Explaining the reluctance of managers to provide feedback to employees

A game-theoretical model

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An important task of managers is to motivate employees. One way is to provide feedback on task performance. Performance feedback is generally accepted to improve employee performance. However, research also revealed that managers often fail to provide feedback. The present paper introduces a game-theoretical model that explains the reluctance of managers to provide feedback. If ability and effort are complements, and the employee is effort averse, the manager is generally better off by not providing feedback. Positive feedback may induce the employee to reduce effort if he is more able. And negative feedback may induce the employee to stop participating if he is less able. On the other hand, feedback positively affects performance if it motivates the agent to participate at all.

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1. Introduction

One of the main tasks of managers is to motivate employees. Employee motivation can be enhanced in several ways. Economic literature has typically focussed on the role of remuneration. It offers alternative ways of how managers can motivate employees by linking performance and rewards (for reviews, see Gibbons, 1998; Prendergast, 1999). Recently, economists have also looked at human resource management practices such as the delegation of tasks and job enlargement as ways of motivating employees (Bénabou & Tirole, 2003; Swank & Visser, 2007). So far, economists have paid little attention to the question of how managers can motivate through ordinary talk. In the management literature and the psychological literature much more attention is devoted to talk as a motivating device. In particular, numerous papers have been published on feedback.

1.1 A literature review on feedback

At its most basic level, feedback is information received by an individual about his or her past behavior (Annett, 1969). It provides some information about the correctness, accuracy, or adequacy of the response (Bourne, 1966). Feedback can be provided in many different ways, from a formal performance appraisal (e.g. Pearce & Porter, 1986) to informal feedback provoked by employee's feedback-seeking strategies (e.g. Larson, 1989). However, managers often fail to deliver feedback (Larson, 1984; 1986). This holds particularly for negative feedback. Managers have been shown to delay, avoid and distort negative feedback (Benedict & Levine, 1988; Fischer, 1979; Ilgen & Knowlton, 1980), especially informal day-to-day feedback (Jablin, 1979). For example, Larson (1986) found that managers were less likely to provide performance feedback when employees failed to meet their performance goals successfully, then when employees met their goals. He further observed that managers sometimes provide positive feedback even when an employee performed poorly. More surprisingly, managers seem also reluctant to give positive feedback. Wall (2007) concluded from a survey that almost 60 percent seldom if ever were personally praised by their manager. Managers provided written thanks and public praise even less frequently. Taken together, managers often fail to deliver both positive and negative feedback.

Several studies examined the effect of feedback on employee's performance. Kluger and DeNisi (1996) conducted a meta-analysis and concluded that feedback generally improved

performance. However, in more than one third of the cases feedback handicapped performance. So, when people receive negative feedback, they sometimes “give up” and sometimes they “try harder”. Similarly, when people get positive feedback, they sometimes “bask in their glory” and sometimes they “double their efforts” (Van-Dijk & Kluger, 2004). Psychological literature provides explanations for these different effects of positive and negative feedback. Firstly, the impact of feedback on performance depends on feedback acceptance. Acceptance refers to the employee’s belief that the feedback provides an accurate description of his or her performance (Ilgen, Fischer, & Taylor, 1979). Only when feedback is accepted, it influences future effort and performance. Psychologists distinguish between two motives for interpreting information about the self, the so called self-evaluation motives. According to the self-enhancement motive, a person seeks feedback to the extent that it is favorable. Self-assessment refers to seeking accurate feedback regardless of its favourability (Dunning, 1995). The self-enhancement motive predominates when ability is described as stable (Dunning, 1995). Hence, the employee will accept positive feedback and reject negative feedback. In contrast, the self-assessment motive predominates when ability is described as malleable. Hence, the employee may accept both positive and negative feedback because an ability level is not established yet. The acceptance of feedback seem to depend on the situation. Overall, negative feedback is less accepted than positive feedback (Ilgen et al., 1979).

In addition, Waldersee and Luthans (1994) distinguish four major theoretical mechanisms through which feedback affects performance, namely (1) role clarification, (2) self-efficacy levels, (3) behavioral reward contingencies, and (4) self-regulatory control processes. Feedback impacts performance partly through reduction of uncertainty or ambiguity about aspects of a person’s role and task, that is through role clarification (e.g. Walsh, Taber & Beehr, 1980). This holds particularly for positive feedback on complex, non-routine tasks (Waldersee & Luthans, 1994). Conversely, in routine tasks or high task mastery the employee already experiences role clarity. Therefore, positive feedback will not improve behavior through the role clarity mechanism in routine tasks. A second way that feedback affects performance is through self-efficacy enhancement (Bandura, 1986). Positive feedback raises a person’s self-efficacy, self-set performance goals and finally performance. This second mechanism works particularly for more complex tasks and is less relevant to routine tasks where self-efficacy is already high. A third way feedback influences performance is through the behavioral reward properties inherent to positive feedback. Positive feedback is a reinforcer, which

positively affects the rewarded behavior. In addition, positive feedback is often associated with pay raises and promotions. These secondary reinforcers in turn increase the frequency of performance behaviors (Luthans & Kreitner, 1985). A fourth way that feedback influences performance is through the employee's self-regulatory system. This is central to cybernetic theories such as control theory (Carver, 1979). This theory proposes that individuals have performance standards or goals against which they judge the feedback they receive about current performance. Negative feedback indicates a negative deviation from this standard and therefore the individual is motivated to try harder and increase performance. The effect of negative feedback through self-regulatory control was found in upward feedback (that is, subordinates rating the performance of their immediate supervisors). Negative feedback increased manager's performance levels in several field studies (e.g. Johnson & Ferstl, 1999; Reilly, Smither, & Vasilopoulos, 1996; Walker & Smither, 1999). Positive feedback however, may lead to a reduction of effort since the employee can still attain the performance standard.

Taken together, provided that feedback is accepted by the employee, positive feedback works through role clarification, self-efficacy enhancement and behavioral reward properties, whereas negative feedback works through self-regulatory control. This is summarized in Table 1.

Positive feedback	**Negative feedback**
1. role clarification	4. self-regulatory control
2. self-efficacy enhancement	
3. behavioral reward properties	

Table 1. Mechanisms through which feedback positively influences performance.

The above discussion emphasizes that feedback can have both positive and negative effects on employee's performance depending on the situation, which may provide an explanation for the meta-analytic finding of Kluger and DeNisi (1996). Different mechanisms may work in different directions to influence performance, making the effect of feedback on performance complex. Additionally, some variables moderate the effect of feedback on performance, particularly the influence of negative feedback. The effect of feedback depends on trust in the feedback source (Early, 1986), source power (Fedor, Davis, Maslyn, & Mathieson, 2001), feedback quality (Ashford & Cummings, 1983; Steelman & Rutkowski, 2004), and feedback delivery (Steelman & Rutkowski,

2004). For example, negative feedback has a positive effect on job performance only when the feedback source is trustable and powerful, the feedback is of high quality and the feedback is delivered in a considerable manner – that is when negative feedback is related to positive aspects (Steelman & Rutkowski, 2004). The effect of feedback is also moderated by personal variables. For example, people high in self-esteem accept more responsibility for positive feedback than negative feedback. For people low in self-esteem the reverse holds (Jussim, Yen, & Aiello, 1995). To summarize, many factors affect the influence of feedback on performance. However, when the situation is taken into account, feedback potentially has a positive effect on employee performance. Moreover, performance feedback, particularly positive feedback, is widely accepted in human resource management as a way to improve employee performance (e.g. Waldersee & Luthans, 1994).

Having discussed managerial and psychological literature on feedback, we see that at least two of these findings are at odds with standard economic theory. First, we have seen that feedback generally succeeds in increasing employee effort and performance; it motivates the employee to work harder. In other words, feedback leads to higher returns for the manager. Additionally, feedback is ordinary talk and thus costless. From a rational point of view then, economists expect that managers will provide feedback to employees. However, conflicting with this rational reasoning, managers often fail to deliver feedback. Second, when ability and effort are complements and ability is assumed to be constant, increasing effort will lead to higher performance. This implies that economists predict that a manager provides feedback that increases effort. The nature of this feedback depends on the situation, but generally, positive feedback has more effort enhancing properties. Therefore, economists predict managers on average to provide feedback that is too positive. This implies that an employee should have a sceptical attitude towards positive feedback and can safely accept negative feedback. This conflicts with the finding that negative feedback is less accepted than positive feedback. Namely, positive feedback is usually accepted, whereas negative feedback is often rejected.

The purpose of this paper is to use game-theoretical techniques to provide an explanation for feedback usage by managers. In particular, the present paper focuses on the finding that managers often fail to deliver feedback. By using a game-theoretical model we attempt to provide a rational explanation for the reluctance of the manager to provide feedback. The conflicting findings about feedback acceptance will not be discussed in the present paper, but may be incorporated in future

research. Before introducing the game-theoretical model, we first discuss the context of feedback provision.

1.2 Context: formal performance appraisal

Feedback may be provided in different ways and for different purposes. For example, feedback is provided in formal performance appraisals, in job evaluation conversations and in more informal settings. We discuss these contexts subsequently.

Formal performance appraisals can be viewed as one specific form of performance feedback (Pearce & Porter, 1986). A formal appraisal provides clear, performance-based feedback to the employee. The primary purpose of formal appraisals is to support personnel decisions, such as raise and promotion. It is typically one-sided communication. Past performance of the employee is rated by the manager, and raise is determined accordingly (Bouman, 1998). Organizations typically conduct a formal performance appraisal annually, mostly toward the end of the fiscal year (Aguinis, 2009). Additionally, most organizations use a semi-annual meeting halfway through the fiscal year (Aguinis, 2009). In this meeting a temporary performance appraisal is provided.

Besides formal performance appraisals, managers provide feedback in other ways. For example, Bouman (1998) distinguishes a job evaluation conversation from formal performance appraisal. The job evaluation conversation is typically a two-sided conversation, which is focussed on improving future performance and improving working conditions. The manager takes the role of coach and listens to the employee to adjust working conditions accordingly (Bouman, 1998). Hence, in a job evaluation conversation, feedback is the basis of changes in working conditions to improve future performance.

In addition to the formal performance appraisals and job evaluation conversations, feedback is provided informally. For example, subordinate's feedback-seeking strategies may lead the manager to provide feedback (e.g. Larson, 1989). Informal performance discussions take place throughout the year (Aguinis, 2009). This informal feedback provides information to the employee about the upcoming formal performance appraisal, so that completing the appraisal form should not uncover any major surprises.

Taken together, feedback may be given in various contexts and for different purposes. In the present paper we assume a context similar to the formal performance appraisal. Hence, a formal setting of one-sided communication about past performance.

Psychological literature has a lot to say about the construct that is evaluated during formal performance appraisal, that is a subordinate's job performance. Psychologists state that job performance is a complex, multidimensional construct that comprises more than task performance alone. Rotundo and Sackett (2002) distinguish three components of job performance on which an employee is evaluated for the formal performance appraisal, namely task, citizenship and counterproductive performance. Task performance involves work behaviors that contribute to the technical core of an organization, i.e. behaviors that contribute to the productions of a good or the provision of a service (Rotundo & Sackett, 2002). Organizational citizenship behavior (OCB) refers to another group of activities that is not necessarily task related but that contribute to the organization in a positive way (Smith, Organ, & Near, 1983). Examples of OCB include helping colleagues and volunteering for extra-job activities. Citizenship performance has a positive effect on performance (e.g. Podsakoff, Ahearne, & MacKenzie, 1997). Counterproductive work behavior (CWB) involves groups of behaviors that detract from the goals of the organization, such as aggression, interpersonal conflict, sabotage and theft (Fox, Spector, & Miles, 1999). CWB is negatively related to task performance and OCB (Sackett, 2002). Counterproductive performance is therefore negatively related to the formal performance appraisal. In sum, a formal performance appraisal is based on task, citizenship and counterproductive performance. However, feedback is usually linked to task performance alone. Most literature on feedback also regards the influence on task performance alone. For example, in the most recent meta-analysis regarding the effect of feedback interventions on performance, feedback is defined as *actions taken by (an) external agent(s) to provide information about some aspect(s) of one's task performance* (Kluger & DeNisi, 1996, p. 255). More recently some papers regard the influence of feedback on other performance domains, such as emotions and extra-role behavior (Belschak & Den Hartog, 2009). In the present paper we assume that feedback regards task performance and not extra-role behavior.

To sum up, the purpose of this paper is to develop a game-theoretical model that provides an explanation for the finding that managers fail to deliver feedback to their subordinates. To that end, feedback is considered in the context of a formal performance appraisal. The rest of the paper is

organized as follows. Section 2 presents the model. After explaining the model assumptions (2.1) and introducing the parameters (2.2), we analyse the actions of the subordinate (2.3) and the actions of the manager (2.4). This results in an optimal feedback strategy for the manager. Section 3 and 4 provide a conclusion and discussion respectively.

2. Feedback Model

2.1 Model assumptions

The model uses a principal agent approach in which the principal is a manager (she) and the agent is a subordinate or employee (he). The employee (agent) works on a project or combination of projects on behalf of the manager (principal). One assumption of the model is the presence of asymmetric information. The manager knows the standard of performance and observes the performance of the employee (and hence his ability). The employee however, does not know his own ability and performance. The manager has an information advantage, and she may share information with the employee by providing feedback about task performance.

Another assumption of the model is that the contract comprises two periods. The two periods are separated by a temporary performance appraisal and closed by a final performance appraisal. The two-period model is represented in Figure 1.

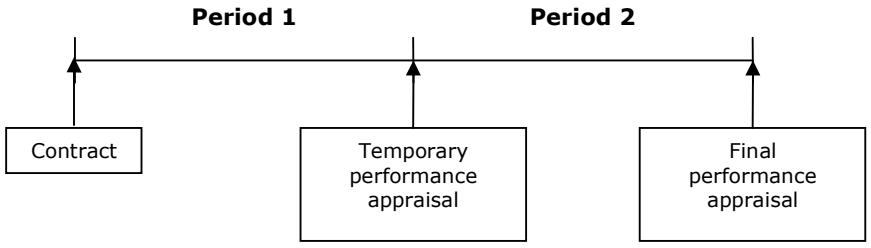

Figure 1. Two-period model of feedback

Feedback (if provided) is given during the formal performance appraisal meeting(s). During the final performance appraisal meeting feedback is provided for sure. The manager announces whether or not the employee has reached the target. In addition, the manager decides whether of not to provide feedback during a temporary performance appraisal. It is important to note that this decision to provide feedback during the provisional meeting is taken and contracted before the two periods start.

We further assume that information cannot be manipulated. That is, feedback represents the true performance of the employee. Finally, both the principal and the agent are risk neutral.

2.2 The model

Suppose a principal and an agent agree on a working contract for the next two periods. The contract can be described as follows:

$$\sigma = \{\bar{y}, b, f\}$$

The contract specifies that the agent has to meet a target, $\bar{y}$, at the end of period 2. If the agent meets the target $(y \geq \bar{y})$, he receives a bonus b. If he does not meet the target, he receives 0. The contract also specifies whether the agent receives feedback at the end of period 1 (f). The feedback, if provided, will be an announcement on the achieved production level at the end of period 1, y_1.

The production of an agent depends on his ability level and the effort he chooses to exert. Ability and effort are complements in production. The production function of an agent is given by

$$y_t = ae_t$$

$$y = a(e_1 + e_2)$$

where e_t is the agent's effort and a is his ability. The agent is effort averse, represented by the following cost function: $c(e_t) = e_t^2$. The parameter a denotes ability and can take on two values $a = \{a_L, a_H\}$ with $0 \leq a_L \leq a_H$ and $\Pr(a = a_H) = \alpha$. When the agent's ability level is a_L, he is also called less able or L type. With a_H he is called more able or H type. The agent does not know a. However, if the principal provides feedback about y_1 at the end of period 1, the agent infers a. We assume the following objective functions for an agent and principal, respectively:

$$U_A = b - e_1^2 - e_2^2$$

$$U_P = y_1 + y_2 - \beta b$$

where β represents the degree to which the principal bears the cost of the bonus. For the principal the bonus represents the money she has to provide to the agent when he does attain the contracted

target. However, for the agent besides this money income, the bonus may also represent the honour, reputation and/or status accompanied by attainting the target, $\bar{y}$. Therefore, the principal may not bear the full cost of the agent's bonus. The larger the reputation component of the bonus, the smaller β.

The purpose of the model is to derive the optimal feedback strategy for the principal. To that end, we use the method of backward induction (e.g. Osborne, 2004; Watson, 2002). Figure 2 represents a decision-tree of the model. It shows two players, the principal (P) and the agent (A). There is one node at which the principal makes a decision. That is, at $t = 0$ the principal announces whether (f) or not (nf) she will provide feedback at the end op period 1. We assume the target ($\bar{y}$) and the bonus (b) are given by the time the principal decides to provide feedback or not. There are also several nodes at which the agent makes a decision. In the upper part of Figure 2 the principal provides feedback. Hence, the agent makes two effort choices. First in period 1, when the agent does not know his type. And second in period 2, when the agent infers his type and his effort choice depends on this type (H or L in Figure 2). In the lower part of Figure 2 the principal does not provide feedback. The agent does not infer his type, so the agent makes one effort choice (for both periods).

In the remainder of the present section we follow a backward induction procedure,. That is, we first discuss the agent's optimal effort strategy. Subsequently, the principal's optimal feedback strategy is derived.

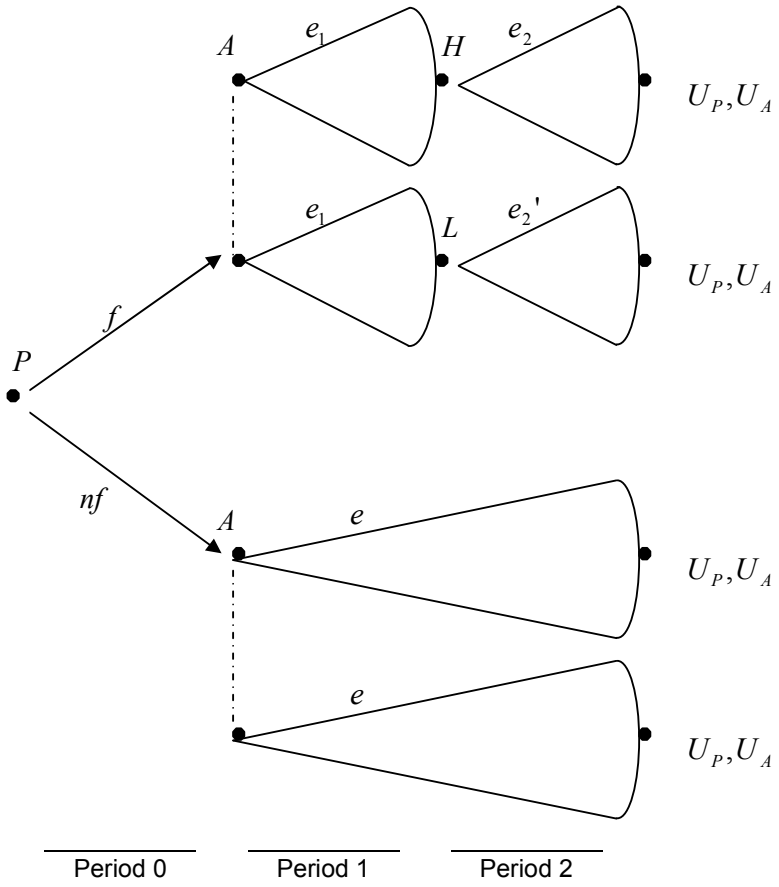

Figure 2. Decision-tree

2.3 The agent's optimal effort strategy

2.3.1 The principal provides feedback

We first derive the optimal effort choice of an agent in case the principal provides feedback. Remember that when the principal provides information about y_1, the agent infers his ability. Consequently he chooses the effort level that leads him to attain the target precisely. Provided that his expected pay-off is positive, the agent indeed exerts effort.

We first consider period 2. In period 2 the agent knows his ability. To meet the target in period 2 the agent should expend effort

$$e_2 = \frac{\bar{y}}{a} - e_1$$

yielding a pay-off of

$$b-\left(\frac{\bar{y}}{a}-e_1\right)^2$$

The agent can also decide to give up by simply choosing $e_2=0$. This yields a pay-off of 0. The agent chooses positive effort if $b-\left(\frac{\bar{y}}{a}-e_1\right)^2>0$, implying

$$a>\bar{a}=\frac{\bar{y}}{\sqrt{b}+e_1} \tag{1}$$

Notice that the agent is more likely to choose positive effort in period 2 the lower $\bar{y}$, the higher b and the higher e_1.

Let us now consider period 1. We distinguish three situations. First, both a H type and L type choose positive effort in period 2 ($a_H>a_L>\bar{a}$). Second, only a H type chooses positive effort in period 2 ($a_H>\bar{a}>a_L$). And third, both types refrain from exerting effort in the second period ($\bar{a}>a_H>a_L$). For each situation we consider the optimal effort choice of the agent in period 1.

2.3.1.1 Situation A

First consider the situation in which both a more able and less able agent participate in period 2 ($a_H>a_L>\bar{a}$). Consequently, the agent will attain the target for sure. The agent chooses positive effort in period 1 when this yields a positive payoff, hence when

$$b-{e_1}^2-(1-\alpha)\left(\frac{\bar{y}}{a_L}-e_1\right)^2-\alpha\left(\frac{\bar{y}}{a_H}-e_1\right)^2>0$$

The agent maximizes his expected utility over the two periods by choosing the following effort level in period 1:

$$\max_{e_1}: b-{e_1}^2-(1-\alpha)\left(\frac{\bar{y}}{a_L}-e_1\right)^2-\alpha\left(\frac{\bar{y}}{a_H}-e_1\right)^2$$

$$e_1={e_1}^A=\frac{1}{2}\left((1-\alpha)\frac{\bar{y}}{a_L}+\alpha\frac{\bar{y}}{a_H}\right)$$

Note that e_1^A decreases with α, a_L and a_H, and increases with $\bar{y}$. Substituting e_1^A in $e_2 = \frac{\bar{y}}{a} - e_1$ we see that the agent smoothes *expected* effort over time. Effort smoothing means that the agent distributes the total amount of effort evenly over the periods ($e_1 = e_2$). Because of the convexity of the cost functions, effort smoothing leads to the lowest total cost and hence the highest utility. However, the agent infers his ability in period 2. Consequently, he chooses the effort level in period 2 that leads him to attain the target precisely. This effort level differs for a L type and a H type, and differs from e_1^A. Therefore, the *actual* effort is not smoothed over time.

Now consider the condition under which the agent chooses e_1^A. This condition depends on the possibility for the agent to obtain a positive pay-off. Two constraints are relevant, the period 1 participation constraint and the period 2 participation constraint of a L type. First, for the agent to participate, the period 1 participation constraint should be satisfied, that is

$$b - \left(e_1^A\right)^2 - (1-\alpha)\left(\frac{\bar{y}}{a_L} - e_1^A\right)^2 - \alpha\left(\frac{\bar{y}}{a_H} - e_1^A\right)^2 > 0 . \qquad (2)$$

Second, the period 2 participation constraint of a L type is relevant. In period 2 the agent infers his type, which is either H or L. The participation constraint of a less able agent is most restrictive. Since $a_L < a_H$, the agent might be inclined not to participate if he infers that he is less able even if the expected pay-off in period 1 is positive. Substituting e_1^A in (1) we find the following threshold level of a_L

$$a_L > \overline{a_L} = \frac{\bar{y}}{\sqrt{b} + \frac{1}{2}\left((1-\alpha)\frac{\bar{y}}{a_L} + \alpha\frac{\bar{y}}{a_H}\right)} \qquad (3)$$

Hence, condition (2) and (3) have to be satisfied for the agent to choose the effort level that leads both types to attain the target (e_1^A). That is, the expected pay-off should be positive in both periods. Comparative statics analysis is used to examine condition (2) and (3).

Bonus (b) and target ($\bar{y}$). Both condition (2) and (3) prescribe that the agent is more likely to choose e_1^A when b is high and $\bar{y}$ is low. The influence of these two parameters is unequivocal.

When the bonus is high, the bonus is more likely to exceed the cost of effort. Hence, the agent is more likely to obtain a positive pay-off. In addition, facing a low target output, less effort is needed to attain the target, and hence the cost of effort is low. This also implies that the agent is more likely to obtain a positive pay-off and thus to choose e_1^A.

Probability that the agent is more able (α). The agent may choose e_1^A both when α is high and when α is low This depends on the agent's ability level (see below). Hence, the condition for α is undetermined.

Agent's ability level (a_L and a_H). Condition (2) prescribes that the influence of a_L and a_H on the agent's effort choice depends on α. This is explained by the fact that e_1^A is a weighed average. Since the agent does not know his ability beforehand, he smoothes *expected* effort over time. Hence, dependent on α, a_L and/or a_H have to be sufficiently high in order to provide a positive pay-off to the agent. More specifically, when α is low the agent chooses e_1^A only when a_L is sufficiently high. Similarly, when α is high the agent chooses e_1^A only when a_H is sufficiently high. For medium levels of α, both a_L and a_H have to be sufficiently high.

In addition, condition (3) prescribes a minimum level for the ability of the less able. Condition (3) is particularly relevant when α is high. This can be explained as follows. With a high probability of being more able, the effort level in period 1 is smaller from a smoothing perspective. As a result, when the agent infers that he is less able, he has to compensate his effort deficit in the second period to still attain the target. However, there is a cost associated with effort. This is when the period 2 participation constraint of the less able becomes relevant. The pay-off in the second period is more likely to be negative, the more L has to compensate, hence the higher α. So, when α is high, the ability level of a L type is relevant. That is, the agent is more likely to choose e_1^A, the smaller the difference between L and H. When both types are roughly similar, the less able has to compensate only a small amount of effort. And consequently, the less able is more likely to obtain a positive pay-off. Hence, the agent is more likely to choose e_1^A, the smaller the difference between the less and the more able.

Taken together, the agent is more likely to choose positive effort the higher b, the lower $\bar{y}$, the higher a_L (if α is low), and the higher a_H (if α is high). In the next subsection we will see that when a_H is high (and α is high), and additionally a_L is low, the agent may choose another effort level in period 1.

2.3.1.2 Situation B

Next we determine the condition for which a more able agent does participate in period 2, and a less able does not ($a_H > \bar{a} > a_L$). That is, when only a more able agent can attain the target with a positive pay-off and consequently the agent will attain the target with probability α. The agent chooses positive effort in period 1 when this yields a positive payoff, hence when

$$\alpha b - e_1^{\,2} - \alpha\left(\frac{\bar{y}}{a_H} - e_1\right)^2 > 0$$

The agent maximizes his expected utility over the two periods by choosing the following effort level in period 1:

$$\max_{e_1} : \alpha b - e_1^{\,2} - \alpha\left(\frac{\bar{y}}{a_H} - e_1\right)^2$$

$$e_1 = e_1^{\,B} = \frac{\alpha}{1+\alpha}\frac{\bar{y}}{a_H}$$

Note that $e_1^{\,B}$ increases with α and $\bar{y}$, and decreases with a_H. Notice also that $e_1^{\,B} < e_1^{\,A}$. The agent exerts relatively less effort in period 1 because with probability $(1-\alpha)$ effort is wasted. Moreover, the agent again does not smooth effort over time.

Now consider under what condition the agent chooses $e_1^{\,B}$. Two constraints are relevant. First, for the agent to participate, the period 1 participation constraint should be satisfied, that is

$$\alpha b - \left(e_1^{\,B}\right)^2 - \alpha\left(\frac{\bar{y}}{a_H} - e_1^{\,B}\right)^2 > 0\,. \qquad (4)$$

Second, e_1^B must yield a higher payoff than e_1^A. In the previous subsection we derived that the agent chooses e_1^A when this effort level yields a positive pay-off. In the present subsection we derived that the agent chooses e_1^B when it yields a positive pay-off. However, it is possible that both e_1^A and e_1^B yield a positive pay-off. Logically, the agent chooses the effort level that yields the highest (positive) expected pay-off. Hence, the agent chooses e_1^B when additionally

$$\alpha b - \left(e_1^B\right)^2 - \alpha\left(\frac{\bar{y}}{a_H} - e_1^B\right)^2 > b - \left(e_1^A\right)^2 - (1-\alpha)\left(\frac{\bar{y}}{a_L} - e_1^A\right)^2 - \alpha\left(\frac{\bar{y}}{a_H} - e_1^A\right)^2 \qquad (5)$$

Again, comparative statics analysis is used to examine condition (4) and (5). The parameters b, $\bar{y}$, α, a_L *and* a_H are discussed in turn to examine parameter values that induce the agent to choose the effort level that leads the agent to attain the target only if he is more able (e_1^B).

Bonus (b) and target ($\bar{y}$). Condition (4) prescribes that the agent is more likely to choose e_1^B when b is high and $\bar{y}$ is low. Both a high bonus (higher benefits) and a low target (lower costs) imply a higher expected pay-off. Consequently the agent is more likely to choose e_1^B. However, condition (5) prescribes that b is not too high and $\bar{y}$ is not too low. This can be explained as follows. When the bonus is sufficiently high and/or the target is sufficiently low, it is more likely that the agent can attain the target with a positive pay-off even if he is less able. Consequently, the expected pay-off for e_1^A exceeds the expected pay-off of choosing e_1^B. Hence, the agent chooses e_1^A over e_1^B. Concluding, for the agent to choose the effort level sufficient for the agent to attain the target only if he is more able (e_1^B) the bonus have to be (not too) high, and the target (not too) low.

Probability that the agent is more able (α). The agent is more likely to choose e_1^B when α is high. When α is high, the agent is most likely a H type. Consequently, the probability is high that the agent does attain the target and the expected pay-off is positive. However, notice that this only holds when a_H is sufficiently high. The higher a_H, the lower the required level of α for the agent to choose e_1^B. In sum, condition (4) holds if α is sufficiently high.

Agent's ability level (a_L and a_H). Condition (4) prescribes that the agent is more likely to choose e_1^B when a_H is high. Ability and effort are complements. Hence, the higher ability, the less effort is needed to attain the target. This implies a low cost, and thus a higher expected pay-off for the agent. Concluding, the ability of a H type (a_H) must be sufficiently high. For the requirements of a_L we examine condition (6). When a_L is sufficiently high, it is more likely that also a less able type can attain the target with a positive pay-off. Hence, the agent chooses e_1^A over e_1^B. Therefore, the agent is more likely to choose e_1^B when a_L is low. More precisely, for the agent to choose e_1^B, the H type must be sufficiently more able than the L type.

Taken together, the agent is more likely to choose the effort level that leads the agent to attain the target only if he is more able (e_1^B) when b is sufficiently high (but not too high), when $\bar{y}$ is sufficiently low (but not too low), when α is sufficiently high, when a_H is high (compared to a_L) and when a_L is low.

2.3.1.3 Situation C

Next we determine the condition for which the agent refrains from exerting effort in period 2 both when he is more and less able ($\bar{a} > a_H > a_L$). That is, when the agent cannot attain the target with a positive pay-off. The optimal effort strategy is given by

$$e_1 = e_1^C = 0$$

Having derived the condition for which both H and L can attain the target with a positive pay-off and for which only the more able does, finding the condition for which neither type can attain the target with a positive pay-off is straightforward. Both types refrain from exerting effort when both condition (2) and (4) are not satisfied.

Generally, the agent does not exert effort when the bonus is low. That is, with a significantly low bonus, the cost of effort always exceeds the benefits of attaining the target. This holds also for a significantly high target. The target may also be unattainable when a_L and/or a_H are too low, or when α is too low. When the target is unattainable with a positive pay-off, the agent is better off when he does not participate.

2.3.1.4 Results

Summarizing, in case the principal provides feedback three situations can be distinguished:

1. The agent chooses e_1^A and both types attain the target with a positive pay-off;
2. The agent chooses e_1^B and only H does attain the target with a positive pay-off;
3. The agent chooses e_1^C and no type does attain the target with a positive pay-off.

Table 2 roughly indicates parameter values for which the agent chooses e_1^A, e_1^B, and e_1^C.

Parameter	Optimal effort level (feedback)		
	e_1^A	e_1^B	e_1^C
b	High	(not too) High	Low
$\bar{y}$	Low	(not too) Low	High
α	Low or High	High	Low
a_H	High	High	Low
a_L	High	Low	Low

Table 2. Values of parameters for which the agent chooses the optimal effort levels when the principal provides feedback, that is e_1^A, e_1^B, and e_1^C respectively.

Further, we derived the following result:

Result 1: When feedback is provided, an agent does not always smooth effort perfectly over time.

2.3.2 The principal does not provide feedback

In the present section we consider the effort choice of an agent when the principal does not provide feedback. Three situations can be distinguished. First, in period 2 the agent exerts so much effort that if he were less able he would exert enough effort to receive the bonus. Second, in period 2 the agent exerts so much effort that only if he were more able he would exert sufficient effort to receive the bonus. Third, the agent never exerts effort.

2.3.2.1 Situation A'

Consider the first situation. In this situation the agent exerts sufficient effort to attain the target even if he were less able. In other words, by choosing this level of effort, the agent will receive the bonus for sure. Again we use the method of backward induction. Period 2 effort equals $e_2 = \frac{\bar{y}}{a_L} - e_1$, yielding a pay-off of

$$b - \left(\frac{\bar{y}}{a_L} - e_1 \right)^2$$

The agent chooses this effort level in period 2 when $b - \left(\frac{\bar{y}}{a_L} - e_1 \right)^2 > 0$, implying

$$a_L > \frac{\bar{y}}{\sqrt{b} + e_1}$$

Now consider period 1. The agent chooses the effort level required for less able to attain the target when it yields a positive pay-off, hence when $b - e_1^2 - \left(\frac{\bar{y}}{a_L} - e_1 \right)^2 > 0$. In period 1, the agent maximizes

$$\max_{e_1} : b - e_1^2 - \left(\frac{\bar{y}}{a_L} - e_1 \right)^2$$

$$e_1 = e_1^{A'} = \frac{1}{2} \frac{\bar{y}}{a_L}$$

Note that $e_1^{A'}$ decreases with a_L and increases with $\bar{y}$. Substituting $e_1^{A'}$ in $e_2 = \frac{\bar{y}}{a_L} - e_1$ we see that the agent smoothes effort over time. In each period the agent exerts $e_t = \frac{1}{2} \frac{\bar{y}}{a_L}$. This can be explained by the convexity of the cost function. When the agent does not infer his type, he does best to smooth effort over time.

Given that the agent only exerts effort if it yields a positive pay-off, we find that he chooses the effort level required for the less able to attain the target if $b - {e_1}^2 - \left(\frac{\bar{y}}{a_L} - e_1 \right)^2 > 0$, which reduces to $b - \frac{1}{2}\left(\frac{\bar{y}}{a_L} \right)^2 > 0$ and further to

$$a_L > a_L{}^* = \frac{\bar{y}}{\sqrt{2b}} \tag{6}$$

Notice that the agent is more likely to choose this effort level when b is high, $\bar{y}$ is low and a_L is high. In the next subsection (Situation B') we derive that the agent is more likely to choose the effort level sufficient for the less able to attain the target when additionally, α is low and a_H is low.

2.3.2.2 Situation B'

Now consider the second situation. In this situation the agent exerts the level of effort that makes him attain the target only if he were more able (and not if he were less able). In other words, in the second period the agent receives the bonus with probability α. Period 2 effort equals $e_2 = \frac{\bar{y}}{a_H} - e_1$, yielding a pay-off equal to

$$b - \left(\frac{\bar{y}}{a_H} - e_1 \right)^2$$

The agent chooses this effort level in period 2 when $b - \left(\frac{\bar{y}}{a_H} - e_1 \right)^2 > 0$, implying

$$a_H > \frac{\bar{y}}{\sqrt{b} + e_1}$$

Now consider period 1. The agent chooses the effort level required for the agent to attain the target when he is more able if this yields a positive pay-off, hence if $\alpha b - {e_1}^2 - \left(\frac{\bar{y}}{a_H} - e_1 \right)^2 > 0$. In period 1, the agent maximizes

$$\max_{e_1} : \alpha b - {e_1}^2 - \left(\frac{\bar{y}}{a_H} - e_1 \right)^2$$

$$e_1 = {e_1}^{B'} = \frac{1}{2}\frac{\bar{y}}{a_H}$$

Note that ${e_1}^{B'}$ decreases with a_H and increases with $\bar{y}$. Notice also that the agent again smoothes effort over time, that is $e_1 = e_2 = \frac{1}{2}\frac{\bar{y}}{a_H}$.

Given that the agent only exerts effort if it yields a positive pay-off, we find that he chooses ${e_1}^{B'}$ if $b - {e_1}^2 - \left(\frac{\bar{y}}{a_H} - e_1 \right)^2 > 0$, which reduces to $\alpha b - \frac{1}{2}\left(\frac{\bar{y}}{a_H} \right)^2 > 0$ and further to

$$a_H > a_H{}^* = \frac{\bar{y}}{\sqrt{2\alpha b}} \tag{7}$$

Notice that the agent is more likely to choose this effort level when α is high, b is high, $\bar{y}$ is low and a_H is high.

Possibly, both condition (6) and (7) are satisfied and hence both ${e_1}^{A'}$ and ${e_1}^{B'}$ yield a positive pay-off. The agent chooses the effort level that yields the highest expected pay-off. Hence, the agent chooses ${e_1}^{B'}$ when

$$\alpha b - \frac{1}{2}\left(\frac{\bar{y}}{a_H} \right)^2 > b - \frac{1}{2}\left(\frac{\bar{y}}{a_L} \right)^2$$

$$\alpha > 1 - \frac{1}{2b}\left[\left(\frac{\bar{y}}{a_L} \right)^2 - \left(\frac{\bar{y}}{a_H} \right)^2 \right] \tag{8}$$

Notice that the agent is more likely to choose ${e_1}^{B'}$ when α is high, and additionally a_L is low. This can be explained as follows. If the probability of being more able (α) is sufficiently high, the expected pay-off of exerting less effort and attaining the target with a high probability exceeds the pay-off of exerting the effort the agent would exert for attaining the target for sure. Now consider a situation where a_L is low (or L is a lot less able than H). If the agent exerts ${e_1}^{A'}$, he needs a lot more effort

in period 1 from a smoothing perspective compared to the lower effort level $e_1^{B'}$. In that case, if the agent infers he is more able, he faces high effort cost. Reason is that effort is smoothes less over time (the agent exerts a lot of effort in period 1 and far less effort in period 2). In addition, if the agent infers he is less able, he also faces high effort cost since his ability is very low. Therefore, the extra effort cost may exceed the benefits form receiving the bonus for sure. So also when a_L is low, the expected pay-off for $e_1^{B'}$ is more likely to exceed the pay-off of $e_1^{A'}$.

Now return to Situation A'. Note that the agent is more likely to choose $e_1^{A'}$ when α is low and when a_H is low. That is, the lower α, the lower the expected pay-off for $e_1^{B'}$ because it is less likely that the agent does receive the bonus. Consequently, the expected pay-off of $e_1^{A'}$ is likely to exceed that of $e_1^{B'}$ when α is low. In addition, when the H type is only slightly more able than the L type (a_H is low), the agent does better to exert a marginal amount of extra effort to receive the bonus for sure. Hence, also when a_H is low, the agent chooses $e_1^{A'}$.

2.3.2.3 Situation C'

The third situation is straightforward. The agent does not exert effort when both $e_1^{A'}$ and $e_1^{B'}$ do not yield a positive pay-off. That is, the agent chooses

$$e_1 = e_1^{C'} = 0$$

when condition (6) and/or (7) is not satisfied. Notice that it is less likely the agent exerts effort, the higher $\bar{y}$, the lower b, the lower a_L (if α is low), and the lower a_H (if α is high).

2.3.2.4 Results

To sum up, when the principal does not provide feedback three situations can be distinguished:

1. The agent chooses $e_1^{A'}$ and both types attain the target with positive pay-off;
2. The agent chooses $e_1^{B'}$ and only H does attain the target with a positive pay-off;
3. The agent chooses $e_1^{C'}$ and no type does attain the target with a positive pay-off.

Table 3 roughly indicates parameter values for which the agent chooses $e_1^{A'}$, $e_1^{B'}$, and $e_1^{C'}$

	Optimal effort level (no feedback)		
Parameter	$e_1^{A'}$	$e_1^{B'}$	$e_1^{C'}$
b	High	High	Low
$\bar{y}$	Low	Low	High
α	Low	High	Low / High
a_H	Low	High	Low
a_L	High	Low	Low

Table 3. Values of parameters for which the agent chooses optimal effort levels when the principal does not provide feedback, that is $e_1^{A'}$, $e_1^{B'}$, and $e_1^{C'}$ respectively.

Further, we derived the second result:

Result 2: When no feedback is provided, an agent smoothes effort over time.

2.4 The principal's optimal feedback strategy

In section 2.3 we derived the optimal effort strategy of the agent. Now consider the final step in the backward induction procedure. That is, the optimal feedback strategy of the principal. The principal has two feedback choices. She may either provide feedback (f) or she may choose not to (nf). Anticipating the effort choice of the agent, the principal chooses the strategy that yields the highest (expected) pay-off. Remember that the principal's pay-off is given by

$$U_P = y_1 + y_2 - \beta b$$

where $y_t = ae_t$.

2.4.1 Feedback versus no feedback

To determine whether the principal should provide feedback or not, we distinguish the same three situations as in subsection 2.3.2 as a starting point.

2.4.1.1 Situation A*

Suppose that without feedback, the agent chooses $e_1^{A'}$. This implies that the agent can even attain the target with a positive pay-off if he were less able. Providing feedback does not affect the total effort of the agent if he is less able. However, feedback induces the agent to cut his effort in period 2 when he infers that he is more able. Since $a_H < a_L$, the total effort of the agent is substantially lower if he is more able and when feedback is provided. Consequently, the pay-off for the principal is reduced by providing feedback. This yields the following result:

> **Result 3**: Suppose the agent chooses $e_1 = e_1^{A'}$ without feedback. Then, not providing feedback yields a higher pay-off for the principal. In this way the principal can take away part of the rent of a H type.

Result 3 may be observed in the way senior medical specialists supervise their students (see Box 1).

Notice the importance of β. The agent is especially inclined to choose $e_1^{A'}$ when the bonus is high. A high bonus implies large benefits for the agent. However, the same bonus implies cost for the principal. Remember that the bonus represents a money transfer from the principal to the agent, but may also include honour, reputation and/or status. Assume $\beta = 1$, implying that no honour is involved and the principal bears the full cost of the bonus. When the bonus is extremely high, the principal is not able to obtain a positive pay-off out of the contract. Hence, the principal may not be willing to provide a contract to the agent when $\beta = 1$. Therefore, the present situation requires that

$$\beta < \frac{ae}{b}$$

BOX 1.

In many medical educations, training as a medical specialist is obtained by means of hospital internships under the supervision of senior specialists. Suppose you are a student that eagerly want to become a heart surgeon. Your supervisor is responsible for the training of a total of ten students, including you. Next week she will perform a beating heart surgery. The student that completes the best stitch will assist her in this fairly unique surgery. For you, as a student that wants to specialize in heart surgery, this is a unique opportunity (b is high). The cost for the senior specialist can be expressed in opportunity costs of the extra time spent to involve a student in the surgery, which are low (β is low).

You can improve your stitching skills by practicing on wounds of patients in the Emergency Room. You may be either a natural stitcher (a_H is high) implying that you need less practice to perform the best stitch. However, you may also be a less able stitcher (a_L is low) implying that you need more practice to perform the best stitch. The probability that you are a natural stitcher is low. Simply because the procedure is difficult and most people need a lot of practice (α is low).

Only the senior specialist is able to assess your stitching skills. So you are never sure that you are able to complete the best stitch, unless your supervisor provides feedback. The bonus is so high that you are willing to practice a lot ($e_1^{A'}$) to improve your stitch. However, if you supervisor provides feedback and you infer that your stitch is (almost) perfect, you may decide to reduce or stop practicing. This implies that the senior has to perform stitches in the Emergency Room herself. By not providing feedback, your supervisor benefits from the stitches you carry out in the Emergency Room. Hence, your supervisor does best not to provide feedback about your stitching skills.

2.4.1.2 Situation B*

Suppose that the agent chooses $e_1^{B'}$ without feedback. This implies that the agent can only attain the target with a positive pay-off if he is more able. Providing feedback may have two effects. First, the agent chooses e_1^{B}. This happens for example when H is sufficiently more able than L. Then, providing feedback implies a negative effect for the principal. The total effort of the more able type is the same regardless whether feedback is provided or not. However, with feedback the less able type infers that he cannot attain the target. Therefore, he refrains from exerting effort in period 2. This is a loss for the principal. Thus, the principal does better not to provide feedback. This is illustrated in Box 2.

BOX 2.

Suppose you are a junior researcher at Organization A. Since your Master's Thesis you have specialized in research on feedback. Organization A offers you the possibility to promote to a senior researcher position. The promotion is accompanied by only a small pay raise and does not affect your activities much. However, the promotion to senior researcher provides opportunities to apply for a job at another organization. You are planning to do so in the near future. Hence, the bonus involves a reputation component (b is fairly high; β is low).

To earn the promotion Organization A requires that you are able to complete projects about subjects other than feedback. To test if you have these abilities you have to successfully complete a project on burn-out. This subject is completely new for you. The successful completion of your promotion project depends partly on your general researching skills, which you have acquired during your career at Organization A. You are fairly confident about these general researching skills. However, the successful completion of the promotion project also depends on your skills to acquire relevant knowledge about burn-out. Since you have rarely come across other subjects than feedback, these skills have not been tested before. Therefore, you have no clue (α = 0.5) if you either have the ability to complete the project successfully (a_H high) or not (a_L low).

The promotion does not involve a large pay raise, or more interesting projects in the future. And even if you do not get promoted, you can apply somewhere else. Hence, in the absence of feedback you choose to put so much effort in the project that only if you are highly able you successfully complete the project (that is, you exert $e_1^{B'}$). When the manager provides feedback during the project, half of the time you infer that your ability is insufficient. Consequently, you drop the project in period 2. When your manager does not provide feedback however, you continue to work on the project. This in turn benefits the manager because the project has to be completed anyway. Hence, your manager does better not to provide feedback.

Second, the agent may also choose e_1^A when feedback is provided. This happens for example when the difference between a_H and a_L is small and additionally α is sufficiently high. Providing feedback again implies a negative effect for the principal. This can be explained as follows. When the agent chooses e_1^A with feedback, both types attain the target. The total effort is the same in both situations if the agent is more able. In addition, the less able agent exerts more effort given that he can now attain the target (since $a_L < a_H$). This benefits the principal. However, both types attaining the target also implies that she has to provide the bonus for sure. This is a cost for the principal that outweighs the benefits of the extra effort exerted by the less able agent. Hence, the pay-off for the principal is lower compared to the situation without feedback. And again, the principal does better not to provide feedback when only the more able agent can attain the target with a positive pay-off with feedback. Box 3 provides a sample situation.

BOX 3.

Consider the example of Box 2. Only now the promotion involves a senior researcher position in the feedback division. Hence, your manager does not require you to broaden your knowledge and skills (only to specialise). The promotion project now is a project that involves feedback. However, the project is slightly more difficult than you are used to. During your career at Organization A you have acquired a broad area of researching skills. So, the probability is high that you are able to complete the project successfully (α is high) . However, if you overlook just one piece of information you will not attain the target (the difference between a_L and a_H is small).

When the manager provides feedback, you infer whether or not you have overlooked that one piece of information. In that case you can correct this lack of information and still attain the target if you put enough effort in the project ($e_1^{\ A}$). Hence, when feedback is provided you choose a higher effort level that leads you to attain the target for sure. The manager has to provide the bonus for sure.

When your manager does not provide feedback however, you put less effort in the project ($e_1^{\ B'}$) because chances are high that you are a highly able researcher and you need less effort to complete the project. The manager does better not to provide feedback, since she only has to provide the promotion with probability α .

The two effects can be summarized in the following result:

> **Result 4**: Suppose that without feedback $e_1 = e_1^{\ B'}$. Then, not providing feedback yields a higher pay-off for the principal. In this way the principal can induce the L type to exert effort in period 2 and only has to provide the bonus with probability α .

Analogous to the previous situation, the principal is not always willing to contract an agent when $\beta = 1$. More particular, the present situation requires that

$$\beta < \frac{ae}{\alpha b}$$

2.4.1.3 Situation C*

Suppose that without feedback, the agent chooses to refrain from exerting effort. This implies that no type can attain the target with a positive pay-off. Possibly providing feedback may have no effect on the effort strategy of the agent. For example, if the ability of both the more and less able are extremely low.

However, providing feedback may have a positive effect for the principal. Feedback may motivate an agent to participate. The reason is that with feedback, the effort in period 2 is certainly productive. The agent chooses positive effort in period 2 only if he is more able. In addition, anticipating feedback the agent exerts less effort in period 1 from a smoothing perspective. That is, $\frac{\alpha}{1+\alpha}\frac{\bar{y}}{a_H} < \frac{1}{2}\frac{\bar{y}}{a_H}$. Taken together, when feedback is provided less effort is wasted, implying lower cost. This effect of feedback may be just enough to motivate the agent to participate. This provides the following result:

> **Result 5**: Suppose that without feedback the agent chooses $e_1 = e_1^{C'}$. Then, feedback may encourage the agent to exert positive effort. The reason is that with feedback, effort in period 2 is certainly productive. While without feedback effort is only productive with probability α. In addition, less effort is wasted in period 1.

This positive effect of feedback is illustrated in Box 4.

BOX 4.

Suppose you walk on a crowded square during your holidays. You are asked to complete a riddle. The riddle is difficult to solve. Normally, only 10% does find the solution to it (α is low). Most people don't even come close to a solution (a_L is low compared to a_H). When you solve the riddle, you receive a symbolic € 1. However, you would feel proud in front of the bystanders. Because the sensation does not last long, we assume the benefits of solving the riddle are not very high (b is low; β is low).

In the absence of feedback, you decide not to participate. There's a small chance you solve the riddle, and you would feel foolish if you did not. However, you are offered the option to receive feedback during your attempt to solve the riddle. The inventor of the riddle can tell you whether you are close to solving it. When feedback is provided you would stop trying when you are not even close to solving the riddle. This would save you a lot of effort. However, when you infer that you are close you would persist in trying and likely solve the riddle. Hence, when feedback is provided you would choose to participate.

The inventor does now best to provide feedback. She benefits from people participating. When someone attempts to solve the riddle, this will attract attention on the crowded square. This in turn implies advertisement.

2.4.1.4 Results

In the present subsection we inferred the following three results regarding the feedback choice of the principal.

> **Result 3**: Suppose the agent chooses $e_1 = e_1^{A'}$ without feedback. Then, not providing feedback yields a higher pay-off for the principal. In this way the principal can take away part of the rent of a H type.
>
> **Result 4**: Suppose that without feedback $e_1 = e_1^{B'}$. Then, not providing feedback yields a higher pay-off for the principal. In this way the principal can induce the L type to exert effort in period 2 and only has to provide the bonus with probability α.
>
> **Result 5**: Suppose that without feedback the agent chooses $e_1 = e_1^{C'}$. Then, feedback may encourage the agent to exert positive effort. The reason is that with feedback, effort in period 2 is certainly productive. While without feedback effort is only productive with probability α. In addition, less effort is wasted in period 1.

We can now formulate the optimal feedback strategy for the principal:

1. The principal does not provide feedback when the agent is willing to participate in the absence of feedback;
2. The principal does provide feedback when the agent does not exert effort in the absence of feedback and when additionally feedback motivates the agent to participate.

3. Concluding remarks

The purpose of the present paper is to use game-theoretical techniques to explain feedback usage by managers. In particular, the paper focuses on the finding that managers often fail to deliver feedback. The model developed here focuses on situations in which the employee is either more or less able and the manager has an information advantage. We distinguish three situations, (a) the employee chooses the effort level that leads both the more and less able to achieve the target, (b) the employee chooses the effort level that leads only the more able to obtain the target, and (c) the employee does not exert effort. A key aspect of the model is the convexity of the cost of effort function, which induces the employee to smooth effort over time. Situation (a) explains the reluctance of the manager to give positive feedback. Feedback induces the more able to reduce his effort. Situation (b) explains the

unwillingness to provide negative feedback. Feedback induces the less able to stop participating. Feedback may only work in situation (c) where feedback motivates the agent to participate. Overall, the model explains the reluctance of the manager to provide both positive and negative feedback.

4. Discussion

The model developed here should be regarded as a starting point for the use of game theory to examine feedback usage. In the present section we provide suggestions for future research to improve the feedback model. The model developed here explains the reluctance of managers to provide both positive and negative feedback. However, concurrently this finding also contradicts psychological and managerial literature that found feedback, particularly positive feedback, to improve employee performance (e.g. Waldersee & Luthans, 1994). Factors not incorporated in the present model may be responsible for this finding. Therefore, future research could expand the present model to examine other factors that are relevant in the feedback-performance relationship.

For example, feedback encompasses other functions that may increase performance. In the present model, feedback only informs the employee about his ability level. This information in turn affects his effort choice. However, feedback has other properties that induces the employee to work harder. Remember the role clarification, self-efficacy levels and behavioral reward contingencies explained in the introduction (Waldersee & Luthans, 1994).[1]

In addition, the model assumes that the employee accepts feedback as it is provided. However, feedback acceptance is not certain. It depends for example on features of the sender (like trust in the manager, and the manager's power), feedback properties (like feedback quality, and feedback delivery), and features of the receiver (like self esteem, self-evaluation motives). These factors have been shown to moderate the effect of feedback on performance (e.g. Steelman & Rutkowski, 2004). Therefore, future game theoretical research could also include these moderators in the relation between feedback (acceptance) and performance.

[1] Note that the present model does explain the working of self-regulatory processes. For example, in situation (a) the less able employee exerts too little effort from a smoothing perspective in period 1 and hence is below standard. When the employee infers he is below standard (negative feedback) he increases his effort in period 2. Similarly, the more able employee exerts too much effort in period 1. When he infers he is above standard (positive feedback) he decreases his effort in period 2. Adjusting the effort to the standard of performance explains the self-regulatory control processes of feedback.

Another suggestion for future research also regards feedback acceptance. In the introduction we stated that two findings in the psychological and managerial literature are at odds with standard economics theory. The model developed here provides an explanation for the finding that managers fail to provide feedback. However, in the present study we did not elaborate on the second finding. Namely, that employees should have a sceptical attitude towards positive feedback because managers may provide false positive feedback to enhance performance. In the present model we assumed that managers provide honest feedback (information cannot be manipulated). However, psychological research suggests that managers sometimes exaggerate performance feedback (e.g. Greenberg, 1991), and sometimes managers are more lenient in rating employees (e.g. Harris, Smith, & Champagne, 1995). Future game-theoretical research could abandon the assumption of honest feedback to examine the motives for the manager to manipulate information and to examine the behavior of an employee anticipating the possibility of manipulated information.

Besides feedback, the employee may have other sources of information about his ability. These sources become particularly relevant when manipulation of information is possible. Often, employees make judgements about their own performance, for example, by comparing themselves with others. In the present model feedback is the only information source regarding the employee's ability. However, feedback is just one way an employee learns about himself. Future research could incorporate this aspect into a game-theoretical model. For example, by assuming that both the manager and the employee receive a noisy signal about the employee's performance. Feedback is a message from the manager to the employee. And the employee bases his future efforts on both feedback and his own signal.

Taken together, the present model provides a starting point for examining feedback in the manager-employee relationship. There is still quite a lot to explore.

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