 | *** | | 0.67 | * | | 0.94 | |
| Female | | 1.58 | ** | | 1.06 | | | 1.09 | |
| Age | | 1.04 | | | 0.93 | | | 1.05 | |
| Position | | 1.43 | *** | | 1.26 | *** | | 0.89 | (*) |
| Place of work | | 1.23 | * | | 0.98 | | | 1.16 | |
| Work experience | | 0.99 | | | 1.02 | (*) | | 0.99 | |
| Gender distribution | | 0.99 | | | 1.02 | | | 0.91 | |
| Gender of superior, female | | 1.00 | | | 1.17 | | | 1.51 | ** |
| 'Objectives' | | — | — | | 5.13 | *** | | 1.51 | ** |
| 'Dialogue' | | 5.12 | *** | | — | — | | 0.80 | |
| 'Hierarchy' | | 1.48 | ** | | 0.80 | | | — | — |
| Intercept | −2.79 | — | *** | −1.87 | — | *** | −1.72 | — | *** |
| -2LL improvement | | 290.7, 10 df, *** | | | 200.7, 10 df, *** | | | 27.2, 10 df, ** | |
| Correctly predicted cases, % | | | 71 | | | 68 | | | 71 |

OR = odds ratio.
(*) $P < 0.1$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Logit probabilities for stereotypic persons were calculated. There was a great span of variation in the dependent variables in relation to the selected independent variables. In all calculations, place of work was set as city, work experience as 15 years, age as between 40 and 45 years, and equal gender distribution in work group. The following examples were calculated:

A male dentist in a high position and stating that management by dialogue has increased has a probability of 95% of saying that management by objectives and related control systems have increased.

A non-dentist woman in a low position and stating that management by dialogue has not increased has a corresponding probability of 15%.

A male dentist in a low position who says that management by objectives has increased has a probability of 38% of saying that management by dialogue has increased. A male academician in a high position has a corresponding probability of 65%.

A dentist in a low position who has a male supervisor has a probability of 17% of saying that management by hierarchy has increased. The corresponding value for a dentist with a female supervisor is 24%.

## Discussion

The main results were as follows: 1) Dentists stated increases of 'objectives'—that is, increased performance/monitoring of results and competition as a means to increase production—much *more* than other academicians. 2) Dentists reported increases in dialogue-oriented control systems to a *lower* extent than other academicians. 3) The control systems 'objectives' and 'dialogue' were intercorrelated; increases in both systems were often reported simultaneously. 4) There was no difference between dentists and others in the reports with regard to 'hierarchy'; considerable numbers of both dentists and academicians reported decreases in that respect.

The present results indicate that there have been fundamental changes in management style in the public sector in Sweden. This is in congruence with the current management debate in Sweden (22–24). What has not been previously discussed is the existence of differences between professional groups in the perception of such changes. The conspicuous differences between dentists and others found here are interesting in that respect. The results can be interpreted as showing that managerial changes in the dental care system differ from those in other public sectors.

Support for this interpretation can be found in the fact that the PDHS for a long time has competed with the private system, within a similar fee-for-service remuneration system. Thus, exposure to competition was earlier and stronger in the PDHS than in other public systems in Sweden, implying increased production pressure (5–8, 14, 25). One should, however, keep in mind that the study was done in 1992. Since then, workload and downsizing have increased considerably in the public sector. An indication of this is the increasing problems in psychosocial work environment factors and health among dentists (26).

The result can also be interpreted in terms of changes in dominant management doctrines. In traditional scientific management two central criteria of an efficient organization were management by close supervision and measure of performance (27). In the 'human relations' doctrine the emphasis was rather on communication and motivation (28). The strong covariation between changes in management by objectives and by dialogue in the present study indicates that a modern synthesizing management doctrine, Human Resource Management, has gained ground in the public organizational systems in Sweden. This doctrine stresses control of the individual performance and goal orientation, teamwork, and communication. It also sets decentralization of hierarchies as a central component of modern management (29). The model has been criticized for embedding contradictions between the 'hard' and the 'soft' version: a hard version emphasizing economic factors and a soft version stressing communication and motivation (30).

In the present results, perception of changes in control systems was related to position at work. The difference between men and women was rather small when position was kept constant. The main gender difference was that men and women were found in different positions. It is well known that men have better career prospects. However, women managers are often conceived as more relation-oriented and employee-centered and less task-oriented. This stereotype is not supported by the present results, confirmed in other studies (31, 32). The female heads of clinics have been found to be more hard-driving, competitive, and distinct as leaders compared with male managers, who were more easy-going (32).

These results should on some points be interpreted with caution. A general weakness in this study, as in many others, is the reliance on self-reports, resulting in a risk for bias. Others have, however, found that self-reports are 'better than is often assumed' (33). The fact that there were salient differences between positions and professions offers an argument against tangible bias on this point (4). Still, it would be favorable to have information providing a connection between reports of changes and studies of changes actually occurring at specific workplaces. Such data were unfortunately not available in this case. Another problem in the present study is the relatively large non-response, worsened by high internal non-response on some questions. The gender-related response frequency difference has, however, been considered in the analysis, and the remaining material, even after deletion of missing data, was still very large. The stability of the factor analysis between subgroups also increases the credibility of the results.

As a whole, it can be concluded that there clearly seem to have occurred changes in management style among the studied professional groups, and some of these changes have been especially obvious for dentists. Assessment of the

consequences of the changes should, however, be subject to further study.

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