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Helping to improve suggestion systems: predictors of making suggestions in companies

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Summary Predictors of submitting suggestions and their quality were studied in a Dutch company with a well-developed suggestion system ($n = 207$ blue collar workers). A model with person variables (initiative at work, higher order need strength, control aspirations, and interest in work innovation), work characteristics (control and complexity), motives (better work, reward), self-efficacy, and system factors (system inhibitors, system responsiveness, and supervisor support) was developed and tested. They are related to the three process variables, deemed to be important in making a suggestion: having ideas, submitting suggestions and quality of the suggestions. A path analysis revealed that the most important factors related to these process variables were initiative at work, higher order need strength, self-efficacy, expected improvements in work and suggestion inhibitors (negatively). Copyright © 1999 John Wiley & Sons, Ltd.

Introduction

Suggestions about how to improve productivity are important features of modern production systems (e.g., lean production or total quality improvement programmes) (Imai, 1986; Juran and Gryna, 1993; Taira, 1996; Womack, Jones and Roos, 1990). Europe in particular should be concerned with this issue because European workers provide very few suggestions in comparison to the Japanese (Womack *et al.*, 1990 reported that workers in Japanese automobile companies produced on average 61.6 suggestions per year in comparison with European factories with only 0.4 suggestions per worker per year.) Many companies with a suggestion system in place have shown that many suggestions lead to important improvements in quality and quantity of production (Womack and Jones, 1996). The savings from suggestions in the company we studied were approximately 1.5 million Dutch guilders (ca US$750 000) in 1996 (Jaarsverslag, 1996).[1]

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[1] Since the company does not present any exact figures on their savings, we had to approximately and conservatively calculate this figure from their yearly publication.

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There has been little empirical research on the issue of suggestions by rank-and-file workers (with exceptions like Oldham and Cummings (1996), for whom suggestions are part of organizational creativity; and Aiken, Bacharach and French (1980) and Frese *et al.* (1996) who think of suggestions as an indicator of initiative). While there have been studies about total quality management and modern production systems, which rely to some extent on suggestions to improve the production process, there has been little specific focus on suggestion systems. Since continuous improvement is to a large extent dependent upon suggestions given by employees, we thought it worthwhile to concentrate on this issue. For this reason, we conducted research on the predictors of making suggestions in a company in the Netherlands that has a tradition of using a well-organized suggestion system,

Making suggestions as innovative behavior can be approached from at least two sides: developing suggestions as creative behavior and as initiative. The creative behavior perspective conceptualizes suggestions as creative acts that are related to skills in the task domain, skills in creative thinking, creative personality and emotional expression (Amabile, 1988; Ford, 1996).

The initiative perspective (Frese *et al.*, 1996; Frese *et al.*, 1997) adds one particular facet to the creative process idea. Personal initiative means to be self-starting, proactive, long-term oriented, and willing and able to overcome barriers. It takes the push of self-starting, time and effort, and overcoming problems to actually develop an idea in enough detail to make a suggestion good enough to be put into practice. First take the decision to work on an idea to improve production. This implies that one must be sufficiently interested in work to start thinking about ideas in the first place: one must think long-term and proactively ('this problem will always be there, if I do not do something about it'); one has to overcome obstacles (because usually the very first idea may not feasible); and one must be sure that one can actually get an interesting idea to improve production. Submitting the suggestion has its own difficulties. One has to fill out a form and one has to write up the idea (and usually one will find some problems at this stage that need to be overcome). Obviously, the creative and initiative perspectives are complementary and partly overlapping. Thus, motivational constructs are used both by Amabile (1988) and by Ford (1996)[2]. However, we think that the initiative issue has not been emphasized enough and we shall, therefore, concentrate on this issue in this paper.

Our theoretical model is presented in Figure 1. Central parameters of making a suggestion are to have ideas, to work them into a suggestion which can be submitted to the suggestion scheme and which is then rewarded depending on the quality of the suggestion. Without the idea, one cannot submit a suggestion, without submitting a suggestion, the company cannot appraise its quality. This central process of ideas, submitting, and evaluating the quality can be influenced by several variables. In the following we concentrate on the factors that have an influence on having ideas and on writing and submitting a suggestion.

Making suggestions is a specific action and a specific performance variable (Campbell *et al.*, 1993). Performance is a function of desirability and feasibility (Ford, 1992; Gollwitzer, 1993; similarly Campbell *et al.*, 1993). Key aspects of desirability are valences, motives, and needs. Important aspects of feasibility are whether it is possible to do something and whether one is able to do it.

There are different desirability and feasibility predictors for the phases—having ideas and submitting suggestions. Submitting should be primarily related to whether or not it makes sense and whether it is possible to submit something. One feasibility issue is related to whether the

[2] It is interesting to note that in the area of organizational innovation, a complementary perspective of 'innovation implementation' has been called for by Klein and Sorba (1996). This perspective has similarities to our arguments with regard to initiative

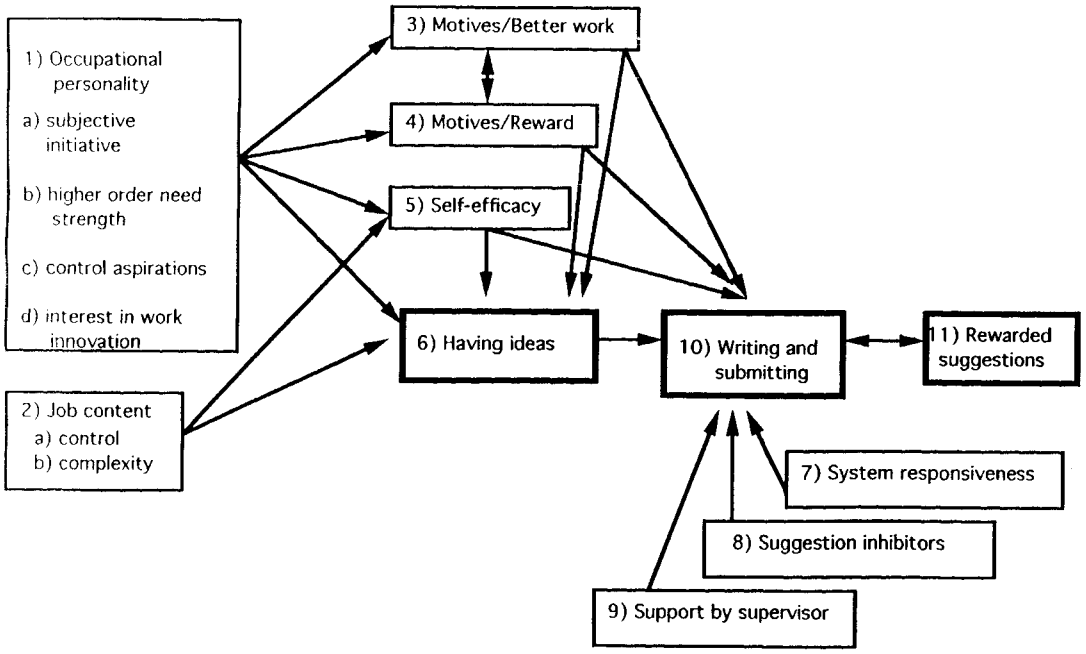

Figure 1. A general model

suggestion system is seen to respond adequately to a submission (system responsiveness). System responsiveness is of obvious importance; a person will be more likely to submit a suggestion if she or he believes that the organization treats suggestions adequately, fairly, and understands and implements the suggestions where possible. Another feasibility issue is whether there are hindrances to submitting an idea (suggestion inhibitors). These inhibitors can be negative organizational barriers or it may be easier to put an innovation into effect by oneself rather than submitting a suggestion and having to wait for the response. A third factor is supervisor support. Theories of innovation have suggested that the supportiveness and safety of a system are important determinants of innovation (West, 1990). One of the most important factors of support (and impediment) is the supervisor (Amabile *et al.*, 1996). Scott and Bruce (1994) have argued (and empirically shown) that organizational support is important for innovative behavior at work and that supervisors have an influence in two ways. On the one hand, they can influence the climate that supports or hinders innovativeness (cf. Ekvall, 1996). On the other hand, direct expectations by the supervisors will have an influence on the worker because they encourage the worker to hand in suggestions (Oldham and Cummings, 1996) and in the sense of a self-fulfilling prophesy (Eden, 1984). Thus, the three factors of system responsiveness, suggestion inhibitors, and supervisor support should influence writing and submitting a suggestion. These three factors should not influence a person in 'having ideas'. A worker can have ideas regardless of whether or not the external environment is conducive but he or she will not submit them if the environment is not seen as supportive.

We now turn to those factors—self-efficacy and motives—that should influence *both* the central concepts in Figure 1—having ideas and submitting them. These factors are internal in contrast to the external factors of system responsiveness, suggestion inhibitors, and supervisor support, discussed earlier. An important feasibility factor is self-efficacy, which is defined as 'people's judgments of their capabilities to organize and execute courses of action required to

attain designated types of performances' (Bandura, 1986, p. 391). One has to believe in one's ability to produce suggestions and to put them on paper in order to actually attempt to develop suggestions and to write them down. Moreover, producing new ideas often leads to uncertainties, and in uncertain situations self-efficacy is particularly important (Farr and Ford, 1990). Thus, self-efficacy produces a feeling of safety to bring forward innovation (cf. West, 1990).

Desirability implies that one gets some positive results—i.e., pay-offs from submitting suggestions (Farr and Ford, 1990). People are motivated to develop and submit suggestions when they think they can improve their work situation in terms of making it easier or safer to work. Approved suggestions carry monetary rewards in many companies and this may be an important motive (cf. Figure 1).

In addition, classic job content factors and person factors may also play a role. Because they are general variables they will not be as influential on a specific act of writing and submitting a suggestion (Epstein and O'Brien, 1985) as they are on having ideas. In European research, two of the most important job content factors have traditionally been control and complexity (Gardell, 1971; Frese, 1989; Frese, Garst and Fay, 1998; Wall, Jackson and Mullarkey, 1995)—we think of them as feasibility factors. Since control implies that one is able to experiment in the work place, it should be related to the number of ideas (Aiken *et al*., 1980; Amabile *et al*., 1996). A high degree of complexity of work implies that one is able to use and further develop one's skills and that work is more challenging. Thus, more learning takes place and this makes it more likely that one will also think of new ideas to improve the production (Aiken *et al*., 1980; Amabile *et al*., 1996; Hacker, 1986; Wood, 1986).

Self-efficacy should also be influenced by control and complexity. In a longitudinal study of initiative (Speier and Frese, 1997), the impact of control and complexity on self-efficacy was shown. Theoretically, control and complexity provide the room to have mastery experiences and should, therefore, be related to the expectations of self-efficacy (Bandura, 1986; Gist and Mitchell, 1992; Speier and Frese, 1997).

The exogenous person variables of Figure 1 are restricted to *occupational* orientations. At least four variables—subjective initiative, higher order need strength, control aspirations, and interest in innovation—are important here. Since these are general orientations, they cannot be neatly grouped into feasibility and desirability, although they are most likely to be interpreted as desirability variables. Subjective initiative implies proactivity and thus people should be more actively involved in their work (Bateman and Crant, 1993) and should, therefore, be more prone to actually think of ideas to change things that bother them (either because it is not efficient or because removing them improves the work place). Further, a proactive attitude should lead to more mastery experiences which in turn may help to increase self-efficacy (Bandura, 1986). Similarly, higher order need strength (Warr, Cook and Wall, 1979) should be related to involvement in work and to occupation with not just the bare necessities of production but with ideas that go beyond it. Creativity and persistence in finding a solution are related to intrinsic motivation to work (Oldham and Cummings, 1996). Thus, higher order need strength should lead to ideas and suggestions and may also lead to mastery experiences.

Control aspirations should be related to having ideas. People with high control aspirations take charge and actively seek information in various situations (for example in a job entry situation—Ashford and Black, 1996). Similarly, they should also be more motivated to develop ideas to change the work situation. Interest in innovation is related to having ideas because one wants to change things for the better. Therefore, people with high interest in innovation look out for new ideas and produce more ideas and suggestions (Patchen, 1965). A desire for mastery is probably underlying both control aspirations and interest in innovation and, therefore, we suggest that they should be correlated with self-efficacy as well.

The relationship between submitting and rewarded suggestions should be relatively high for the following reasons. First, those people who develop many ideas are also likely to have more good ideas. Diehl and Stroebe (1987) reported the correlation between quantity and quality of ideas to be 0.82). Second, people do two kinds of screening before they actually submit an idea. They ask themselves whether it is actually good enough to get a reward. Additionally, they may ask the supervisor or their colleagues what they think of an idea. Thus, these two processes ensure that good ideas are more often submitted than bad ones, leading to a high correlation between the two. Finally, there is a learning process, and only if people are successful will they attempt to submit again, while those that are not successful will give up.

Figure 1 leads to the following hypothesis:

Hypothesis 1: There are three central variables: having ideas, writing and submitting, and rewarded suggestions that should be most strongly correlated with each other.
Hypothesis 2: Having ideas should be positively related to the three motives, self-efficacy, occupational orientations, and job content. It should not be related to system responsiveness, suggestions inhibitors, and support by supervisor.
Hypothesis 3: Writing and submitting suggestions should be affected most strongly by having ideas and more weakly by system responsiveness, suggestions inhibitors, and support by supervisor as well as by the two motives and self-efficacy.
Hypothesis 4: Occupational orientations should be related to motives and self-efficacy, and, in addition, job content should be related to self-efficacy.
Hypothesis 5: Rewarded suggestions should be directly related only to writing and submitting suggestions.

Method

The company and its' suggestion system

The company is a large steel company in the Netherlands which employs 11,000 people. They started their suggestion system in the year 1925. Since 1951, they have had an elaborate system in which there is a central unit that keeps track of the whereabouts of the evaluation of the suggestions. Once a suggestion is handed in, the central unit sends it to the appropriate department or individual who evaluates the usefulness of the suggestion. This evaluation is sent back to the central unit which controls whether or not the answer by the specialists is appropriate (otherwise it is sent back to him or her again). After this process, the rank-and-file worker gets a reward if the suggestion is judged to be useful and is implemented. The system is largely restricted to blue collar workers because higher rank employees are expected to improve productivity as part of their job. Per year there are between 12,250 (in 1991) and 7,500 (in 1995) suggestions (the reduction was probably a result of lay-offs and of instituting a quality circle concept that produced a parallel system to make suggestions). The company estimates that its' system saves a tremendous amount of money, much more than it costs to run the suggestion system.

Sample

The sample was drawn from four company plants. The plants were chosen so that there was a wide spread of participation in the suggestion system (two plants participated a little, two much

more). In this way we made sure we obtained a high variance in the dependent variable. In each plant, 90 blue collar workers were asked to participate (in total $n = 360$). However, we reasoned that those workers who had participated in the suggestion scheme were more likely to respond to our research and those workers who had never handed in a suggestion would be under-represented in the sample. To compensate for this, an additional 45 from the latter group were asked to participate. In all, 215 responded—a 51 per cent response rate; however another 8 did not fill out the questionnaire completely and were, therefore, discarded, leading to $n = 207$. The subjects were assured confidential treatment of their data. However, we needed their personal registration numbers, because we had to link their answers to the central unit's register of the suggestions they had sent in. Nearly all the subjects were male (4 females), mean age was 39 years with a range from 21 to 56, mean tenure was 16 years, and all were blue collar workers. This is equivalent to the socio-demographic make-up of the four plants of the company.

Measurement

The questionnaire consists of one central variable (having ideas), 6 general variables (the person's orientations and work characteristics), and 6 specific variables which relate directly to suggestions (supervisor support, system responsiveness, motives/better work and reward, suggestion inhibitors, and self-efficacy). All scales used the 5-step response scale of 'van toepassing zijn' (helemaal niet, een beetje, middelmatig, redelijk veel, volledig); this is difficult to translate and means approximately 'is true' (very false, a bit false, middle, a bit true, very true). All scale scores were divided by the number of items.

The central variables

Having ideas is a two-item questionnaire scale with good reliability (items: 'I often have ideas'; 'I am busy a lot with thinking of ideas'). The number of suggestions over a 3-year period were taken from the central unit's register. *Writing and submitting suggestions* is the count of the number of these suggestions without paying attention to the usefulness of these suggestions (of course, there were people who never submitted any suggestions at all). Those suggestions that could be implemented and that were rewarded were separately counted and made up the *rewarded suggestions* variable.

As shown in Table 1, on average each employee gave 6.51 suggestions across the three year period of which 3.88 were adopted by the company. However, there was a wide empirical range, going from 0 suggestions to 75 (of which 30 were adopted). Thus, the standard deviation of this variable is relatively high. The median of this variable was 2 and the mode was 0. Thus, most workers (28 per cent) gave no suggestions. One suggestion was given by 14 per cent, between 2 and 5 suggestions were given by 30 per cent, between 6 and 8 suggestions by 12 per cent; above 8 by 18 per cent (because of rounding, this number is higher than 100 per cent).

General variables

The general variables shown as exogenous variables in Figure 1 were all previously developed scales while the more specific variables had to be developed for this study. *Subjective initiative* is a questionnaire version of initiative (Frese *et al.*, 1997) and correlates well with an in-depth interview measure of initiative. A sample item is: 'Whenever there is a chance to get actively involved, I take it.' This measure is similar to Bateman and Crant's (1993) proactive behavior and is empirically related to need for achievement, action orientation (Kuhl, 1992), and

Table 1. Intercorrelation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	Range	Alpha	M	S.D.
1. Proactive	1.00												2–10	0.87	7.86	1.17
2. Aspirations	0.3†	1.00											2–10	0.74	7.21	1.51
3. Job content	0.47†	0.26†	1.00										2–10	0.81	6.56	1.58
4. Motive/reward	0.17*	−0.12	0.06	1.00									1–5	0.76	2.98	0.91
5. Motive/better work	0.15*	−0.10	−0.03	0.26†	1.00								1–5	0.72	3.45	1.09
6. Self-efficacy	0.46†	0.38†	0.25†	0.06	0.05	1.00							1–5	0.63	3.88	0.85
7. Ideas	0.47†	0.34†	0.09	0.17*	0.24†	0.47†	1.00						1–5	0.77	2.83	0.91
8. System responsiveness	0.06	0.02	0.13	−0.27†	0.07	0.10	−0.07	1.00					1–5	0.70	3.04	0.66
9. Suggestion inhibitors	−0.06	−0.04	0.06	0.19†	0.12	−0.08	−0.01	−0.25†	1.00				1–5	a	2.31	0.63
10. Supervisor support	0.14	0.08	0.10	0.00	0.17*	0.10	0.05	0.20†	−0.19†	1.00			1–5	0.63	3.10	1.12
11. Writing and submitting	0.13	0.17	−0.15	0.02	0.19†	0.22†	0.40†	0.03	−0.19†	0.06	1.00		0–75		6.51	11.72
12. Rewarded suggestions	0.19*	0.11	0.00	−0.04	0.16*	0.24†	0.38†	0.10	−0.24†	0.18*	0.76†	1.00	1–30		3.88	5.00

Note: Proactive orientation consists of Proactive work + Higher order need strength.
Aspirations consists of Control aspirations + Interest in work innovation.
a: No alpha because it is an index.
*$p < 0.05$.
†$p < 0.01$.

problem-focussed coping (Frese *et al*., 1997). *Higher order need strength* is taken from Warr, Cook and Wall (1979) and measures internal motivation to work (a sample item is 'Using your skills to the maximum'). *Control aspiration* is the reverse of a variable called control rejection (Frese *et al*., 1994, cf. also Frese *et al*., 1996) and asks whether or not the individual wants to have control at work and carry the responsibilities that go along with having control (details in Frese *et al*., 1996; sample item: 'I prefer to have a supervisor who tells me exactly what I have to do. Then he or she is at fault if something goes wrong', reversed scoring). *Interest in work innovation* was taken from Patchen (1965) and implies that a person is willing to produce innovations at work (sample item: 'Some people prefer doing a job in pretty much the same way because this way they can count on always doing a good job. Others like to go out of their way in order to think up new ways of doing things. How is it with you on your job?'). High intercorrelations between the four orientations produce the problem of multicollinearity. With the help of a second order factor analysis we reduced these four scales to two factors with moderate intercorrelations: Proactive orientation is made of subjective initiative and higher order need strength. Aspirations implies that novelty is sought at work (control aspirations and interest in innovation).

The two scales on job content were control at work and complexity. *Control at work* was a reduced, three item, version presented by Semmer (1984) and assesses job discretion in terms of, for example, ability to influence working conditions and work strategies (details in Frese *et al*., 1996). *Complexity of work* measures how difficult the decisions in the job are (three out of the four items were taken from Semmer, 1984, cf. Frese *et al*., 1996 for details). Complexity is clearly related to functional pay groups as shown by a Spearman correlation of 0.31 ($p < 0.001$) in this study. Control at work and complexity at work were highly correlated (0.53, $p < 0.01$) and were, therefore, added to become one variable 'job content' to reduce the problem of multicollinearity.

Specific variables

In order to develop the specific variables, pilot interviews were conducted with 16 blue collar workers. All sorts of reasons why or why not to participate in the suggestion programme were ascertained and written into 42 items. Since these items were developed from scratch, an exploratory factor analysis was used (a confirmatory factor analysis was not warranted because there was not a clear priori theoretical structure to these empirically developed items).

The results of the factor analysis were analyzed with the following criteria in mind: scales should have a minimum reliability of 0.60; all items loading less than 0.50 were to be excluded; reasons of content were used to combine factors to further reduce the number of scales. A first principal component analysis (cut-off Eigenvalue = 1) resulted in 14 factors. We rejected all those factors that did not lead to reliable scales (except suggestions inhibitors which we kept as an index because of its theoretical importance) and all those items loading less than 0.50. A further principal component analysis of the remaining items with 9 factors is presented in the Appendix. Some factors were combine to produce system responsiveness, motive reward, and suggestion inhibitors. This leads to the six scales (items and factors loadings in the Appendix, Cornbach's Alphas are presented in Table 1).

Supervisor support asks whether the supervisor actually helps or hinders sending suggestions in (the Alpha of 0.63 is adequate for a two-item scale).

System responsiveness implies that one believes that the suggestion system reacts favorably and fairly when suggestions are submitted. This scale consists of two factors combined on a rational basis—one factor embracing the positive items, another one the negative questions.

Motives/better work implies that one can improve one's own work and safety by sending in suggestions.

Motives/reward means that people are interested in getting money as a reward for suggestions. This scale was a combination of two factors as shown in the Appendix.

Suggestion inhibitors This index ascertains reasons why one would not participate in the suggestion programme (such as the bad economic situation of the company; good ideas have already been presented). It consists of two factors (one item loads below the original cut-off of 0.50). As suggested by MacCallum and Browne (1993), one should not use internal consistencies (such as Cronbach's Alphas) on indices which are not conceptualized to be latent variables. There are no stringent logical or psychological reasons for the items to be intercorrelated. For example, an item that suggestions have already been presented before should not necessarily be related to an item that the worker deals with small matters him- or herself. However, each item counts as an additional argument against submitting suggestions and the more items one agrees with, the more a person should be inhibited to submit a suggestion.

Self-efficacy asks whether one is able to produce and write down suggestions. The Alpha of this scale is 0.63 because there are only two items in this scale.

Analysis strategy

Our model warrants a path-analysis (we used LISREL 8 with the SIMPLIS command language with chi^2, the goodness of fit index, adjusted goodness of fit index and the standardized root mean square residual as fit indices). To be able to interpret the path coefficients, multicollinearity had to be reduced. Therefore, the two job content variables were added together and, as indicated above, the occupational orientations were condensed into two factors and some of the specific factors were also combined.

We could not include the dependent variable 'rewarded suggestions' into all our LISREL path analyses because we have fewer subjects for this variable (all those who did not produce any suggestion are counted as missing data when using this variable). Therefore, a second LISREL path analysis was done for the dependent variable rewarded suggestions which excluded all subjects who did not produce a suggestion ($n = 147$).

It should be kept in mind that we cannot test causal hypotheses with a cross-sectional study and that in some cases we do not even hypothesize causal relationships (e.g., in the case of the relationship between submitted and rewarded suggestions).

Results

LISREL analyses were performed to test our hypotheses as displayed in Figure 1 (the LISREL analysis was based on the intercorrelations shown in Table 1). Model A is a path analysis with the dependent variable writing and submitting suggestions, as presented in Figure 1. This model does not lead to an adequate solution (cf. Model A in Table 2). Modification indices suggested that two additional paths had to be introduced—a path from motives/rewards to system

Table 2. Fit measures of the path models

	Chi^2	*df*	*p*-value	GFI	AGFI	Standardized RMR
Model A	65.99	20	0.00000	0.95	0.83	0.066
Model A*	26.09	18	0.098	0.98	0.92	0.038
Model B	5.56	6	0.47	0.99	0.94	0.016
Model B*	3.84	5	0.57	1.00	0.97	0.018
Model C	10.73	9	0.29	0.99	0.88	0.025
Model C*	11.61	15	0.71	0.98	0.94	0.034

Note GFI = Goodness of fit index; AGFI = Adjusted goodness of fit index; RMR = root mean square residual; * = improved model, see text.
Model A: Suggestions submitted as dependent variable (rewarded suggestions not included).
Model B: Parsimonious model with suggestions submitted as dependent variable (rewarded suggestions not included).
Model C: Parsimonious model with suggestions submitted and rewarded suggestions as dependent variables.

responsiveness and enabling motives/rewards and motives/better work to co-vary. After allowing for these two paths, the model had a better fit (Model A* in Table 2). However, there are some difficulties in interpreting this model, particularly the path from motives/reward to system responsiveness because individual motives should not influence a system characteristic.

Therefore, we went ahead and tested an alternative and more parsimonious model that radically reduced the mediators displayed in Figure 1 (except the central process variables of having ideas, writing and submitting and rewarded suggestions) and interpreted all other variables including the former mediators motives and self-efficacy as exogenous variables. This Model B had a very good fit (cf. Table 2). Model B could be improved slightly by setting all the non-significant paths to 0 (Model B* in Table 2). Models B and B* clearly show a better fit than Models A and A*.

Model C is based on Model B but includes the dependent variable 'rewarded suggestions' as well ($n = 147$). As one can see, Model C also had a good fit. However, modification indices suggested to include one additional non-hypothesized relationship: the path from support by supervisor to rewarded suggestions. When the non-significant paths were set to 0 (Model C* in Table 2), the fit was about the same (slight improvement in adjusted goodness of fit index (AGFI) and slight reduction in goodness of fit index (GFI) and standardized root mean square residual).

The Beta coefficients of the Models B* and C* (C* in parentheses) are presented in Figure 2. The path coefficients can be used to test the hypotheses as suggested in Figure 1. As suggested by hypothesis 1, the three central variables of having ideas, writing and submitting and rewarded suggestions were highly related to each other (between 0.38 and 0.76). Thus, having ideas leads to writing and submitting and this in turn is related to whether or not suggestions are rewarded.

According to hypothesis 2, having ideas should be related to the motives, self-efficacy, occupational orientations, and job content and it should not be related to system responsiveness, suggestions inhibitors, and support by supervisor. This is borne out by the results in figure 2; the prediction of having ideas is good with an R^2 of 0.39 (0.38 for Model C*). The lack of high modification indices also means that no additional paths should be put into the model. Occupational orientations (particularly proactive orientation) and self-efficacy showed the highest relationships with having ideas (zero-order correlations with having ideas were 0.44 ($p < 0.01$), for initiative, were 0.39 ($p < 0.01$) for higher order need strength, 0.21 ($p < 0.01$) for control aspirations, and 0.33 ($p < 0.01$) for interest in innovation). Motives/reward only had a significant relationship with having ideas for the subsample of those that submitted any suggestion. Motives/better work had a significant path only for the whole sample (and not for Model C). In contrast to our hypothesis, job content was negatively related to having ideas. We

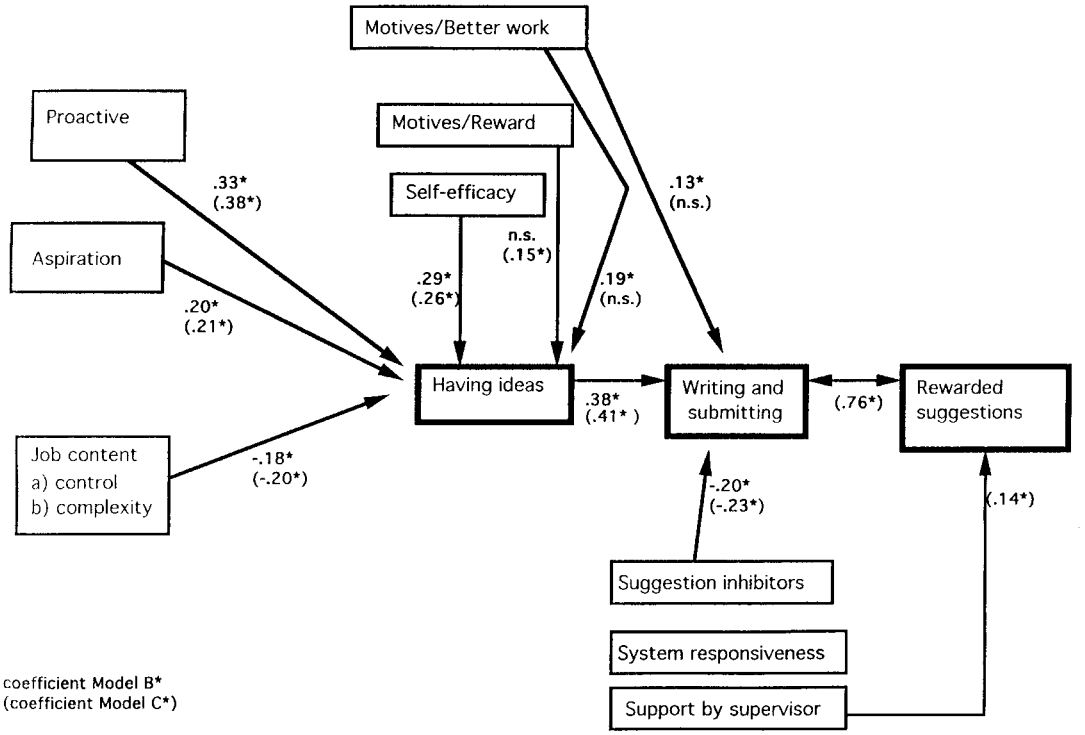

Figure 2. LISREL path coefficients of Models B* (model predicting writing and submitting suggestions but excluding rewarded suggestions) and C* (model that includes rewarded suggestion with a reduced n of 147; model C parameters are given in parentheses)

(Proactive orientation = subjective initiative and higher order need strength, Aspirations = control aspirations and interest in innovation)

shall interpret this later. Hypothesis 2 also suggests that there should be no relationships between having ideas and suggestion inhibitors, system responsiveness, and support by supervisor. This is indeed the case; the modification indices do not suggest the inclusion of these variables into the equation and the fit of model B* can hardly be improved.

Hypothesis 3 states that writing and submitting suggestions should be affected most strongly by having ideas and more weakly by system responsiveness, suggestions inhibitors, and support by supervisor, and by the two motives and self-efficacy. This hypothesis is only partially supported. Having ideas had a strong path coefficient with writing and submitting. However, self-efficacy, motives/reward, system responsiveness and support by supervisor were not important predictors of this variable. There was only a small path from motives/better work to writing and submitting. In all, writing and submitting is predicted by the predictors in Figure 2 with an R^2 of 0.22 (0.23 in Model C*) which is a good prediction given the fact there was no common method variance between the predictors from the questionnaire to the criterion based on archival data.

Hypothesis 4 implies that occupational orientations should be related to motives and self-efficacy, and that job content influences self-efficacy. This is not the case—thus motives and self-efficacy were treated as exogenous variables in Model B*. Since both models B and B* had better fit indices than Model A or A*, this goes against the indirect effect of occupational

orientations and job content via motives and self-efficacy. Motives and self-efficacy did not turn out to be mediators between occupational orientations/job content and having ideas.

Hypothesis 5 relates rewarded suggestions to writing and submitting suggestions. This is the case with a Beta of 0.76. However, the modification indices indicated that support by supervisors should be included in the Model. Apparently, supervisor support was not important for writing up a suggestion but for the improvement of the quality of a suggestion (or the discouragement for non-quality suggestions). There are no other factors that influence rewarded suggestions and rewarded suggestions were predicted with an R^2 of 0.61 in Model C*.

Discussion

The model suggested in Figure 1 has fared quite well. There is empirical support for the hypothesized relations between having ideas, writing and submitting, and rewarded suggestions. One first has to have an idea before one can write it up and submit. This is not surprising. However, it is also not a trivial relationship. It needs additional initiative to turn one's ideas into a written proposal, particularly for blue collar workers who are not used to writing a lot. The strong path between writing and submitting and rewards for the suggestion is theoretically and practically important. Theoretically, it means that there is no other path to a rewarded suggestion other than those from writing and submitting and support by supervisor. Thus, quality of suggestions was mainly influenced by the quantity of submitted suggestions. This implies that a company that wants to have good ideas should do everything to promote an increase in the number of suggestions. Thus, there is no trade-off between the number of suggestions and the quality of them. This is in line with creativity research that argued for producing many ideas and showed that the quantity and quality of ideas is highly related (Diehl and Stroebe, 1987). Further, we assume that people weed out poor ideas before submitting them because poor ideas just cost time and do not carry any rewards.

Having ideas was predicted by all those variables that were suggested in Figure 1 (except job content having a negative path). However, there are differences in importance. Self-efficacy, subjective initiative, and higher order need strength were most important. The two motives were of least importance; in particular, the motive to get a reward was only slightly related. This suggests that companies should not attempt to increase participation in suggestion systems by paying more money (however, we do not suggest that one should decrease rewards because this might lead to the feeling of being unjustifiably cheated). Theoretically, these results mean that the desirability of achieving changes in the work place or gains for one's wallet are not of primary importance for having ideas. Thus, extrinsic motivation is of lesser importance in this area. Thus, occupying oneself with the work place and being confident that one can think of good ideas are more important than being externally motivated to think of good ideas.

The negative path from job content and having ideas is difficult to explain. Two interpretations are possible: First, people with a higher degree of control and complexity do not need to participate in the suggestion system because they can immediately change things themselves. Second, this negative path was produced by a suppressor effect since the zero-order correlation was small but positive (cf. Table 1) This relationship needs to be explored further in future studies.

Writing and submitting suggestions was not predicted by motives/reward, self-efficacy, system responsiveness, and support by supervisor. However, system inhibitors, and motives/better

work were related to writing and submitting. This means that organizational barriers influenced the decision to write and submit a proposal but the positive system responsiveness was not important. Thus, whether or not one trusts the system may not be so influential as the fact that there are no direct inhibitors. Self-efficacy was hypothesized to be related to both having ideas and to writing and submitting. However, self-efficacy only works indirectly via having ideas on writing and submitting. Both motives were not strongly related to writing and submitting, but there was a small significant path from motive/better work. Being interested in rewards clearly does not help one to submit a suggestion. Support by supervisor is not related to writing and submitting in our study but instead to rewarded suggestions. Oldham and Cummings, (1996) also report no significant relationship of supervisor supportiveness with suggestions at work (although it showed a complex interaction with other variables). Apparently, the supervisor may be more important in shaping the quality of a suggestion than in the creative and initiative processes of having an idea or filling out a suggestion form.

Surprisingly, there were no significant paths from occupational orientations and job content on self-efficacy and the motives, although the zero-order correlations with self-efficacy were quite high. This contradicts the job socialization notion that control and complexity have an influence on self-efficacy (Frese, Garst and Fay, 1998; Speier and Frese, 1997). However, these studies used a general scale of self-efficacy that may be more readily influenced by general work factors than specific self-efficacy with regard to submitting suggestions.

Our personal initiative perspective has proven to be useful. While we do not suggest that people actually go about developing ideas and suggestions in a linear fashion, as implied by our model, we can explain a major portion of the variance of having ideas and of writing and submitting (as well as of rewarded suggestion which works primarily through writing and submitting). While we did not intend to compare creativity and initiative perspectives, we think that innovation at work literature should systematically include initiative as an important explanatory concept. In other research, we have used giving suggestions as one indicator of initiative and have shown that this is highly related to other aspects of initiative, notably the self-starting and proactive nature of initiative (Frese *et al*., 1997). In this research we have shown that those predictors that are important for initiative are also important for the process characteristics of suggestions (except the job content variables). Apparently, simply having ideas is already the result of initiative—the self-starting, proactive, and self-efficacious orientation towards work. Since thinking about the work place and improvement of production is not something that people usually do, one needs to be self-starting to do it. We assume that both initiative and creativity need to be there in order to come up with good ideas and to write up these ideas in a suggestion.

We have already alluded to some of the practical implications of our study. Possible entry points for increasing the number of ideas and the number of suggestions submitted are self-efficacy and doing away with suggestion inhibitors. Other points to note are attempts to increase proactivity initiative at work (Frese *et al*., 1996, 1997) and the selection of people with a higher order need strength. In general, we found that increasing external rewards for giving suggestions will probably not result in a large increase. Surprisingly, managers do not have to be overly concerned with system responsiveness (including the fairness of the system). It seems that people who submit suggestions do this because they are active people who have a high degree of perceived competence and who do not feel they are really hindered by their situation in the organization.

There are strengths and weaknesses of this study. One strength is the fact that we have developed a specific set of variables related to suggestion making. This may, for example, be useful for analyses before a suggestion system is introduced.

Another strength lies in the objective measurement of the dependent variables and in the good criterion of suggestion quality (namely the painstaking process of finding out the usefulness of a

suggestion within the company suggestion system). This implies that there is no common method variance between the major independent variables and the dependent variables. Since the independent variables predicted having ideas with an R^2 of 0.39, submitting suggestions with an R^2 of 0.22 and rewarded suggestions with an R^2 of 0.61, this is an appreciable and practically useful prediction model.

The fact that our study was done in only one company can be interpreted to be either a strength or a weakness: Its strength is that we could show what parameters are predictive in a company with a well-developed suggestion system (and that the dependent variable was very carefully developed by the company). It is a weakness because we do not know how far the results can be generalized. However, we tend to think that the results are generalizable to a certain degree. For example, creativity research has argued repeatedly that a high number of suggestions leads to high quality suggestions (Diehl and Stroebe, 1987, reported a high correlation between number of ideas and quality of these ideas). We found similarly a high relationship between writing and submitting and rewarded suggestions. Practically, this would mean that it is useful to encourage people to give more suggestions because this will eventually result in more usable suggestions.

Other reasons also account for a certain generality of the findings. There is enough variance in the variables (the standard deviations are about as high as in other studies which use a five-point answer scale divided by the number of items); this is the result of our decision to include company sites that had high and low numbers of suggestions. Moreover, many of the predicted theoretical relationships were borne out by the results.

A weakness of the study is its cross-sectional nature; it is not a real prediction study. As a matter of fact, one could even argue that it was a post-diction study because the predictors were ascertained with questionnaires at one point in time and the number and quality of suggestions refer to the last three years up to this point in time. This leads to some problems in interpretation. The most important problem is that people could have answered in terms of retrospective attributions in the sense of 'Why do I not give any suggestions; I must not like the suggestion system or I must not feel self-confident and efficacious enough to do that'. Our research shares this problem with other studies that use archival data to measure performance and creativity (e.g., Amabile *et al.*, 1996; Oldham and Cummings, 1996; Taylor *et al.*, 1984).

We know the importance of giving suggestions in organizations will increase and there will be more reliance on such suggestions by organizations. Therefore, it pays to start developing a model that explains why people do or do not make suggestions.

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Appendix. Specific questions: Principal component analysis results

	F6	F1	F5	F2	F3	F4	F8	F9	F7
Supervisor support									
1. My supervisor encourages me to give suggestions.	*0.81*	0.14	−0.07	0.00	0.00	0.01	−0.04	−0.09	−0.01
2. Giving suggestions is appreciated by my supervisor.	*0.80*	0.05	0.11	0.15	0.01	0.05	−0.07	0.00	0.10
System responsiveness									
1. My suggestions are executed most of the time.	0.00	*0.56*	0.10	0.21	0.13	−0.23	0.18	−0.10	0.26
2. I think there's a big chance a suggestion will be executed.	0.03	*0.68*	0.09	−0.16	0.09	−0.03	0.13	−0.07	0.10
3. I think the treatment of suggestions leaves much to be desired (recoded).	0.01	0.22	*0.74*	0.01	−0.20	−0.06	0.03	0.03	−0.15
4. I give few suggestions because it takes a long time before you get an answer (recoded).	0.27	−0.03	*0.55*	0.00	−0.13	−0.43	−0.13	−0.01	0.16
5. Rejected suggestions are sometimes used anyhow (recoded).	−0.09	0.26	*0.55*	−0.28	−0.13	0.07	−0.03	0.00	0.01
6. When I give a suggestion it is taken seriously.	0.31	*0.73*	0.07	−0.01	−0.01	−0.01	−0.04	0.12	−0.06
7. I can see by the answer that they understood my suggestion well.	0.09	*0.74*	0.03	−0.02	0.00	−0.07	−0.25	0.10	−0.14
8. I can understand the answers to my suggestions.	−0.08	*0.67*	0.18	0.04	0.05	0.01	−0.12	−0.09	0.11
Motive: better work									
1. I send in a suggestion whenever I'm bothered by something in my work.	0.07	0.01	−0.05	*0.76*	0.05	−0.07	0.16	0.11	0.00
2. I send in a suggestion when my job can be done easier.	0.15	0.13	−0.08	*0.80*	0.09	0.12	−0.04	−0.01	0.08
3. I send in a suggestion when the work situation is unsafe.	−0.06	0.16	−0.02	*0.75*	−0.06	0.16	−0.11	−0.06	−0.06
Motive: reward									
1. I would send in more suggestions if they would be rewarded more often.	−0.03	−0.22	−0.06	0.35	0.43	*0.51*	0.16	0.16	0.14
2. I would send in more suggestions if the rewards would be higher.	−0.14	−0.14	0.05	0.21	*0.51*	*0.59*	0.17	0.09	0.06
3. When I send in a suggestion I do it for the reward.	−0.06	−0.01	−0.13	0.04	*0.88*	0.00	−0.06	0.00	0.01
4. The reward is most important for me when I send in a suggestion.	0.14	0.13	−0.22	−0.02	*0.78*	0.19	0.02	0.07	−0.03
5. I think recognition is an important motivation to send in a suggestion.	0.15	−0.04	−0.12	0.04	0.04	*0.80*	−0.08	−0.03	−0.01
Suggestions inhibitors									
1. After some of my suggestions were rejected I stopped sending them in.	−0.06	−0.18	−0.48	0.07	−0.02	0.21	0.30	*0.47*	−0.10
2. I deal with small matters myself; I don't need to send in suggestions.	−0.02	0.19	−0.27	−0.08	−0.28	0.02	0.13	*0.57*	0.28
3. Whenever the company is doing badly sending in suggestions is of little use.	0.04	−0.17	0.07	0.21	0.06	0.28	*0.61*	0.13	−0.08
4. Publicity on rewards has a motivating effect (recoded).	−0.16	0.02	−0.16	−0.13	−0.04	−0.16	*0.78*	−0.10	−0.03
5. When I get more rights to change things myself, I send in less suggestions.	−0.07	−0.05	0.17	0.09	0.25	−0.01	−0.13	*0.78*	−0.06
Self-efficacy									
1. I can fill in a suggestion form.	−0.01	−0.03	0.06	0.04	0.03	−0.01	−0.06	−0.06	*0.83*
2. I'm very capable to think of suggestions.	0.11	0.15	−0.11	−0.02	−0.01	0.03	−0.03	0.09	*0.79*
%Explained Variance	5.4	15.4	6.4	12.3	6.7	6.4	4.2	3.9	4.8

Note: Presentation order makes it necessary not to present the factors in the order of their explained variance weights.