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"DO I REALLY HAVE TO USE IT?" A MOTIVATIONAL MODEL OF OFFICE AUTOMATION USE

Working Paper

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INTRODUCTION

Microcomputers occupy an increasingly large place in many sectors of North American society (Moreau and Rousseau, 1986), and this trend will continue, under pressure from the development of new technologies and social and organizational demands for increased productivity (Gutek, Bikson and Mankin, 1984). The technological revolution may bring many advantages, provided we can reduce the organizational risks inherent in implementing office automation (Gibson, Singer, Schnidman and Davenport, 1984). Among these risks are the under-utilization of automated office tools by employees, which may prove to be an obstacle to the anticipated productivity gains. Success or failure in introducing office automation in an organization is highly dependent on the response of potential users, and it is thus important for organizations to attempt to solve this problem, or, in a better scenario, prevent it from arising.

To date, the literature on this subject has mainly been studies to determine the relations between the degree of use of automated systems and various organizational and/or individual variables. At this stage in the research, it seems desirable to make a rigorous analysis of the results obtained in this area, so as to link them into a coherent, significant whole, thus enabling us to open new research avenues and develop intervention strategies. To do this, we must be able to refer to a theoretical framework that enables us to integrate all the results obtained so far and bring to light the processes governing the phenomenon of non-use of new technologies. It will then be possible to identify in advance which situations would be most likely to generate employee resistance to computerization and those individuals who are most prone to develop this resistance.

Although this relation has not yet been studied empirically, user motivation to learn to operate a computer is often mentioned intuitively as a key factor in the learning and use of computerized work instruments. The motivational approach seems likely to provide us with a theoretical framework that will enable us to integrate current knowledge on the phenomenon of under-use of computerized systems in the workplace. More specifically, the cognitive evaluation theory (Deci and Ryan, 1985) has proved to be

significant, since it enables us to analyze this phenomenon in terms of a lack of intrinsic motivation resulting from feelings of incompetence and a loss of self-determination. This recent motivational theory is currently considered the most complete and appears well suited to integrate all the results obtained thus far in studying the phenomenon of resistance to the use of new technologies.

In reviewing the literature on this theme, it is often possible to establish links between the reasons advanced and variations in the level of perceived control and competence. The purpose of this study is to inventory what has been written on the reasons for non-use of computerized tools in the workplace and to outline a theoretical model that could integrate this knowledge and provide access to new avenues of research. The first part of this document presents the cognitive evaluation theory (Deci and Ryan, 1985), along with variables that may influence intrinsic motivation. It ends with a proposed model in which motivation mediatizes the impact of situational and individual variables on the use of computer tools. The second part is a review of the literature on the reasons for non-use of microcomputers in the workplace; the first section deals with variables linked to the situation, and the second with variables linked to the individual. The last part deals with possible new avenues of research.

1. COGNITIVE EVALUATION THEORY

When an office automation system is introduced into an organization, three types of reactions may appear among employees. Some employees display tremendous enthusiasm and are prepared to invest time and money in learning to master automated office tools. Others show rather lukewarm interest and wait to see what the system can do. Other employees prefer to avoid any contact with the new machines (Kerr and Hiltz, 1982; Leclerc and Francescut, 1986). Why is a given system rejected by some and welcomed enthusiastically by others? It is possible to analyze these different reactions in terms of the intrinsic motivation of individuals with respect to use of micro-computers.

1.1 Intrinsic motivation and extrinsic motivation

Intrinsic motivation is normally defined as the practice of an activity for itself, with no external constraints (Deci, 1971). This notion is opposed to that of extrinsic motivation, which leads an individual to participate in an activity for a reason external to the activity. In experiments, intrinsic motivation is measured by the time spent on a target activity during free-choice periods (Vallerand, Ryan and Deci, 1987). For example, an intrinsically motivated person will use an automated office tool because the activity in itself procures pleasure and satisfaction. An extrinsically motivated person will use a computer for a reason external to the activity (e.g., to avoid losing a job). Deci (1975) suggested that intrinsic motivation results from an innate need to feel competent and self-determined and that any event that affects perceived competence and self-determination has an effect on intrinsic motivation.

1.1.1 Intrinsic motivation factors

The most recent formulation of the cognitive evaluation theory (Deci and Ryan, 1985) suggests that every event has both a controlling aspect and an informational aspect, and that intrinsic motivation varies depending on which aspect is perceived as predominating. When the controlling aspect predominates, intrinsic motivation varies with the feeling of self-determination. A highly controlling event causes an individual to act or think in a certain way.

In this situation, the individual may feel a loss of self-determination and perceive his behavior as being influenced by the event (external locus of causality), and this may have a negative impact on his intrinsic motivation. Conversely, an event where there is little control promotes a feeling of self-determination: the individual perceives his behavior as freely chosen and determined by his own goals and interests (internal locus of causality), which has the effect of improving his intrinsic motivation regarding the target activity.

When a person feels obliged to participate in an activity, his or her intrinsic motivation towards this activity diminishes due to the loss of self- determination. The person sees his behavior as being governed or caused by external constraints such as material or symbolic rewards, which has a negative effect on his intrinsic motivation (Deci, 1971, 1972; Lepper, Greene and Nisbett, 1973). Similarly, imposing a time limit on completion of a task (Amabile, DeJong and Lepper, 1979; Dollinger and Reader, 1983; Reader and Dollinger, 1982) or the fact of being subject to surveillance (Lepper and Greene, 1975) lowers the subsequent intrinsic motivation towards this activity. As well, when a goal is imposed, it may well be perceived as controlling and thus cause a loss of self-determination and intrinsic motivation (Vallerand et al., 1987). Individuals who cannot choose the activity in which they wish to participate display lower intrinsic motivation toward this activity than those who can choose (Zuckerman, Lathin, Smith and Deci, 1978).

When the informational aspect of an event dominates, intrinsic motivation varies with perceived competence: positive information about competence, given in a low-control context, tends to maintain or increase intrinsic motivation. Recourse to verbal feedback constitutes an excellent means of giving information about competence. The valence of feedback has a modulating effect on intrinsic motivation. An increase in intrinsic motivation is observed when verbal feedback is positive, and a decline in intrinsic motivation when it is negative (Vallerand and Reid, 1984; 1988).

Research on intrinsic motivation has also shown that certain individual characteristics may influence the impact of external constraints on intrinsic motivation. Characteristics identified to date are sex (Deci and Ryan, 1985), initial level of interest for the target activity (Loveland and Olley, 1979; McLoyd, 1979) and certain aspects of the personality such as locus of control (Earn, 1982) and motivational orientation (Boggiano and Barrett, 1985).

The interpersonal situation also plays a role in determining intrinsic motivation. Recent studies suggest that a controlling interpersonal situation has a negative effect on intrinsic motivation, while an informational situation favoring autonomy has a positive effect (Deci, Nezlek and Sheinman, 1981; Ryan and Grolnick, 1986). The interpersonal context seems to depend to a great extent on how the person in a position of authority (teacher, supervisor, etc.) uses rewards and external constraints in relations with his subordinates. A person with a tendency to control will emphasize the controlling aspect of rewards and communications, while a person who encourages autonomy will use rewards and communications in a more informational manner. This orientation may depend on personal disposition or be generated by the situation (Deci and Ryan, 1985). In the latter case, it may be induced by pressure (control, evaluations, etc.) from higher levels (Deci, Spiegel, Ryan, Koestner and Kauffman, 1981; Garbarino, 1975), by subordinate behavior (Jelsma, 1981, in Deci and Ryan, 1985) or by supervisors' perceptions of their subordinates' motivation (Pelletier, Vallerand and Blais, 1985).

Several factors may cause intrinsic motivation to vary. As well, a person's type of motivation may have various consequences for his work. A number of studies show that high intrinsic motivation improves performance (Vallerand et al., 1987), while a lowering of intrinsic motivation is often accompanied by a decline in performance (McGraw, 1978). Moreover, intrinsic motivation

promotes creativity (Amabile, 1983) and allows for more flexible cognitive activity (Benware and Deci, 1984) and more conceptual learning (Grolnick and Ryan, 1986). It appears likely that intrinsic motivation increases perseverance in the pursuit of an activity or training program (Vallerand and Bissonnette, 1988).

1.1.2 Extrinsic motivation

Intrinsic motivation and extrinsic motivation are often seen as the two poles of a continuum. The majority of spot measurements carried out in studies on intrinsic motivations would appear to corroborate this perception. In practice, it is not quite that simple. Often, one person will display both types of motivation for a given activity. For this reason, research on motivation is paying increased attention to extrinsic motivation.

For Deci and Ryan (1985), extrinsic motivation varies along a continuum according to four levels of behavioral regulation: external, introjected, identified and integrated, depending on the degree of self-determination exercised by the person. At the first level, external regulation, the source of control is entirely external to the individual. This is the case, for example, of people who would use an automated office tool mainly because their superior obliges them to do so. At the second level of behavioral regulation, introjection, the source of control is internal to the person, and approval or disapproval comes from the person rather than some outside individual. For example, employees would use a computer because they would be annoyed with themselves for not doing so. At the third level, identified regulation, the source of extrinsically motivated behavior is more related to self. The behavior thus takes on value and is judged important, while the individual feels less pressure and is more autonomous than at the levels described above. For example, people would use an automated office machine because this would enable them to acquire skills they feel are important. At the last level, integrated regulation, the source of control is well synchronized with self-image. For example, employees might see themselves

as efficient workers, and the behavior "using an automated office tool" is in harmony with their self-image. Recent studies in the field of education (Vallerand, Blais, Brière and Pelletier, 1987) suggest that the last two levels, which subjects have difficulty distinguishing, in fact form one level the authors call "self-determined extrinsic motivation." In this case, the extrinsic motivation continuum would have three levels.

1.2 Amotivation

Opposed to this continuum is amotivation, characterized by the absence of self-determination (Deci and Ryan, 1985). The person feels there is a lack of correspondence between his or her actions and the results obtained. Amotivation may occur after a number of failures, when all attempts to succeed at something have proved futile. The person then sees himself as incompetent to perform this activity and eventually fails to understand the sense of so much useless effort. This notion may prove particularly interesting in the case of individuals who refuse to use an automated office tool or who stop using it after several unsuccessful attempts. Another manifestation of amotivation is indifference with respect to some behavior or activity, leading the person to avoid it. This aspect may be pertinent in the case of persons who refuse to even go near a new automated office tool.

1.3 Summary

A number of variables, both situational and individual, may influence intrinsic motivation, through variations in the level of feelings of self-determination and perceived competence. Certain individual characteristics, along with the interpersonal context, may also mediatize the effect of material or verbal rewards on intrinsic motivation. The different variables may prove useful in studying employee reaction to the use of computerized instruments in an organizational context. For example, the functioning of an organizational system of rewards and constraints may be of assistance in understanding employee reaction to change. A restrictive context that leaves little room for self-determination may render initial employee contacts with computers less pleasant and have a diminishing effect on

their intrinsic and/or self-determined extrinsic motivation. In reviewing the literature on employee resistance to work automation, it is often possible to link the reasons given to processes that influence perceived competence (e.g., frequent failures) and feelings of self-determination (e.g., the obligation to use the system). Based on the cognitive evaluation theory (Deci and Ryan, 1985), we may also expect an impact on the intrinsic motivation of employees to use the new equipment. This has led us to propose a model according to which certain variables, related either to the use situation or to the user, influence the level of use of computerized equipment through variations in the level of intrinsic motivation (see Figure 1). The model also postulates that the use of computers may depend on extrinsic employee motivation as well. The two processes are presented as independent phenomena, although deriving from the same sources. In the case of extrinsic motivation, however, the process would be more closely related to the self-determination exercised by the person in a use situation.

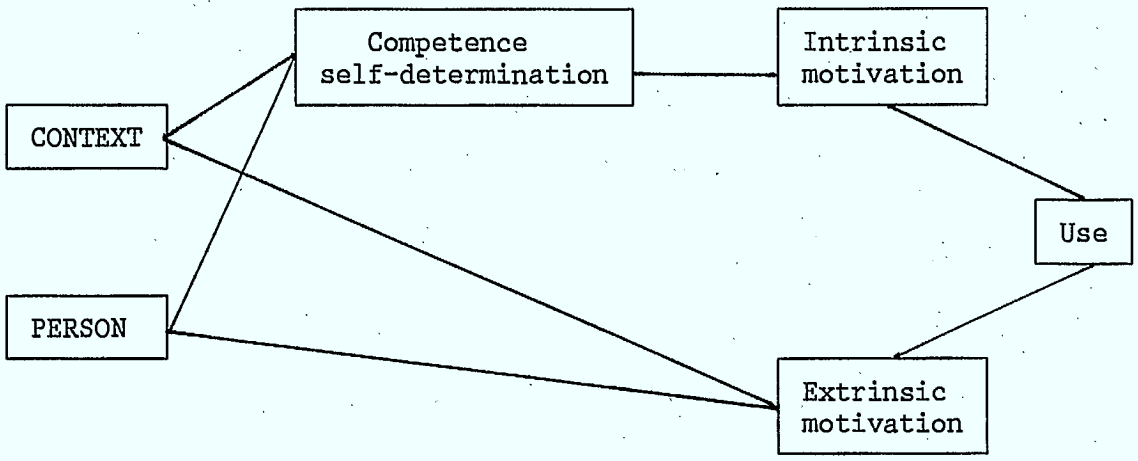

Figure 1

Proposed model in which the impact of variables linked to the situation and the individual is mediatized by intrinsic motivation and/or extrinsic motivation

2. REVIEW OF THE LITERATURE

This chapter contains a review of the literature on the reasons for non-use of computers in the workplace. It is intended to bring out the action of various factors on perceived competence and feelings of self-determination. We shall look first at the literature dealing with variables related to situations and then at those related to individuals.

2.1 Variables related to situations

There are a number of studies dealing with situations of office automation implementation. These are mainly case studies of successful or unsuccessful implementations, produced by surveying employees and managers involved in the process. Conclusions are drawn on the basis of the strongest correlations between degree of use and the variables studied.

2.1.1 Implementation process

For Clark, Dechman, Drake and Snider (1986), much of the literature on employee reactions to office automation deals with an investigation of the implementation process. The training methods used and the degree of information dissemination are seen as the principal factors determining whether this equipment is accepted or rejected. The authors stress the fact that working conditions prior to implementation may influence reactions: the most favorable responses seem to occur when the working environment is already satisfactory and conducive to employee autonomy. Conversely, when the system is introduced in a context where employees can exercise little control over their activities, the risk of unfavorable reactions appears to be higher.

Ranney (1982, quoted in Clark et al. 1986) is of the opinion that the end result of implementation is influenced to a great extent by the rate at which introduction takes place and by the way the system is introduced. In an article suggesting some strategies for minimizing the risk of employee

resistance to the introduction of robots, Foulkes and Hirsh (1984) mention the importance of gradual implementation in order to reduce employee apprehensions and allow them to discover the strengths and weaknesses of the new system. Several authors, basing their remarks on comments by managers who have supervised the implementation of computers or robots, emphasize the need to have employees participate at all levels of the process and ensure that they receive adequate information on the system and its potential impact (Clark et al. 1986; Foulkes and Hirsh, 1984; Gibson, Singer, Schnidman and Davenport, 1984). When implementation is carried out in an authoritarian manner, that is, when the manager in charge controls the whole process without consulting employees, the risks of resistance are very high (Gibson et al., 1984).

In summary, the organizational context and the manner of carrying out implementation may, to a certain extent, determine employee response to the introduction of a new computerized system. Implementation of office automation is most likely to succeed in a situation where all conditions are in favor of intrinsic motivation. A controlling situation decreases employee self-determination and may generate more resistance and lead to a low use rate for the new equipment. In comparison, a situation where employees are informed and play an active role in the implementation process increases the feeling of self-determination and promotes the use of these new tools.

2.1.2 Training program

The training given to new users is often considered in the literature as a factor that may influence the degree of use of computerized tools. In a study of the various types of organizational and individual variables and the corresponding degree of use of automated office equipment and attitudes of users towards automated office systems, Clark et al., (1986) determined that there was a positive correlation between the length of the training period and the degree of use of equipment. Moreover, the perception of the ease of applying the concepts learned was not only positively correlated to the degree of use, but also favored the development of positive attitudes towards computerization.

David-McNeil (1986) found that secretaries who had received longer training courses were less inclined to perceive word-processing equipment as being complicated than secretaries with less training. For this author, the perception of the complexity of the machine has a significant effect on perceptions of the impact of word processing on office work. Secretaries who saw word-processing equipment as complex were more likely to believe that their workload increased and that it was necessary to modify the organization of their work. They were thus more inclined to be reluctant to use word-processing equipment. The author does not, however, mention any link with degree of use of the equipment, probably because the secretaries were obliged to use it notwithstanding any reluctance.

In interviews with new users of computerized tools, many employees expressed dissatisfaction with the training they received. On the whole, complaints had to do with the highly compressed course content, with a great deal of information being given in a very short space of time. This left trainees little time to digest the course material or master the use of the machine. Those interviewed would have preferred the courses to extend over a longer period, with time between each class to put into practice the knowledge acquired and develop more skill with the machine. Some of them would have liked to have access to a microcomputer before taking the course, so as to become familiar with the machine and thus overcome their apprehensions.

These results draw attention to the importance of training programs in determining employee behavior and attitudes regarding work automation. A training program that is too short or inadequate does not promote the development of perceived competence and may limit the use of computerized equipment.

2.1.3 Work environment and computer hardware

The degree of acceptance of an automated office system is generally measured in terms of the time employees spend using the equipment. To achieve the proper correspondence between use time and acceptance, we must also take

into account the physical environment and the accessibility of equipment. For example, if only one machine is available for several users, or if they must always go to another location to use the equipment, it may be predicted that use time will be affected (Engel and Townsend, 1985; Steinfield, 1986). In such cases, however, it is impossible to draw any clear conclusions about the degree of acceptance of the new system, as it may only be necessary to make more machines available to employees in order to increase the frequency of use. If, on the other hand, access is limited, users cannot develop the skills necessary to use the equipment properly, and this may have negative repercussions on their perceived competence.

Installing new equipment may also aggravate working conditions that are already unsatisfactory. Employees who are dissatisfied with their work environment tend to develop negative attitudes towards new automated office systems, and this may have negative consequences for the use of this equipment (Engel and Townsend, 1985). It appears, however, that environmental factors are most important during the initial phase of implementation, and that the impact diminishes over time (Engel and Townsend, 1985). In a study on satisfaction in the workplace, Engel and Townsend (1985) found many expressions of general dissatisfaction with the work environment, but failed to discover any relation with the degree of use of equipment.

The computer hardware itself is an important factor in the acceptance of office automation. The degree of use will be lower if the equipment is not well suited to the needs of users, if the various machines are not compatible, or if they are too difficult to master. Frequent technical problems may also reduce the degree of use (Steinfield, 1986). From the user's point of view, and particularly for the novice, these situations may be interpreted as experiences of personal failure or indications of the user's inability to master the system. Such interpretations are likely to have a negative effect on intrinsic motivation and on the degree of use of the equipment.

The studies cited in this part are mainly exploratory, given the fact that this is a fairly new field of research, as well as the methodological problems inherent in organizational research (Goodman and Argote, 1984). The situation in which computerized systems are introduced and used nevertheless appears to determine, at least to a certain extent, employee reactions and the degree of use of the equipment. One type of action that might promote the use of computerized tools would be to work on the situation and pay particular attention to the problem variables mentioned above.

2.2 Variables related to individuals

Another source of influence may derive from characteristics of the users themselves. These are almost impossible to change, which considerably limits the potential for action. One solution to this situation would be to identify the psychological processes through which individual characteristics lead a person to refuse to use computerized tools placed at his or her disposal. We should not forget, however, that individuals act in a specific context, which exerts an influence on their behavior. Based on this notion, we may observe that certain situations are more or less appropriate to certain individuals. If we act on the situational level, it may become possible to deflect the influence of individual characteristics, or even to make use of them.

The section that follows deals with more stable variables linked to the individual. The main individual differences discussed in the literature have to do with demographic characteristics, cognitive styles and certain personality factors. The studies are presented according to these categories, and relations are suggested between variables that may lead to non-use of automated tools in the workplace and variations in intrinsic motivation.

2.2.1 Demographic characteristics

Demographic variables seem to play a secondary role in predicting the degree of use of automated office tools (Steinfield, 1986). Age correlations are almost never found except for users 50 and over, who would be less inclined to use microcomputers and would express less satisfaction when they did use them (Kerr and Hiltz, 1982). Certain authors, however (Gibson et al., 1984), point out that the hypothesis that older employees are less receptive is generally unsubstantiated. Engel & Townsend (1985) found no relation between the degree of use of automated office tools and age, education, sex or seniority. Others (Clark et al., 1986) discovered no correlation between age or level of education and acceptance of new technologies. They do stress the fact that linguistic considerations should be investigated. Using software designed in another language than one's own might have an effect on rate of use; however, this hypothesis remains to be verified. Steinfield (1986) found a moderately positive relation between level of education and use of new communication technologies, along with a moderately negative relation with age. These relations can probably be explained by differences in attitudes towards new technologies. More educated subjects feel less threatened than those with less schooling (Steinfield, 1986), and younger employees are more likely to be already familiar with these technologies (Kerr and Hiltz, 1982), which seems to have a positive impact on use (Clark et al., 1986).

It appears likely that there are other, relatively stable, personal characteristics that influence the acceptance and use of new technologies. One avenue of research, which emphasizes adapting computerized systems to user characteristics, is aimed at identifying these characteristics (Van Muylwijk, Van de Veer and Waern, 1983). This idea is based on the fact that it is easier to change the characteristics of the equipment than personality variables, and that it is also easier and less costly to train users once the system has been adapted to suit them. The results of this research

might help us understand how certain personal characteristics might influence the rate of use of computerized tools in the workplace and obtain indices that would allow us to establish relations between perceived competence and feelings of self-determination. The characteristics studied from this standpoint are the various cognitive styles and some aspects of personality.

2.2.2 Cognitive style

The concept of cognitive style refers to individual differences with respect to information-processing strategies adopted when solving problems (Robertson, 1985). These differences in cognitive function are believed to be the product of relatively stable personal characteristics (e.g., intelligence, personality traits) and cultural and educational influences (Van der Veer, Tauber, Waern and Van Muylwijk, 1985). It appears that cognitive style influences the learning process and it is thus possible to postulate the existence of relations between cognitive style and the way people learn to use computerized tools (Robertson, 1985). These relations have yet to be verified empirically.

a) Field - dependence/independence

One of the cognitive styles studied in relation to the use of computers is "field-dependence" as opposed to "field-independence" (Witkins, Moore, Goodenough and Cox, 1977). This style involves the ability to transfer learned material from one situation to another. Field-dependent individuals are more influenced by the situation, while those termed field-independent are little affected by this influence (Van Muylwijk et al., 1983). Transfer of learned material is thus more difficult for the former group: they adopt a solution and attempt to apply it, as is, to various situations which, though similar, do not necessarily lend themselves to that type of solution (Robertson, 1985; Van der Veer et al., 1985). This can obviously complicate the learning of an automated office tool and lead to increased risk of errors and unsuccessful attempts.

b) Reflective/impulsive

Another cognitive style refers to the number of alternate solutions considered when a problem arises. A person with a "reflective" cognitive style will tend to examine more alternate solutions than a person with an "impulsive" style (Kagan, Rosman, Day, Albert and Phillips, 1964). In a learning situation where the people are left to themselves, as is often the case when a new user is learning to use a computerized tool, the "reflective" type will be slower but his or her learning is generally more efficient than the "impulsive" type who tends to proceed more by trial and error and to draw rapid conclusions and who is more often in a failure situation.

It may be seen that two of the cognitive styles identified may lead to more frequent errors in learning and/or performing a task. If learners interpret these errors as just one failure after another, they may come to see themselves as incompetent, resulting, according to the cognitive evaluation theory (Deci and Ryan, 1985), in a decline in intrinsic motivation. The activity then becomes less interesting and less satisfying in itself, and we may expect the person to spend less time using the equipment.

Other cognitive styles were also identified, although these were not studied in direct relation to learning to use microcomputers. Moreover, it would appear that greater cognitive complexity is generally linked to greater curiosity and a more pronounced tendency to use computerized tools. Research on adapting systems to users has also examined other types of individual differences that might have an impact on the use of new technologies, the effects of which might be explained through variations in the degree of perceived competence and feelings of self-determination.

2.2.3 Personality

Personality factors are more stable individual characteristics than cognitive styles. The system, or rather the interface, must be adaptable; otherwise the user will simply stop using it and will never acquire enough

experience to feel competent (Van der Veer et al., 1985). As with cognitive styles, these relations are only postulated, and empirical research is needed to verify them.

a) Introversion/extroversion

One personality variable that might be influential has to do with introversion and extroversion (Van Muylwijk et al., 1983). For these authors, it would appear that introverts prefer situations with a fairly low level of stress, and tend to lose interest if stress becomes too great, particularly when there is strong pressure on them to learn to use new equipment. Extroverts, on the other hand, prefer variety and tend to abandon a task if it becomes too monotonous. This taste for variety often causes them to explore more alternative solutions, leading them to make more errors and possible to feel incompetent and less motivated intrinsically.

At the outset, this dimension does not appear useful in identifying users who might fail to use the system. Considering the context, however, we might predict that introverts are more comfortable if they can learn at their own speed, without pressure, so as to keep the stress level down. Stress is of little importance for extroverts, but because of their preference for variety, it might be necessary to allow them to explore different strategies.

b) Fear of failure

Another personal characteristic that might affect degree of use through perceived incompetence is the fear of failure, which leads the individual to under-perform in evaluation situations (Van Muylwijk et al., 1983). The anxiety arising from this fear of evaluation makes the person more prone to errors which, in turn, may induce feelings of incompetence and low intrinsic motivation. Some studies have also shown that there is a negative relation between anxiety and intrinsic motivation (Csikzentmihalyi and Graef, 1980).

c) Heuristic/epistemic competence

Two types of perceived competence have been identified, heuristic competence, which is apparently a more stable personal characteristic, and perceived epistemic competence, which is situational (Van Muylwijk et al., 1983). Perceived heuristic competence refers to a general perception of competence that consists of the feeling of generally being competent enough to take on most situations and solve problems. Perceived epistemic competence has to do with specific competence, or knowledge regarding the performance of a particular task, and is related to the notion of expertise in a specific field of knowledge. New users of computerized equipment with a high level of heuristic competence tend to explore the system more systematically, while users with lower perceived heuristic competence tend more to proceed by trial and error (Van der Veer et al., 1985). The latter groups would thus be more likely to experience failure and thus to maintain their perceived competence at a low level. Perceived epistemic competence is more situational, and it is thus possible to encourage its development during the learning of a computer application, which should be easier for individuals with a already high degree of perceived heuristic competence.

d) Locus of control

Another personality variable discussed in relation to learning to use automated office equipment is locus of control (Rotter, 1966). This notion refers to the general beliefs of individuals concerning the correspondence between their behavior and the results obtained. Individuals with an internal locus of control believe that results are within their own control, while those with an external locus see results as being controlled by chance or some outside force.

Pertinent studies on this theme deal mainly with the relation between locus of control and attitudes to computers (Arndt, Feltes and Hanak, 1983; Coovert and Goldstein 1980; Kerber, 1983). Coovert and Goldstein (1980)

found that individuals with an internal locus of control have more favorable attitudes towards microcomputers than those who have an external locus which, for Arndt et al. (1983), would make them more reluctant than the former group to use word-processing equipment. Conversely, Kerber (1983) was unable to establish a relation between locus of control and degree of use. Since it appears quite probable that locus of control is an important variable in explaining human behavior in organizations (Spector, 1982), it might be interesting in future research to clarify what effect locus of control has on learning and using computerized office equipment.

We have seen that demographic characteristics such as age or level of education were rarely related to the degree of use of this equipment and, where a relation does exist, it can only reflect differences in attitudes. Relations may, however, exist between the use of computers and certain individual differences in cognitive style and personality, but such individual characteristics are hard to form and change. If intervention appeared necessary, for example where individual characteristics were an obstacle to use of computerized equipment, one possible solution might be to adapt the system to different individuals in order to make it easier to learn and use (Van Muylwijk et al., 1983). Another solution would be to explore the psychological processes at work in human/machine interactions which might lead to under-use. In reviewing the literature, it appears that problem characteristics may lead a person into frequent experiences of failure, which tends to induce perceived incompetence, and this, according to the cognitive evaluation theory (Deci and Ryan, 1985), tends to lower intrinsic motivation.

These relations between individual characteristics, variations in intrinsic motivation and use of computers have yet to be verified empirically. If the postulated relations do exist and it is proven that non-use of computerized tools corresponds to low intrinsic motivation, it might be possible to set up a program of intervention, or prevention, aimed at promoting perceived

competence and feelings of self-determination among users of computers. Training given to users might be an ideal occasion to intervene, if courses were designed so as to encourage the development of perceived competence and feelings of self-determination. However, empirical verification of the possible relations should be made first in order to effectively direct efforts aimed at solving problems of non-use of computerized equipment.

Among the variables related to individuals, a substantial segment of the literature on use of computers deals with the attitudes of people towards office automation and the relations which may exist between these attitudes and use of the equipment. This category of variables differs from those mentioned previously in that they are not as stable. The next section will deal with a review of relevant studies and ends with a brief presentation of the theory of Ajzen and Fishbein (1980), which may serve as a basis for developing an instrument for measuring the intention to use a computerized tool, which in turn is an immediate determinant of use. Since the cognitive evaluation theory (Deci and Ryan, 1985) does not take attitudes into consideration, this study may open another avenue of research, which will enable us to collect additional information.

2.3 Attitudes

The concept of attitude refers to a durable, positive or negative affective reaction to persons, objects or issues (Petty and Cacioppo, 1981). Some authors point out that optimum use of new technologies depends to a great extent on user attitude (Guimond and Bégin, 1987). Regarding office automation, it would appear that the trend is to moderately positive attitudes towards work automation (Gutek, Bikson and Mankin, 1984). Contact with computerization seems to encourage the development of positive attitudes towards new technologies. This was the conclusion of Arndt et al. (1983) from a postal survey of 241 secretaries employed in an American university. The results indicated that familiarity with office automation, measured in terms of prior experience and frequency of use, is associated with positive attitudes regarding word-processing. This is

apparently due to the fact that previous experience reduces anxiety regarding use, and frequency of use leads to a more positive assessment of the impact of word-processing on work. In a study to determine the attitudes of professionals towards microcomputers, Zoltan and Chapanis (1982) also found that more experienced users developed more positive attitudes, whereas little or no direct exposure to microcomputers appears to lead to erroneous perceptions and negative attitudes. We may thus conclude that it is necessary to provide users with information on the utility and likely benefits of using computers.

In the course of a longitudinal study lasting 20 months, Clark et al. (1986) studied the possible relations between the degree of use of microcomputers and employee attitudes. Measurements were taken using a questionnaire, at three different stages in the implementation of office automation. Before implementation (pretest), the questionnaire was addressed to all potential users, while the other two measurements were made only among active users. The attitudes of non-users, although they might have been very informative, were not examined because there were not sufficient subjects to allow valid conclusions to be drawn.

Results showed that the degree of acceptance of automated office equipment varied with length of employment and type of job. Support staff and officers made greater use of this equipment as it became more familiar and technical problems diminished. For managers, use-time was already low at the outset and decreased over time, since their first attempts led them to the conclusion that the system was not suited to their needs. Attitudes also changed over time. In the early stages of implementation, the most negative attitudes were found among support staff, despite the fact that these employees had expressed very positive expectations prior to implementation. This may be due to the fact that secretaries were obliged to use the equipment since it had replaced their typewriters. They were also under considerable pressure from their superiors: production demands remained the same notwithstanding the fact that they were still learning to use the equipment and the system was still plagued with technical problems.

Managers and officers had more latitude, and could choose to wait until the technical problems were ironed out before beginning to use the system. At the time of the post-test, 20 months after implementation began, the situation had changed. Support staff displayed much more positive attitudes: because officers made much more use of the new equipment to do their own writing, secretaries had more time available to perform tasks they judged more interesting.

For Clark et al. (1986), differences in attitudes from one type of position to another depend on the control a person has over the new system and the consequent changes in duties. A high perception of control (for example, the possibility of choosing whether or not to use the new equipment, appears to promote the development of positive attitudes. The mediating effect of degree of choice between attitudes and use had already been suggested by Panko and Panko (1981, quoted in Kerr and Hiltz 1983). For these authors, this would explain the fact that 71% of managers and professionals have very positive attitudes to new technologies, while this is true for only 46% of secretary-users.

Clark et al. (1986) found that potential for advancement was another factor in acceptance of automated office tools. Employees who believe they have a chance to be promoted through use of computers were more in favor of them and used the equipment to a greater degree. We may therefore conclude that it is necessary to check the system of internal rewards within the organization when studying varying responses to new technologies. A relation was also observed between work satisfaction and degree of use. Individuals who are very satisfied with the way they function at work will be more reluctant to use a machine they have not mastered perfectly or on which their performance is as yet unsatisfactory, and which obliges them to change their work methods.

We may conclude from this study that, on the whole, positive attitudes towards office automation promote acceptance and use of equipment. Use also appears to depend on the degree of control users have over their work. When implementation of the system is complete, however, availability of equipment and practice time allowed seem to be important factors in determining use time.

Grantham and Vasque (1985) examined the mediating effect of employee attitudes on acceptance and use of an electronic messaging system for work-related tasks. Data were collected using questionnaires, as part of a major market study. The results showed that physical access to equipment was not sufficient to promote use. The best factors for predicting use appear to be respondents' attitudes to the system, since positive attitudes before implementation lead to greater use. But specific attitudes are not sufficient to predict use, and it is necessary to consider the general attitudes of individuals towards new technologies as well.

As the valence of attitudes appears to have an impact on the use of computerized tools, it might be interesting to study what forms them. This was done by Kerber (1983), who studied the attitudes of university students regarding some specific computer applications, in relation to their level of skill and the degree of difficulty encountered during learning. According to this study, a high rate of error during learning a computer application leads to the development of less favorable attitudes to computers. This may mean that there is a relation between perceived competence and use, with errors causing feelings of incompetence and a decrease in the intrinsic motivation to use a computerized tool.

For Kerber (1983), the origin and nature of attitudes may make it possible to guide interventions aimed at increasing the use of computers. If negative attitudes are due to a lack of experience with computers, more contact with new technologies should be arranged in order to promote the

development of skills and increase the level of expertise. If unfavorable attitudes are the result of belief in the negative effects of computers, these beliefs should be examined and attempts made to change them.

In a survey of studies on employee reactions to the introduction of office automation systems, Kerr and Hiltz (1982) dealt with attitudes towards office automation and their influence on degree of use. Since attitudes that are significantly correlated with use are those related to the perceived utility of the system, whether for increasing productivity or improving professional image. The relative importance given to a task is only one dimension of attitudes that influence the amount of time spent using the system. The other is intrinsic interest for the task. When a task to be performed on a computer is judged pleasant, the employee finds time to do it, even if it is not a priority (Kerr and Hiltz, 1983).

Expectations, whether general (e.g., ease of use) or specific (e.g., utility, impact on productivity), appear to influence the perceptions of users of the system and the quantity of time and energy they are prepared to invest in learning (Kerr and Hiltz, 1983). In particular, it would appear that individuals who think that their attitude will become more positive as time goes by are more likely to use computers.

A number of studies have dealt with the influence of attitudes on acceptance and use of computerized systems; however the measurement instruments used are rarely validated (Guimond and Bégin, 1987). One of the next stages in this field of research will be the development and validation of instruments for predicting use based on attitudes.

2.3.1 Ajzen and Fishbein (1980) model

One model that might be used to predict the use of computerized tools is one developed by Ajzen and Fishbein (1980). The authors propose a reasoned action theory that would make it possible to predict and understand individual behavior.

According to this theory, the immediate antecedent of any behavior is the intention to adopt this behavior. The stronger the intention, the greater the likelihood that the behavior will be adopted. Intention itself is influenced by two major determining factors, one personal and the other social. The first factor is attitude towards the behavior, that is the positive or negative affective evaluation of the behavior in question. The second factor, known as the subjective norm, refers to perceived social pressure to adopt or reject the behavior. A certain relative importance is given to each of these two factors which, together, determine the intention.

3. RESEARCH AVENUES

This chapter presents a research project aimed at developing a valid measurement instrument for identifying individuals likely to have motivational problems that might lead to under-use of a new computer tool. At present, there are no questionnaires that specifically determine perceived competence, feelings of self-determination, intrinsic motivation and extrinsic motivation of current or potential users of computerized equipment.

The first stage in developing such a questionnaire would be to determine, with the individuals involved, the relevance of using concepts related to intrinsic and extrinsic motivation. If this concept appears relevant, the information so collected might be used in a second stage to verify the postulated relations between intrinsic motivation, extrinsic motivation and the use of computers. Subsequent stages would deal with the psychometric and predictive validation of the questionnaire. Once the validation process is complete, we would then have a final version that we could use to identify individuals likely to have a low degree of intrinsic and/or extrinsic motivation to the use computerized tools.

3.1 Verification of concepts

The first stage, which consists in verifying the relevance of the concepts used, has already been completed. Interviews were conducted with 12 new users of automated office equipment in three different organizations. The interviews were intended to obtain information on user reactions to office automation and the use of computerized equipment. A short questionnaire was also sent to 20 individuals involved in office automation training. Of this total, 9 questionnaires were completed and returned. The purpose of the questionnaire was to determine trainers' perceptions of the influence certain characteristics of individuals or their working environment might have on learning a computer application (feelings of incompetence, constraint in the work environment, etc.). Although this sample is rather small, the data collected were used in developing the content of the experimental measurement instrument.

For trainers, perceived competence and the desire of students to learn to use automated office equipment create favorable conditions for learning. The content of the interviews is of interest in illustrating the postulated constructs, and clearly shows that the problem is a real one. For example, some more reticent individuals stated that they "would not touch a computer unless they had to." To justify this statement, they claimed they saw the computer as a "monster," and that changing their work habits would make them insecure, particularly after they had seen other people having problems learning. "In the next section, there were girls who cried when they tried to use their PC." Negative expectations contribute to increasing reluctance: "When I saw them in the box (the PCs), even before they were installed, I knew it would be just awful"; "Just hearing the word computer gave me a headache." Several people claimed that they felt pressure: production demands were too heavy, even while they were learning, and this increased the risk of error and made them panic. A feeling of "depersonalization" also appears: "Soon we'll all be little robots; they won't need secretaries any more," as well as a feeling of losing control over one's work and the equipment: "If I touch a key I'm not supposed to, I have the feeling just about anything could happen."

Certain conditions appear conducive to learning and accepting the new system. This occurs, for instance, when users are left a choice between using and not using their microcomputer: "What helped was that they left us our typewriters." Previous experience of success in adapting to new equipment leads users to expect that the new change will also be successful: "When we got our electronic typewriters, we panicked. But after a few weeks, it was a bit better. I know it will be the same with the PC."

3.2 Experimental version of questionnaire

A preliminary version of the measurement instrument has already been developed (see Appendix A). Part of the questionnaire is intended to identify factors that might motivate potential users to want or not want automated office equipment introduced into their department. This is done by

first asking a general question ("What are the main reasons that would motivate you to use automated office equipment if it was available to you?"), followed by a number of possible reasons conceptually linked to intrinsic motivation ("For the satisfaction of learning something new."), amotivation ("I can't see what I would gain by using a computerized tool.") or each of the three levels of extrinsic motivation: non-self-determined external regulation ("To do the same as other people in my department"), introjected ("Because I wouldn't feel right if I didn't use it.") or self-determined extrinsic ("It would enable me to increase my work qualifications.") For each item, respondents are asked to estimate, on a scale of 1 (not at all) to 5 (completely), to what extent the suggested reason corresponds to one of the reasons that might motivate them to use new computerized office equipment.

Another part of the questionnaire measures the perceived competence of potential users. Two levels of perceived competence are measured: aptitude for trying new things at work ("In general, I find it easy to learn new work methods.") and aptitude for using computers ("I don't understand the first thing about computers.") Eight items are listed, four positive and four negative, each followed by a scale of 1 (not at all) to 5 (completely) on which respondents are asked to estimate to what extent each item applies to them.

The third part of the questionnaire deals with intention to use computerized office equipment and the factors determining this intention. The concepts used are those contained in Ajzen and Fishbein's (1980) model described earlier (see 2.3). A general question is asked concerning the intention to use new computerized office equipment during the month following its introduction. The answer is given on a scale of 1 (not at all) to 5 (absolutely). This first question is followed by a section that assesses attitudes towards use of computerized tools. The next section deals with the advantages and disadvantages of using computerized office equipment in

the workplace ("I think that using (application) will allow me to save time"), followed by a section dealing with the subjective assessment of the item ("How important do you think it is to save time?"). The suggested responses were chosen from responses obtained in interviews and must be rated on a scale of 1 (not at all) to 5 (very). The last section evaluates subjective norms perceived by respondents regarding the use of computerized office equipment ("The people who work with me think that I should use (application)."") and their intention to conform to these norms ("In general, I want to do what the people I work with think I should do.") These latter items are rated on a scale of 1 (rarely) to 3 (usually).

3.3 Psychometric validation

The next stage consists of establishing the psychometric validity of the experimental version of the questionnaire using statistical analyses. To do this, the questionnaire is distributed to a fairly large number of respondents shortly after an automated office system has been introduced. The data obtained is then analyzed statistically to establish the degree of internal consistency of sub-scales as well as correlations between items, and to determine whether items are properly grouped by concept. This process would enable us to eliminate items that are not sufficiently correlated with the others and thus to obtain a corrected version of the questionnaire.

3.4 Predictive validation

Another possible form of validation would be to verify the predictive capacity of the questionnaire, that is, whether the intrinsic, extrinsic or amotivation of potential users to use computerized office equipment makes it possible to predict the rate of use of this equipment over time. The first stage would be to distribute the questionnaire to potential users in the early stages of implementation, and then measure the rate of use approximately 8 months later. Statistical analyses should reveal relations between type of motivation, attitude and degree of use.

According to our hypotheses, intrinsically motivated individuals or those with a high degree of self-determination should have a significantly higher use rate for computerized equipment than unmotivated individuals or those with a low level of self-determination. As well, individuals with negative attitudes to the use of computerized office equipment should use it less than those with positive attitudes.

Another way of establishing the predictive validity of a measurement instrument would be to work on the use context. Some potential users would be placed in a controlling situation (conducive to non-self-determined extrinsic motivation), while others would be placed in a context where autonomy was encouraged (conducive to self-determination and intrinsic motivation). After about 8 months, these users would complete the questionnaire and their rate of use would be measured. Persons in controlled situations should have a lower level of self-determination, be less intrinsically motivated and have lower use rates than users in contexts that promote autonomy. The latter individuals should also have more positive attitudes regarding use of computerized office equipment.

CONCLUSION

We have seen that the action of variables related to either the situation in which computerized equipment is used, or to the user, influence the degree of use through variations in the level of intrinsic motivation (which in turn is mediatized by perceived competence and feelings of self-determination), or through variations (in the level) of the extrinsic motivation. It would therefore appear that research on motivation might be extremely useful in understanding and solving problems of under-use of computerized equipment in organization settings. If we can prove empirically that these relations exist, intervention might be aimed at promoting the intrinsic motivation of users towards using computerized equipment and thus increasing the rate of use. The research project outlined in the last part might allow us to clarify the relations between perceived competence, feelings of self-determination, intrinsic motivation, extrinsic motivation and the use of computerized equipment. In short, the theoretical framework would allow us to verify results already obtained in this area and examine them in a new light. Determining the psychological processes underlying problems in the use of computerized equipment will be sure to pave the way for effective intervention in the workplace.

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APPENDIX A

Experimental Version of Questionnaire

Computerized office equipment has recently been installed in your department, or will be in the near future, and it is possible you are thinking about using it. Please indicate how likely it is that you will decide to use it by circling the appropriate figure on the scale below:

1	2	3	4	5
Unlikely		Possible		Very likely

Using the scale provided below, indicate to what extent the reasons listed correspond to the main reasons that would motivate you to use the computerized equipment available to you.

For each statement, circle the figure that best describes to what extent the reason suggested applies to you.

	Not at all		Somewhat		Completely
1. For the satisfaction of learning something new.	1	2	3	4	5
2. Because it will help me develop skills that will be useful later on.	1	2	3	4	5
3. To do the same as the other people in my department.	1	2	3	4	5
4. I find it really discouraging to have to learn to use an office computer.	1	2	3	4	5
5. Because I will feel obliged to do so.	1	2	3	4	5
6. So my fellow workers don't think I'm eccentric.	1	2	3	4	5
7. Because it will enable me to be more creative in performing my work.	1	2	3	4	5
8. To show other people that I am capable of doing it.	1	2	3	4	5
9. I would like to use a computer in my work, but I don't think I'll ever succeed in learning.	1	2	3	4	5
10. Because I will be able to upgrade my qualifications.	1	2	3	4	5
11. Don't know; I don't think it would help me in my work.	1	2	3	4	5

	Not at all				Completely
12. Because it might eventually help me to find more interesting work.	1	2	3	4	5
13. Because it will give me an opportunity to meet some interesting challenges.	1	2	3	4	5
14. Because in the world today, it is absolutely essential to be able to use computerized office equipment.	1	2	3	4	5

What are the main reasons that would motivate you to use the computerized office equipment available to you?

	Not at all				Completely
15. I really don't see what good it would do me to use computerized office equipment.	1	2	3	4	5
16. Because I wouldn't feel 'right' if I didn't use it.	1	2	3	4	5
17. Because my superior will force me to.	1	2	3	4	5
18. Because I think it would be interesting to use computerized office equipment.	1	2	3	4	5
19. So as not to lose my job.	1	2	3	4	5
20. Because I will be able to work more efficiently.	1	2	3	4	5

The next section deals with the way you feel in certain situations. Answer by circling the figure that best describes to what extent each of the following statements applies to you. Note that the term "computer" refers to any type of computerized equipment (e.g. electronic apparatus, automated banking machine, etc.)

	Not at all		Somewhat		Very much
1. In general, I find it easy to learn new work methods.	1	2	3	4	5
2. I feel nervous when I come near a computer.	1	2	3	4	5
3. Whenever possible, I avoid trying new things.	1	2	3	4	5
4. I think I could easily learn to use a computer.	1	2	3	4	5
5. I feel sure of myself when I try something new at work.	1	2	3	4	5
6. I don't know the first thing about computers.	1	2	3	4	5
7. It often takes me a long time to decide to try something new.	1	2	3	4	5
8. In general, I do pretty well when I use a computer.	1	2	3	4	5

You have just received, or will soon receive, new computerized office equipment in your department. Please indicate which office application is (or will be) installed in your department: _____

Using the scale provided, indicate to what extent you feel that each term or phrase applies by circling the appropriate figure. Your answers should refer to the office application shown above.

1. I intend to use _____ during the month following its introduction:

1	2	3	4	5
Not at all		Perhaps		Absolutely

2. I think that using _____ will be:

		Not at all		Somewhat		Highly
a)	pleasant	1	2	3	4	5
b)	unsettling	1	2	3	4	5
c)	stressful	1	2	3	4	5
d)	beneficial	1	2	3	4	5
e)	frightening	1	2	3	4	5
f)	necessary	1	2	3	4	5

3. I think that using _____ will:

		Not at all		Somewhat		Very much
a)	allow me to save time	1	2	3	4	5
b)	deteriorate my working conditions	1	2	3	4	5
c)	leave me more time for interesting jobs	1	2	3	4	5
d)	increase my productivity	1	2	3	4	5
e)	make my work harder	1	2	3	4	5
f)	let me try new things	1	2	3	4	5
g)	let me spend less time on boring jobs	1	2	3	4	5
h)	leave me less control over my work	1	2	3	4	5
i)	place more pressure on me to produce more	1	2	3	4	5

4. How important do you think it is:

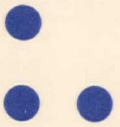
		Not at all				Very much
a)	to save time	1	2	3	4	5
b)	that working conditions deteriorate	1	2	3	4	5
c)	to have more time for interesting jobs	1	2	3	4	5
d)	to increase productivity	1	2	3	4	5
e)	that your work is harder	1	2	3	4	5
f)	to be able to try new things	1	2	3	4	5
g)	to spend less time on boring jobs	1	2	3	4	5
h)	to have less control over your work	1	2	3	4	5
i)	to have more pressure to produce more	1	2	3	4	5

5. Using the scale below, indicate to what extent you feel that each of the following statements applies:

	Not at all				Very much
1. Most of the people who are important to me think I should use _____	1	2	3	4	5
2. My superior thinks I should use _____	1	2	3	4	5
3. The people who work with me think I should use _____	1	2	3	4	5
4. My friend(s) think(s) I should use _____	1	2	3	4	5

6. For each of the following statements, circle the figure that indicates how frequently you normally want to do what is described:

In general,	Rarely		Occasionally		Usually
1. I want to do what most of the people important to me think I should do	1	2	3	4	5
2. I want to do what my superior thinks I should do	1	2	3	4	5
3. I want to do what the people who work with me think I should do	1	2	3	4	5
4. I want to do what my friend(s) think(s) I should do	1	2	3	4	5



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