



# Self-efficacy, overconfidence, and the negative effect on subsequent performance: A field study

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## ARTICLE INFO

### Article history:

Received 14 March 2008

Received in revised form 11 September 2008

Accepted 29 November 2008

Available online 15 January 2009

### Keywords:

Field study

Metacognition

Overconfidence

Performance

PLS

Self-efficacy

## ABSTRACT

Self-efficacy has been used to predict the level of performance or usage of IT. The psychological literature has suggested, however, that rather than promoting behavior, it can lead to overconfidence and reduce performance over time. We investigated this claim by studying the relationship between self-efficacy and performance in a field study. Overconfidence was measured metacognitively as the difference between a person's expected performance and his or her actual performance. Using PLS and a sample of 108 students in an systems analysis and design course, we found that for the sample as a whole, self-efficacy was positively and significantly related to performance, and that performance was positively and significantly related to subsequent self-efficacy. When levels of over- and under-confidence were taken into account, however, the relationships changed. In particular, overconfidence leads to a significant negative relationship between self-efficacy and subsequent performance. Implications for user training included the need to use performance feedback in order to allow for a recalibration of self-efficacy towards a more accurate self-assessment of ability.

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## 1. Introduction

Self-efficacy is considered to be a triadic relationship between three factors: cognitive (personal goals, self-evaluation of performance, and quality of analytical thinking), environmental (level of challenge and circumstances under which the act takes place), and behavioral (choices that are executed) [1].

Actual behavior (accomplishment) provides a feedback loop, with future behavior affected by subsequent outcome expectations and self-efficacy. The stronger the perceived self-efficacy, the higher the challenge people set for themselves and the better a person's ability to cope with obstacles. By raising one's self-efficacy, the amount of effort and time one is willing to devote to the task also increases, leading to higher performance.

Given that IT has no value unless it is used, self-efficacy has been adopted within the literature as a task-specific construct to predict its level of performance or usage [18], as a mediator in technology acceptance, and as the product of IS training [19]. It would appear that we need to enhance the self-efficacy during training.

The problem, however, is that there is evidence to suggest that one can become overconfident when a person's belief about their

expected level of performance exceeds their actual performance. In particular, it was suggested that self-efficacy is only satisfaction in one's level of performance, and complacency may result, leading to a negative relationship between self-efficacy and performance over time [25].

Overconfidence can affect a software engineer's ability to properly estimate the cost of a software development project [13]. Initial success can also lead financial analysts to become overly confident in their ability to predict the market, leading to lower subsequent performance [11].

Bandura observed a similar effect [2], where students playing a management simulation game retained a high level of self-efficacy in the face of declining performance. This effect was explained in terms of "complacent self-assurance." But in spite of this, the problem of overconfidence was dismissed as being of no consequence.

However, if self-efficacy is meant to be a good predictor of IT usage or competence, a negative relationship would have a significant impact on the utility of self-efficacy in IT training programs. Therefore, we decided to investigate whether there was any evidence that contradicted the expected relationship.

## 2. Background

Judgment of self-efficacy is made under conditions of uncertainty, because it is typically measured before a task is performed. First impression judgment of self-efficacy is particularly important because it affects the activities that a person decides to pursue, the

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effort devoted to the activity, and subsequent self-efficacy judgment. Typically, there is a bias towards overly positive self-evaluation because of a tendency to seek confirming rather than non-proving evidence, leading people to overestimate their ability to perform a task.

Other studies have also found that positive information about expected performance (i.e., high performance anchors) increased self-efficacy but not performance. Mildly negative performance anchors had been found to lead to increased effort, attention to strategy, and performance by increasing the challenge of the task, although the effect of positive and negative feedback appeared only to be significant when the task was complex [28]. This suggested that, to promote performance in complex tasks, self-efficacy must be held in check.

### 2.1. The effect of overconfidence

Vancouver and his colleagues [26,27] suggested that high self-efficacy may reduce motivation and have a negative effect on subsequent performance. The positive relationship usually found between self-efficacy and performance is then due to a strong positive relationship between prior performance and subsequent self-efficacy, and a weak negative relationship between self-efficacy and subsequent performance.

They argued that this effect is consistent with Perceptual Control Theory [20], which suggested that human behavior was driven by the perceived difference, or error, between the perceived current external state and an inner desired state. People act on their environment in order to bring their perceived state closer to the desired one. Thus, high self-efficacy may lead to a premature belief that the goal state has been reached, leading to decreased effort and performance.

These hypotheses were tested in a series of experiments using the Mastermind strategy game as an example of complex analytic thinking. The game requires the player to determine the correct arrangement of four colored pegs. In the first experiment, self-efficacy was measured as the perceived likelihood (on a scale of 1–10) of finding a solution by a certain round. Performance was the number of rounds the player actually took, while the goal was the number of rounds to find a solution in the next game.

As expected, correlations between self-efficacy, performance, and goal was positive and significant. When the analysis was changed to a within-persons (repeated measures) design across individual games, however, self-efficacy and goal for the next game was positively related to prior performance, but negatively related to actual performance in the next game.

When self-efficacy was manipulated by changing the solution to match the players' attempt on the third attempt, there was no significant difference in the number of rounds required to find a solution compared to a control group, but for the game after the manipulated trial, self-efficacy was higher for the experimental group. For each point increase in self-efficacy, however, performance decreased.

### 2.2. The counter-argument

The experiments conducted by Vancouver et al. were criticized by Bandura at a number of different levels (see [3]). Philosophically, the negative error-reducing mechanism of PCT was seen as fundamentally opposed to SCT's supposition that people are aspiring, proactive organisms.

Empirically, the claim that self-efficacy had an invariant or debilitating effect on performance was dismissed as being simply false; Bandura argued that under normal conditions past performance was the best predictor of future performance but under challenging conditions prior performance had no predictive

value. Any correlation between prior and subsequent behavior simply reflected the degree of commonality of their determinants.

Methodologically, the value of using the Mastermind game was questioned, being seen as too simple to tell anything meaningful about how people behaved in the real world. The fact that the game was one of chance also created problems, since self-efficacy was being related to ability to guess rather than ability to acquire skills to do better.

Furthermore, the use of a within-person design to uncover the negative relationship was criticized, because there was no inherent superiority between intra-personal and inter-personal designs. Rather, they suggest that intra-person designs had the weakness that when one or more traits was stable over time, there may be insufficient variance to detect effects and the contribution of a determinant became underrated.

In response to these criticisms, however, a recent study analyzed the relationship between self-efficacy and performance across a series of four in-class tests [21]. Using a sample of students taking a statistics course, performance was found to be positively and significantly related to subsequent self-efficacy, while self-efficacy was negatively, although not significantly, related to subsequent performance.

## 3. Research model

While it is hard to imagine how individuals could be motivated to tackle more and more complex tasks during their lifetime without some sense of ability-to-do-so, this goal-attainment spiral cannot continue indefinitely. Regardless of the features that might contribute to task failure, they must affect the user's self-assessment, and that must have an ongoing impact on both beliefs in efficacy and subsequent performance.

Therefore, we set out to investigate the relationship between prior judgment of self-efficacy and performance at time (t1) with subsequent judgment and performance at time (t2). Given the importance of initial first impression as a determinant of tasks chosen by an individual, we made a distinction between initial judgment of self-efficacy and the ongoing relationship between prior and subsequent self-efficacy and performance. We hypothesized that judgment of self-efficacy at time (t1) would have a significant impact on all subsequent constructs. The research model, therefore, was as shown in Fig. 1, where SE1 is a measure of a person's initial judgment of self-efficacy at time (t1), denoted by PERF1, and SE2 is the level of self-efficacy prior to subsequent performance at time (t2), denoted by PERF2. The two measures of performance allowed us to determine whether the complacency due to overconfidence was a product of initial or prior judgment of self-efficacy. We also examined whether the explicit feedback of PERF1 had an impact on subsequent self-efficacy (SE2) and performance (PERF2).

Following Social Cognitive Theory, we begin by hypothesizing that self-efficacy measured just before a task would be an accurate predictor of actual performance. Computer self-efficacy has been significantly related to the level of usage of IT [17], technology acceptance [9,16], and between self-efficacy and skill acquisition [7,24]. We expected that the higher a person's prior self-efficacy, the better one's subsequent performance. This relationship should hold at all times (t1 and t2). Therefore:

**H1a and 1b.** Prior self-efficacy positively affects subsequent performance.

However, overconfidence during preparation for a task has been posited as reducing motivation to continue working on it. Thus prior self-efficacy could negatively affect subsequent performance. Then either H1a or H1b would be negative, because enhancing self-efficacy as part of an IT-training program may lead to lower use or

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