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A quasi-experiment approach to study the effect of e-mail management training

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ABSTRACT

This study investigates the question as to whether e-mail management training can alleviate the problem of time pressure linked to inadequate use of e-mail. A quasi-experiment was devised and carried out in an organizational setting to test the effect of an e-mail training program on four variables, e-mail self-efficacy, e-mail-specific time management, perceived time control over e-mail use, and estimated time spent in e-mail. With 175 subjects in the experimental group, and 105 subjects in the control group, data were collected before and after the experiment. ANCOVA analysis of the data demonstrated possible amount of time saving with an e-mail management training program. In addition, better perceived time control over e-mail use was observed. Since the change of e-mail-specific time management behavior was not significant, but e-mail self-efficacy improved substantially, it suggested that the major mediating process for better perceived time control over e-mail use and less estimated time spent in e-mail was through improved e-mail self-efficacy rather than a change of e-mail-specific time-management behavior.

1. Introduction

Over the past three decades, e-mail has evolved from a specialized Internet application to a general communication tool. To a large extent, e-mail is now an integral part of knowledge workers' lives. The penetration of e-mail into daily life has been unobtrusive, and yet its effect is pervasive. Many of us now depend on e-mail to accomplish tasks, and perhaps many more are emotionally attached to it as a convenient channel for personal communication. Advances in technology have made communication more convenient. For example, e-mail is viewed as task coordination and collaboration tool (Mackay, 1988; Whittaker & Sidner, 1996) and personal information management tool (Bellotti & Smith, 2000), which influenced our lives positively through task accomplishment and life enrichment. However, it also brought about side effects such as information overload. Many of e-mail's negative effects are caused by its ineffective use. Farhoomand and Drury's survey (2002) of 124 managers in Australia, Hong Kong, the U.K., and the U.S. reported that the Internet and e-mail are the largest external sources of personal information overload (60%). Furthermore, Davenport (2005) pointed out that the performance of knowledge workers is hindered by their lack of control over information flows. His data showed that e-mail is central to the problem: on average, knowledge workers spend 1.58 h per day using e-mail, which represents about 20% of an 8-h workday. In addition, about 77% of knowledge workers check their e-mail frequently, resulting in excessive interruptions that adversely affect productivity. The problems arising from ineffective use of e-mail, both directly and indirectly, increase time pressure.

In the workplace, training is frequently used to help end users become familiar with computing environment and to promote effective system implementation (Igbaria, Pavri, & Huff, 1989; Riemenschneider & Mykytyn, 2000; Urwiler, Ramarapu, Wilkes, & Frolick, 1995). Thus it is intuitively attractive to approach the problem of e-mail use with training. In a general sense, "work smarter, not harder", could be a solution to the increased pressures caused by e-mail. Working smarter has to do with whether one manages his or her time effectively. Time management training thus appears to offer a promising solution. On the other hand, as knowledge workers often use no more than 10–20% of the functions of any software tools that are available to them (Compeau, 2007), training them to use computer software functions more proficiently and comprehensively also promises time savings and consequent increases in productivity. Still, many organizations neglect e-mail training. A survey by Davenport (2005) reported that 51% of knowledge workers do not feel that they are in control of information flows, and 41% believe that their organizations do not offer them assistance in dealing with the situation.

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Table 1
Two levels of variables and the variable abbreviations.

Level	Variable abbreviations	
First	SE: E-mail self-efficacy	TM: E-mail-specific time-management behavior
Second	TC: Perceived time control over e-mail use	TS: Estimated time spent in e-mail

Besides the techno-centric viewpoint of system redesign, a contrasting human-centric viewpoint offers another more immediate solution by probing into usage behavior and devising effective training. Thus, the purpose of the study reported herein was to test the effectiveness of a training program. Before devising the training material, a focus group interview was conducted to expand the understanding and augment what was not clearly documented in the literature. The interview aimed to identify not only problematic areas but also non-problematic routine usage patterns (Huang & Lin, 2009). With a deep understanding of what forms of behavior intensify and what forms of behavior alleviate time pressure, a promisingly effective training program could be expected. The effectiveness of training was measured by the increase of perceived time control over e-mail use and the decrease of estimated time spent on e-mail.

The training program, used as the treatment of the quasi-experiment, was undertaken in an organizational setting. The experiment sought to establish or disprove training as an effective way to alleviate time pressure caused by e-mail. Our study focuses on this particular negative impact of e-mail rather than its positive contribution to knowledge workers' life, because the necessity of e-mail easily overshadows the potential impact of time pressure and subsequently affects organizational productivity. The objective of the study was to investigate training outcomes, specifically, the changes in:

(1) E-mail self-efficacy (SE),
(2) E-mail-specific time management behavior (TM),
(3) Perceived time control over e-mail use (TC), and
(4) Estimated time spent in e-mail (TS).

Although these four variables were measured simultaneously, the reasoned relationship suggested that SE and TM were first-level variables that could be affected by training directly, while the potential changes in TC and TS were caused by SE and TM, and they are thus referred to as second-level variables. SE and TM are the potential mediating processes leading to TC and TS. Table 1 shows the two levels of variables.

2. Theoretical model and hypothesis development

2.1. Perceived time pressure and existing solutions

Knowledge workers' lives are characterized by an accelerated pace that has inevitably intensified time pressure, as pointed out by Linder (as cited in Godbey, 2003). E-mail, the most pervasive electronic communication tool today, is adding to this pressure. Though convenient, e-mail creates a situation in which knowledge workers are on-call constantly, whether they are in the office, at home, or on vacation. In other words, frequent interruptions accompany the convenience that e-mail brings. With e-mail, work is also expected to be performed faster. Although the large number of e-mail messages most of us receive has become a problem, Weber (2004) believed that it was secondary to the pressure we now feel as a result of a faster work life. This pressure is closely linked to perceived time pressure.

Technological advancements have lead to societal changes. To make sense of these changes, some researchers have taken the standpoint that technology itself created the changes that are innate, i.e., beyond social influence. This viewpoint is a manifestation of technology determinism (Robins & Webster, 1999). Setting out from this perspective, new software designs have been proposed to offer solutions to the problems arising from e-mail use (Moran, Cozzi, & Farrell, 2005). Moran et al. (2005) believed that a better design should be embedded in the overall e-business system and should unify all activities.

However before a redesigned system is put into use, users' options are limited to the currently available systems. Moreover, negative effects do not arise only from how the technology tool is designed and implemented; there are problems associated with how the tool is used. This line of thinking deviates from the school of technological determinism; it posits that the use of technology is socially conditioned, meaning that the user adoption enables the use and at the same time creates usage problems. Therefore, neither modification nor redesign of e-mail systems can solve the problem of perceived time pressure completely. Instead, users should improve the way they handle the tool.

Researchers have shown interest in reducing certain types of problematic behavior in e-mail use through training (Frazee, 1996; Jackson, Burgess, & Edwards, 2006; Jackson, Dawson, & Wilson, 2003). Both Jackson et al. (2006) and Frazee (1996) investigated the effectiveness of e-mail training to promote clearer communication. Jackson et al. (2003) focused on training employees to change the settings and modes of e-mail software to reduce the effects of work interruption. These studies dealt with specific behavioral change (e.g., e-mail message composition) or e-mail efficacy (e.g., familiarity with e-mail settings). The findings of our study will not only add to the body of knowledge concerning the change of behavior and e-mail self-efficacy, but also link these potential changes to the end results of perceived time pressure and estimated time spent.

The quasi-experiment can be approached in two ways: first, by aiming to increase familiarity with the functions of e-mail systems to allow more efficient handling of e-mail tool, and second, by improving the effectiveness of time management concerning e-mail use. It is documented that time management training is effective in improving job performance and employee attitudes (Macan, 1996). Although it is reasonable to speculate that time management training in e-mail use could also be effective, such speculation is subject to confirmatory investigation. This paper reports the results of the evaluation of an e-mail management training program, which was designed to enhance two areas of effective usage: both the functions of e-mail system and the time management aspect concerning e-mail use.

2.2. Training and time management behavior

Effective time management has been a topic of interest to researchers for many years. Claessens, Van Eerde, Rutte, and Roe (2007) defined time management as types of behavior that aimed at the effective use of time while undertaking goal-directed activities. These types of behavior include time assessment, planning, and monitoring behavior.

Time management behavior has been investigated for its effects on attitudinal and pressure-related outcomes in such areas as perceived time control (Davis, 2000; Francis-Smythe & Robertson, 1999; Jex & Elacqua, 1999; Macan, 1994), job satisfaction (Davis, 2000; Macan, 1994), work-related outcome (Davis, 2000) and somatic tension (Macan, 1994), strain (Jex & Elacqua, 1999), and emotional exhaustion (Peeters & Rutte, 2005). According to the results of these studies, time management behavior is positively related to perceived control of time, and it in turn leads to positive

job satisfaction; whereas the lack of time-controlled perception leads to tension and strain. In other words, time management behavior is not a direct antecedent of performance; rather, it helps individuals to gain the feeling of time control, and indirectly bring out other desirable outcomes.

A few studies have investigated the antecedents of time management behavior. Macan (1994) and Claessens et al.'s study (2007) concluded that time management training and personality traits were two most important ones. Usually there were two parts to time management training. First, subjects would be encouraged to develop their individual goal value and to set priorities. Then tips of making good use of time and self-monitoring strategies were taught. A few studies demonstrated that after time-management training, most subjects would exercise time-management tips and strategies they acquired in the training, leading to positive outcomes (Green & Skinner, 2005; Macan, 1994; Van Eerde, 2003); whereas Macan (1996) reported opposite findings. Macan found that training did not necessarily improve time management behavior, but rather increased employees' perceived sense of control over time. Claessens et al. (2007) concluded that time management training improved time management skills, but that this did not necessarily transfer to better performance.

It is clear that in the extant literature the observed variables of time management training varied and the results mixed. The only consistent finding seemed to be the correlation between time management training and perceived control of time. However this relationship in the context of e-mail use has never been studied. As perceived control of time is intuitively linked to the time pressure caused by increasing or ineffective e-mail use, it is worth investigating whether e-mail management training improves e-mail-specific time-management behavior and leads to improved perception of time-control.

In this study e-mail-specific time-management behavior (TM) was measured by the degree to which subjects exercised various forms of time assessment, planning, and monitoring concerning e-mail use.

2.3. Training and self-efficacy

Self-efficacy is one's judgment of his/her ability to perform certain tasks (Marakas, Yi, & Johnson, 1998). Thus, e-mail self-efficacy does not measure each individual's skill level in using e-mail functions as in a lab test. Rather, it measures how comfortable and confident one is in using e-mail functions. Although self-efficacy is related to skill level, it is not solely determined by skill level. Research has consistently shown that training improves computer self-efficacy (Chou, 2001; Compeau & Higgins, 1995a; Decker, 1999; Rozell & Gardner, 1999) and Internet self-efficacy (Torkzadeh, Chang, & Demirhan, 2006).

Although e-mail system has evolved from requiring skills of issuing line-mode commands to requiring relatively uncomplicated skills of window- or web-based graphical interface, it remains a system which effective use depends on users' information system literacy, specifically e-mail efficacy. Prior research indicated that self-efficacy, instead of skill level, directly affected work-related performance (Stajkovic & Luthans, 1998), therefore we were interested in finding out whether a well-devised training program would increase e-mail self-efficacy and, in turn, improve TC and TS.

According to Bandura (1977), expectations of personal efficacy are derived from the following four components: performance accomplishments, vicarious experience, verbal persuasion, and physiological states. In turn, expectations of personal efficacy can result in persistence in activities that further self-efficacy.

Saks (1997) indicated that, by training, self-efficacy could be increased through the following four manners: by providing subjects with practice opportunities, by demonstrating the procedure, by providing positive feedback, and by eliminating the feelings of fear and anxiety. These four manners map closely to the four components mentioned above. They guided the devise of the e-mail management training program for our experiment.

Training has been identified as an important factor in the learning process. Several empirical studies showed that training was especially effective in improving computer self-efficacy (Compeau & Higgins, 1995a; Torkzadeh, Plfughoeft, & Hall, 1999), Internet self-efficacy (Torkzadeh & Van Dyke, 2002), and increasing computer-use performance (Marakas et al., 1998; Venkatesh & Davis, 1996). For example, Compeau and Higgins (1995a) compared the effectiveness of behavior modeling and lecture-based instruction in increasing computer self-efficacy, by using word processing and spreadsheet as the target systems. They concluded that behavior modeling was more effective than lecture-based instruction for spreadsheets, but not for word processing. Gist, Rosen, and Schwoerer (1988) found that modeling is superior to tutorial in helping students to master computer software. Gist, Schwoerer, and Rosen (1989), Saks (1994), Saks (1995) continued to support behavior modeling as the choice for improving post-training efficacy and reducing anxiety. E-mail self-efficacy is a type of computer self-efficacy or Internet self-efficacy. We believe that e-mail management training by behavior modeling will improve e-mail self-efficacy, and in turn leads to desirable performance outcome.

As shown in Fig. 1, the performance of interest was the second-level variables, TC and TS. TC measured the degree to which subjects perceived their ability to limit time spent on e-mail. TS measured subjects' assessment of time spent in e-mail. TS was used to examine whether the perception of better time control, if it existed, was merely a misperception or a reflection of actual time savings. We reasoned that TC and TS would be the results of the first-level variables, SE and TM.

Thus, the hypotheses are as follows.

H1. E-mail management training improves an individual's e-mail-specific time management behavior.

H2. E-mail management training improves an individual's e-mail self-efficacy.

H3. E-mail management training improves an individual's perceived sense of time control over e-mail use.

H4. E-mail management training improves an individual's estimated time spent on e-mail.

3. Research method

3.1. Training program

The training program comprised a mix of introduction, demonstrations, videos, and exercises. Each session was 3 h long and included two parts of training: a 1.5-h e-mail specific time-management module and a 1.5-h e-mail tool training module. Three hours was considered suitable because this was about the length most organizations would allocate for a training session not directly related to immediate profits. The e-mail-specific time-management session taught the subjects how to set goals, how to plan, and how to set priorities for e-mail use; it specifically dealt with interruptions and media selection. Further, the session persuaded the subjects to keep a time diary to track e-mail use following the training for a week to closely assess actual e-mail use. This provides a foundation toward a habit of using e-mail efficiently. The e-mail tool training session was segmented to several units, with each unit containing a demonstration and a follow-up exercise. Major functions of e-mail were covered: filtering and searching, folder management, archiving, address book

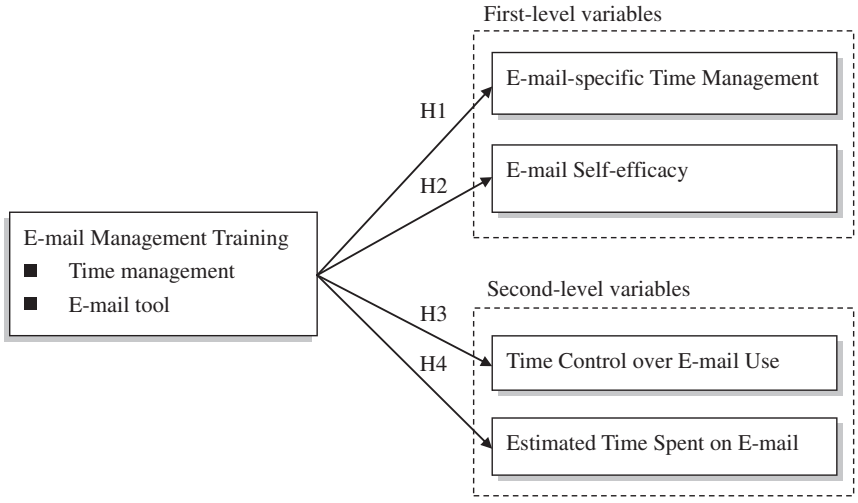

Fig. 1. Conceptual framework.

management, schedule management, and message management. At the training session, each subject received a booklet of training material, and several teaching assistants went around the classroom to help with hands-on practices. In order to insure training quality, this training program was pre-tested with 16 college students for three hours in the same corporate computer classroom, which was the facility for actual experiment later. The program was presented as an e-mail management course rather than as an experiment.

3.2. Subject

An open environment such as the whole Internet is not suitable to conduct a training experiment. A workplace had to be chosen for the purpose of our study. Under budget consideration, the case company must have its own computer classroom, so that we do not need to rent one and transport subjects offsite. In addition, to make sampling meaningful, the case company must be large enough and must have high percentage of knowledge workers. A multinational corporation in the industry of computer and electronic home appliance, which meets our criteria was identified and contacted. Its human resource department agreed to collaborate in this experiment after meeting our experienced instructors, reviewing our proposal and training material. Therefore, subjects were recruited through the training and education unit of the human resources department, among the employees whose job functions characterized them as knowledge workers.

The recruitment was presented to employees as a regular in-house training and education program. As the subjects could freely choose to attend the training sessions, it was not possible to randomly assign each subject to an experimental or control group; it was only possible to randomly designate subjects of an entire session to either an experimental or control group. Therefore the subjects in the two groups were unequal in number. Also, the nature of quasi-experiment does not assure equivalent control group, i.e., the characteristics of the control group may not be similar to the experimental group. This non-equivalent control group design (Cook & Campbell, 1976) is a nature of quasi-experiment, and calls for ANCOVA analysis to include baseline scores as a covariate, in order to eliminate the effect of non-equivalent control group.

The two groups were assessed for profile similarity prior to training to ensure that there were no significant demographic differences between them. The results of this assessment indicated that there were no statistical differences between these two groups in educational background, work experience, e-mail usage experience, or job positions.

3.3. Measurement

The questionnaire items used for baseline and follow-up phases were identical and covered the following areas.

3.3.1. E-mail-specific time management behavior (TM)

Macan (1994) developed a time management behavior (TMB) scale to measure general time management behavior with three subscales: goal-setting tendencies, time management mechanics, and organizational preferences. To better capture time management behavior that is specific to e-mail use, the instrument developed by Macan was modified and adapted to fit in the context of this study. Participants rated each item on the 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). High scores indicated that the subject was applying time management principles more often.

Eleven items were pre-tested by 165 knowledge workers in a number of industries. Exploratory factor analysis (EFA) was then used to examine the factor structure of the construct. Two factors with eigenvalues greater than 1 emerged; together they explained 64.7% of the total variance. The first factor was labeled "habit factor (HF)"; it assessed how subjects establish goals and schedule their time regarding e-mail use. The second factor was labeled "judgment factor (JF)"; it assessed subjects' e-mail writing habit and media selection consideration. The Cronbach's alphas for these factors were 0.76 and 0.79, respectively, which exceeded Nunnally's criterion of .70 (Nunnally, 1978), indicating that the items reliably measure each factor dimension. These two factors are different from Macan's (1994) time management behavior scale. This difference is expected, because the items in this study are specific to e-mail use, while Macan concerned time management in a general sense.

3.3.2. E-mail self-efficacy (SE)

Bandura (1977) believed that self-efficacy measurement must be customized according to the domain of interest in order to maximize prediction, rather than with general measures. There are quite a few studies of computer or Internet self-efficacy (Barbeite & Weiss, 2004; Compeau & Higgins, 1995b; Torkzadeh & Van Dyke, 2002), but none addressed e-mail self-efficacy. To design the e-mail self-efficacy measurement items, we first conducted a focus

group to collect in-depth information about how knowledge workers process and file e-mails and other overall e-mail usage behavior. There are countless e-mail functions, but we believe only a few are crucial to knowledge workers' e-mail usage; for that the focus group study was necessary. The scale was then developed based on Compeau and Higgins's scale of self-efficacy (Compeau & Higgins, 1995b), with each major e-mail function identified by the focus group study serving as the target of self-efficacy assessment. Subjects rated each statement on a 5-point Likert scale.

Each item assessed the extent to which subjects believe they have the ability to use specific e-mail functions. An exploratory factor analysis (EFA) found support for two e-mail self-efficacy factors, explaining 63.9% of the total variance. The first factor was labeled "basic self-efficacy", and the second factor, "advanced self-efficacy". The Cronbach's alpha of 0.81 and 0.72 showed an overall acceptable reliability.

3.3.3. Perceived time control (TC)

In this study, we applied Macan's (1994) scale of perceived control of time to the context of e-mail use. It is a five-item 5-point scale. The Cronbach's alpha for the 5-item measure was 0.83.

3.3.4. Estimated time spent (TS)

TS was measured by an interval scale (for example, 15, 30 min, etc.) and converted to 5-point scale. It is a one-item measurement. Although simple and direct, it served as an important indicator of the potential cause of improved TC. If TS is not improved and only TC is, then the perception of better time control is merely a misperception. Simultaneous improvement of both reflects a great likelihood of actual time savings.

Since a meaningful experiment relies on a well-devised program, this study also measured subjects' satisfaction with the training, including course content, the instructor's teaching style and clarity, and the classroom setting and equipment.

There were two phases in the experiment: baseline and follow-up phases, and Fig. 2 shows the timeline. All subjects were sent baseline questionnaires. Follow-up questionnaires for the experimental group were sent after the training, but for the control group, the follow-up questionnaires were sent and collected before the training.

As for the optimal time interval between baseline and the follow-up phases, there was no agreement in the literature (Green & Skinner, 2005), but training effects, if they exist, generally decrease with time. Baldwin and Ford (1988) indicated that immediate training transfer effects average around 40%, but decrease quickly to 25% after 6 months. The follow-up questionnaires in this study were administered 1.5 months after the baseline phase, hoping to judge the effects of the training while they could still be clearly measured. Therefore, approximately 1.5 months after the completion of the training program, all of the subjects in the experimental group were sent follow-up questionnaires, which were identical to the baseline questionnaires, but with the items scrambled. For the control group, both baseline and follow-up questionnaires were administered before training, and the training result was not measured. The subjects in the control group received training after the follow-up questionnaire was collected. This arrangement allowed equal access to the training opportunity for all employees who registered for the training, whether they were assigned to the experimental or control group. The training for the control group had no significance as far as the study was concerned; therefore its training effect was not measured.

3.4. Threats to internal validity

This study adopted various procedures to counter the following threats to internal validity:

3.4.1. History effects and maturation effects

Specific occurrences of events between baseline and follow-up measurements, which can affect the follow-up measurement, are history effects, while the general aspects of change or growth of the subjects are maturation effects. In the questionnaire, subjects were asked about e-mail volume and workload. The statistics indicated that for 82% of the experimental group and 80% of the control group, e-mail volume and workload remained the same between baseline and follow-up, implying a low risk of history effects. In addition, this study adopted an experimental/control group baseline/follow-up design; hence, should history effects exist, they would interfere with both groups simultaneously and would be easily identified.

A short duration between two measurements is helpful in ruling out maturation effects (Sackett & Mullen, 1993). The 1.5-month period chosen in this study was reasonably short enough so that the chance for subjects to grow naturally in e-mail use was slim, yet long enough to observe training effects.

3.4.2. Instrumentation effects and testing effects

Instrumentation effects were the measurement errors caused by the difference between baseline and follow-up measurement instruments, while testing effects were the errors caused by subjects not answering questions. Although representing different threats, some procedures could effectively eliminate both types of threats. By using the same set of items in baseline and follow-up questionnaires, but with the items scrambled, instrumentation

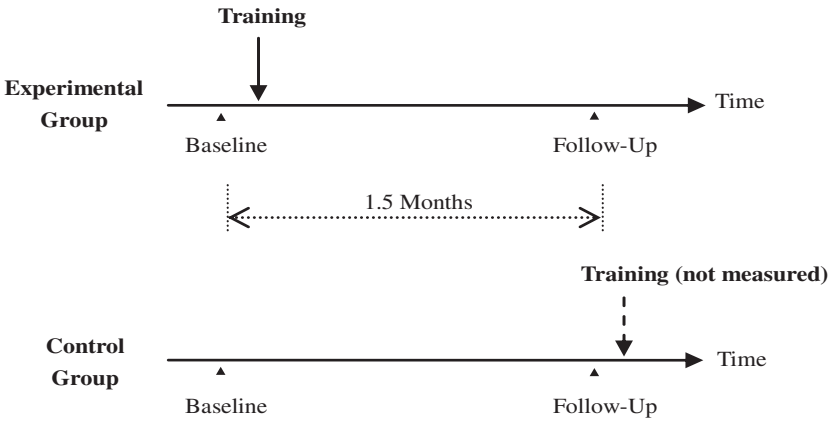

Fig. 2. Timeline for baseline and follow-up phases.

effects were reduced. Testing effects were also largely avoided by reducing the chance that the subjects could "remember" the baseline questionnaire by scrambling the items and leaving a time gap between the two measurements.

3.4.3. Hawthorne effects

It was clearly expressed that the collected questionnaire would not be delivered to the company, and would only be used as feedback to the instructor. In addition, the subjects could evaluate the instructor, but not vice versa. The context encouraged subjects to fill out questionnaires honestly. We believe that subjects did not alter their answers in response to a sense of being "observed," the cause of Hawthorne effects.

3.5. Psychometric properties of measures

The construct reliability of each construct was assessed by computing composite reliability (CR) and average variance extracted (AVE) (Fornell & Larcker, 1981), the convergent validity by testing whether factor loadings were significant; and discriminant validity by Chi-square difference test (Anderson & Gerbing, 1988). Bagozzi and Yi (1988) suggested that CR needs to be greater than 0.6 and AVE greater than 0.5. The CRs of our data ranged from .83 to .89 and the AVEs ranged from .51 to .56, which were all above the recommended cut-off levels of 0.6 and 0.5. The factor loadings of the factors extracted from TM and SE were all significant ($t > 2.35$, $p < .01$). The results of Chi-square difference tests ranged from 15.93 to 69.98 ($\Delta\chi^2 > 6.63$, $p < .01$), suggesting that the constructs under analysis were distinct and discriminately valid.

3.6. Threat of common method variance

The cross-sectional design gives rise to the potential for common method variance (CMV), a threat to the explanation of causality. However, this is of little or less concern in our study, because of the following reasons:

(1) The questionnaire measured the dependent variables. To avoid subjects' response to follow-up questionnaire being influenced by their memory of the baseline questionnaire, the sequence of question items was scrambled. In addition, the layout and the method of filling in responses were redesigned. These arrangements make the follow-up and baseline questionnaires visually distinct, thus effectively keeping subjects from mentally associating them and reducing the threat of CMV.
(2) For independent variables, the threat of CMV did not exist, because they were manipulated in the experiment instead of being measured by questionnaires.

4. Analysis and results

4.1. Differences between respondents and non-respondents

This study conducted *t*-tests on the questions, to see whether the reduced sample differed from the subjects who completed the questionnaire only in the baseline phase. For both experiment and control groups, the two-tailed *t*-tests ($t = .081$, $p > .05$; $t = -.604$, $p > .05$) indicated that those who responded in both stages did not differ from the one-time respondents. Thus sample attrition is not a treat, and the reduced sample could be considered a non-biased sample.

4.2. Descriptive statistics

Of the experimental group, 173 out of 175 (98%) subjects completed baseline questionnaires, and of the control group the figure was 98 out of 105 (93%). The statistical profile is as follows:

Experimental group: 32.4% were women, 67.6% were men, 65% were married, and 35% were single. The mean age was 35 years. 41% held managerial positions and 59% were staff. The average level of seniority was 11–15 years, and e-mail usage history was 6–10 years.

Control group: 36.3% were women, 63.7% were men, 61% were married, and 39% were single. The mean age was 33 years. 40% held managerial positions and 60% were staff. The average level of seniority was 11–15 years, and e-mail usage history was 6–10 years.

Statistical tests indicated that the difference between the profiles of these two groups was insignificant. The two groups were mutually exclusive, because each subject could enroll in only one training session. In the follow-up phase, 125 of the 175 subjects in the experimental group (71%) and 75 of the 105 subjects in the control group (71%) returned completed valid questionnaires.

4.3. Training effects

The percentage of subjects who were satisfied or very satisfied with the instructor, the course content, the equipment, and the environment were 91%, 90%, 92%, and 93%, respectively. In addition, 87% of them regarded the program to be personally helpful, and 90% of them considered it to be beneficial to their work. These data indicated that the training program was well-designed and executed. This was the basis for further analysis of the effects of the training.

To test the training effects, analysis of covariance (ANCOVA) was conducted. This analysis method is used routinely with quasi-experiments (usually experiments conducted in real situations as opposed to in simulated environments) data, because the difference between baseline measures for experimental and control groups, if any, is compensated for before the comparison of follow-up measures is determined. This method was preferred, because by avoiding repeated tests with *t*-test or analysis of variance, statistical power was preserved (Arvey & Cole, 1989). In addition, Hair, Anderson, Tatham, and Black (1998) indicated that ANCOVA achieves two purposes: (1) eliminating some factors outside the control of the researcher that can bias the results; and (2) accounting for the differences due to unique characteristics of the respondents.

In the following reported results, the baseline differences between the experimental and control groups were compensated for in the analysis method chosen. For example, in Table 2, the differences between 3.28 and 3.20, 3.13 and 3.08, 3.44 and 3.53, 2.75 and 2.71 were taken into consideration in the analysis process. In other words, with these initial conditions set to equal through mathematical calculations embedded in analysis of covariance, the follow-up performance of the experimental group and control group could be correctly compared. This was carried out without going through repeated comparisons. With the understanding that each repetition meant a loss of statistical power, the choice of analysis method was vital.

There are conditions and assumptions of ANCOVA that:

1. The groups are mutually exclusive;
2. The covariate is continuous and not affected by treatment;
3. There is linearity between the covariates and the dependent variable;
4. The regression slopes within group are equal;
5. There is homogeneity of variance.

Table 2
Group means for four variables.

Dependent variables	Experimental group		Control group	
	Baseline	Follow-up	Baseline	Follow-up
1. SE (e-mail self-efficacy)	3.28	3.85	3.20	3.25
2. TM (e-mail-specific time-management)	3.13	3.28	3.08	3.16
3. TC (time control over e-mail use)	3.44	3.94	3.53	3.48
4. TS (estimated time spent on e-mail)	2.75	2.40	2.71	2.68

Our research design provided the conditions 1 and 2, and the statistically insignificant results of the homogeneity test within group ($p > 0.1$) and Levene's test of equality of error variances ($p > 0.1$) qualified the assumptions 3–5.

We tested for the effects of the training by ANCOVA, with baseline score as the covariate. The results were statistically significant for SE ($F = 11.95$, $p < .01$), TC ($F = 11.73$, $p < .01$) and TS ($F = 10.96$, $p < .01$). It confirmed the training effects for these three variables, because the average follow-up scores of the experimental group were statistically higher than those of the control group, after the initial differences were taken into consideration and compensated for. The training effect for TM was not confirmed because the difference between the two groups was not statistically significant. In short, the training program improved SE, TC, and TS, but not TM. Therefore, Hypotheses 2–4 are all supported; however, Hypothesis 1 is not supported. Table 2 lists the means for these four variables.

Fig. 3 depicts the group means of all four variables for baseline and follow-up phases. As in Fig. 3, in the case of SE and TC, the lines for the experimental group showed an increase from baseline to follow-up phase, while the lines for the control group are more level, suggesting no significant changes. Although for TM, the line for the experimental group slopes more upwards, statistical tests did not confirm a difference from that of the control group. The improvement for TC is the most noteworthy because the two lines cross over, which strongly implies that there was a causal linkage between the independent variable (the treatment, i.e., the training) and the dependent variable, TC (Shadish, Cook, & Campbell, 2002). Fig. 3 also shows the measures for TS. As with the trend for TC, the lines cross over.

4.4. Time saving in e-mail use

The percentage of possible time saving in e-mail use due to the training was calculated based on the changes of TS scores. The possible time saving was 12.72% (experiment group), while there was little time saving (1%) for the control group. In addition, the 1% increase was tested statistically insignificant. The improvement of TC was 14.53% and 1% for the experimental and control groups, respectively. Again, the 1% was tested insignificant. The small difference between the improvement of TS and TC, which were 12.72% and 14.53%, respectively, further assured the validity of our measurements.

5. Conclusions and implications

Literature review showed that the results of training effects on general time management behavior were mixed. In other words, training was not always effectual in improving general time management behavior. The result of our study joined the non-effectual pool because the average score for TM, which measured e-mail-specific time management behavior, did not improve after

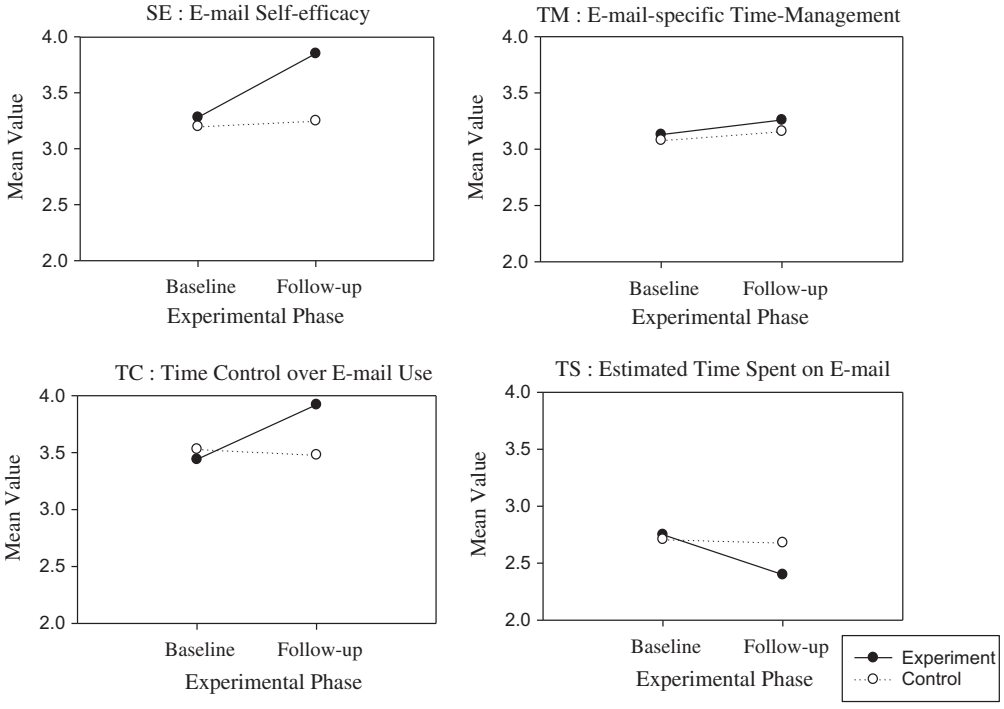

Fig. 3. Mean scores across the two experimental phases.

training. If one takes the stance that behavior change just takes time and constant intervention, thus we should not expect immediate improvement from training at one shot, then it conflicts with the positive effects reported in the extant literature. Therefore there were two major possibilities to the result. First, perhaps there was an improvement, but the change in behavior was not substantial enough to be statistically measurable. Second, unidentified moderators may be responsible for the non-effectual result. Future studies can confirm this speculation.

As SE and TC did improve, this implies that better TC was mainly due to the improvement of SE. Whether improved TM can also result in better TC is not known, because TM was not improved and could not provide any clue. Frese and Fay (2001) and Pervin, Cervone, and John (2005) offered an explanation to this causal relationship: if one believes that he/she possesses the ability to cope with a certain situation, it is more likely that he/she will succeed in controlling the outcome (Frese & Fay, 2001), because it is much easier to deal with anticipated changes, errors, or pressures with higher self-efficacy (Pervin et al., 2005). Self-efficacy is a measure of the perception of one's ability. We reason that this perception can be due to actual improvement in knowledge and skills or merely a result of feeling capable without actual knowledge and skill improvement. In our study, the latter case could not be the norm, because e-mail use is a daily hands-on activity and, without actual improvement, the perception of being more capable was most unlikely. Therefore, we posit that the improved SE was triggered by actual improvement in skills and knowledge, which led to the perception. However, individual differences in skill-perception ratio should be acknowledged.

Further, a training program provides a good opportunity for subjects to evaluate their own situations and benchmark against their peers (Macan, 1996). There was a slight chance that for some subjects the benchmarking itself instead of the improved SE led to better TC. Still, such speculation could only be convincing if there had not been improvement in SE.

The inefficient use of time has been widely recognized as a significant and costly problem for organizations. Our study examined the influence of e-mail management training on SE, TM, TC and TS. The results showed that the e-mail management training programs increased users' SE and TC greatly. A substantial savings in the amount of TS was also demonstrated. It followed that an e-mail management training program could be indispensable for organizations. Sensible organizations should consider holding e-mail management training courses regularly to ease knowledge workers' perception of time pressure due to ineffective e-mail use. The purpose of our study is not to prescribe the training material to organization, but rather, to emphasize the importance of e-mail training. Indeed, it is very encouraging that a mere three-hour training can produce such effect.

The major contribution of this study is to demonstrate the effectiveness of e-mail training, and determine which aspect of e-mail training is more effective. The effectiveness is confirmed by the improvements of TC and TS. In addition, the fact that SE is substantially improved, but TM is not, implies that the more effective e-mail training is to focus on improving e-mail self-efficacy instead of e-mail management behavior. This should alert organizations to reexamine their employee training offerings. First of all, the use of e-mail needs to be taught; secondly, the training needs to focus on improving e-mail self-efficacy rather than time management behavior. The need of e-mail training was also reflected by the overwhelming registrations of the training course and high degree of classroom/lab participation.

The above two points are not likely to be well received without the findings of this study, for the following reason: E-mail is

Table A1
Definition and items of each construct.

Construct definition	Construct items
TM: The degree to which subjects exercise various forms of time assessment, planning, and monitoring concerning e-mail use.	1. I try my best to handle e-mail tasks in more efficient manners. 2. I prioritize my incoming and outgoing e-mails as a habit. 3. I pay attention to the pros and cons of e-mail. 4. I always finish my e-mail tasks in a reasonable time period. 5. I maintain a to-do list on my calendar, including the unfinished e-mail tasks. 6. E-mail is only good for transferring structured information or brief messages, or communicating routine tasks. 7. It is more time-efficient to make an announcement in meetings than in e-mail. 8. The e-mail I send usually only takes care of one thing at a time. 9. In many circumstances, face-to-face or telephone communication is more efficient and reliable than e-mail. 10. The e-mail messages I write are usually brief. 11. I use various ways to reply incoming e-mail; sometimes face-to-face or telephone is more suitable.
SE: How comfortable and confident one is in using e-mail functions.	I know the following functions and use them proficiently: 1. Address book setting, e.g., setting up a contact group 2. Automatic e-mail message classification to folders 3. Archiving functions, e.g., compressing e-mail messages 4. Marking the important messages 5. Setting up a signature file 6. E-mail search functions 7. Settings and assistances for replying/sending e-mail, e.g., blind carbon copy, preview window, read receipt, new-mail check interval 8. Assistances for composing e-mail messages, e.g., e-mail stationery backgrounds, spelling check, file attachment, line spacing adjustment 9. Spam prevention, e.g., setting up a blocking list and updating blocking rule based on the subject or sender's address, or using a spam interception software
TC: The degree to which one believes he can directly affect how his time is spent.	1. I feel in control of my time spent on e-mail use. 2. I find it difficult to keep up with e-mail tasks. 3. I underestimate the time that it takes to handle e-mail. 4. I often spend too much time unconsciously in non-work-related e-mail messages. 5. Time easily slips whenever I am taking care of e-mail messages.
TS: The estimated time spent on e-mail.	1. In the past 24 h, how much time have you spent in handling e-mail?

commonly taken as a tool that requires few skills, and organizations tend to believe that their employees can acquire necessary knowledge on their own. Even if e-mail training is deemed necessary, an incorrect focus of time management may be emphasized. After all, there is a long history of organizations offering time management training in an attempt to increase productivity. We showed that to alleviated perceived time pressure caused by e-mail use, time management training is not as important as e-mail self-efficacy training. The research results of this study urge organizations to view e-mail training from a new angle.

Some limitations should be noted. First, this study took Microsoft Outlook as its e-mail training platform. It was the e-mail system used in the organization being studied. Currently, Microsoft Outlook represents 60% of corporate e-mail client market (ZDNet Research, 2005), and therefore it is representative of e-mail systems. As time evolves and the market share shifts, the study can be repeated for other more popular e-mail system at the time. Second, the subjects of this study were knowledge workers in high-tech industry. Although there is not much doubt that studies of knowledge workers in other industries may lead to similar conclusions, when unique context is in question, the study should be repeated.

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Appendix A

See Table A1.

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