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Keywords
Computer technology Office design, Office messiness, Desk placement, Nonverbal communication, Object language

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Computer technology as object language: Revisiting office design

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Abstract

Object language is a term that describes the messages that objects convey to people. This paper extends previous research on the object language associated with office design elements such as the placement of one's desk and office messiness by examining the role of computer technology as an additional form of object language. Computer technology was operationalized in Study 1 in terms of the innovativeness of technology displayed in an office, while Study 2 focused on the portability of computer technology. Undergraduate students responded to photographs of faculty offices exhibiting various combinations of office messiness, desk placement and technology. Results showed that while computer technology plays a more subtle role in visitor attributions about the officeholder in comparison to office messiness or desk placement, computer technology does convey messages about work performance, especially time management skills. The main role played by computer technology is in terms of its interaction with office messiness. Results of the role of office design in impression management are discussed.

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1. Introduction

Environmental and social psychologists have long asserted that the environmental setting plays an instrumental role in the attributions people make about others (Rafaeli & Vilnai-Yavetz, 2004; Wells & Thelen, 2002; Wilson & Mackenzie, 2000). One manner by which this occurs is through object language, a form of nonverbal communication imparted to others through environmental cues. In business settings, these cues are elicited by such things as visible office furnishings (Ruesch & Kees, 1956). Also known as atmospherics, object language can imply information about a firm's capabilities and quality (Shostack, 1977) and is said to influence personal selling success (McElroy, Morrow, & Eroglu, 1990), customer satisfaction (Bitner, 1990, 1992), and employee satisfaction and productivity (Davis, 1984; Sundstrom & Altman, 1989; Wineman, 1982). Despite nearly fifty years of recognition, research on object language has tended to ignore its effects on visitors (Bitner, 1992), particularly, in the case of office design. Rafaeli and Vilnai-Yavetz (2004) observe that artifacts repeatedly appear in organizational scholarship, but there has been no solid theory about how they operate.

This research investigates the messages conveyed by office computer technology as a form of object language in today's offices. Such research is important because impressions formed from object language may affect the behavior of the person forming the impression toward the officeholder. This paper reports on two studies that replicate and extend previous office design research, research conducted prior to the integration of computers into the office environment. Consequently, this paper seeks to determine whether the nature of the computer technology employed in an office sends messages to potential visitors, either separately or in combination with other office design elements, such as messiness and desk arrangement. Study 1 focuses on how innovativeness of computer technology influences visitor attributions of the officeholder while Study 2 assesses how portability of computer technology affects these same attributions. In addition, this research extends previous research by using multi-item rather than single-item attribution measures and broadens the range of attributions made by visitors to include widely recognized personality dimensions beyond extraversion.

2. Background

Office design has been studied from both a between-office and a within-office perspective. Between-office layout research looks at the positioning of offices relative to one another (Schuler, Ritzman, & Davis, 1981), while within-office design research deals with the configuration of physical markers (i.e., furniture placement, the display of personal objects, symbols of achievement, etc.), that serve instrumental, aesthetic and symbolic functions (Vilnai-Yavetz, Rafaeli, & Yaacov, 2005). Our interest is on this symbolic dimension, or how such physical markers are likely to be viewed and assessed even in the absence of the officeholder. While the literature rarely addresses the intentionality of office design as an impression management device, Goffman (1959) has pointed out, that people will form impressions regardless of the actor's intention to create and send these messages. As an example, work based on social categorization theory shows that cues received earlier in an evaluation process tend to be weighted more heavily in the formation of interpersonal assessments (Fiske & Taylor, 1991). As such, the design of one's office is a vehicle for transmitting information, knowingly or not, that can heavily influence perceptions of first-time

visitors and may carry great weight in their assessments of officeholders (Elsbach, 2004). Moreover, past research on social perception has amply demonstrated that attributions regarding competence, ability, and personality are formed on the basis of momentary impressions (Gosling, Ko, Mannarelli, & Morris, 2002) such as an initial visit to an office. The design of an office is a practical example of environmental cues that elicit expectations regarding the personality of the officeholder (Morrow & McElroy, 1981).

Despite the fact that personalization of office environments is a common practice (Wells & Thelen, 2002), limited research has investigated the messages conveyed by objects within the office design context. For example, whether the desk is positioned in an open versus a closed manner influences visitors' feelings of comfort and welcomeness as well as their attributions about the officeholder (Campbell, 1979; Morrow & McElroy, 1981). Other objects influencing visitor feelings and attributions of the officeholder include the presence or absence of plants, aesthetic objects such as posters (Campbell, 1979), status symbols (Morrow & McElroy, 1981), and the degree of messiness of the office (Campbell, 1979; Morrow & McElroy, 1981).

Unfortunately, these studies were conducted before the personal computer age. Prior to the 1980s few offices were equipped with technology beyond a telephone, typewriter, and perhaps, a calculator. This study builds on the inductive body of research begun by Zweigenhaft (1976) and Campbell (1979) by examining whether computer technology complements, mitigates, or sends additional messages about officeholders to those conveyed by previously documented office design elements (i.e., messiness and desk placement).

2.1. Office messiness

Campbell (1979) used a tidy versus messy dichotomy to demonstrate that clutter resulted in a strong negative effect on visitors' feelings and perceptions of the office occupant. Morrow and McElroy (1981) added an intermediary level of messiness, "organized stacks," to clarify this relationship. In their study, office messiness explained more of the variance in visitor feelings and attributions of the officeholder than either desk placement or status symbols, with the organized stacks condition generally resulting in the most favorable responses (e.g., higher levels of extraversion), with the notable exception of busyness. Both Campbell (1979) and Morrow and McElroy (1981) found messiness and perceptions of busyness to be positively related. Messiness may communicate higher levels of officeholder activity. Consequently, in some instances an "organized stacks" level of messiness produces more favorable occupant attributions, while in other instances messiness elicits more favorable responses.

Turning to attributions of the officeholder's personality, office messiness may be construed as a form of personalization, and both quantity and quality of personalization relate to personality traits (Gosling et al., 2002; Wells & Thelen, 2002). For example, Gosling et al. (2002) found that higher attributions of officeholders' and dormitory residents' agreeableness and conscientiousness were predicted by lower degrees of messiness. Harris and Sachau (2005) reported that poor (i.e., messy) apartment housekeepers are perceived as lower in agreeableness, conscientiousness, intelligence and femininity and higher in neuroticism and openness to new experience. These studies did not, however, include an intermediary level of messiness. Messiness may also communicate a higher level of activity. In light of this limited research, we hypothesize the following effects for messiness on work-related and personality attributions:

H1a. Offices depicted as messy or using organized stacks will be associated with the most favorable work attributions and extraversion.

H1b. Clean offices will be associated with the most favorable attributions about officeholder agreeableness and conscientiousness.

H1c. Messy offices will be associated with higher attributions of officeholder neuroticism and openness to new experience.

2.2. Desk placement

Desk placement has also been shown to affect perceptions. Zweigenhaft (1976) found that when the desk was used as a barrier between the officeholder and the visitor (i.e., closed position), student–faculty interaction ratings by students suffered. Joiner (1971), in a study of London firms, found such arrangements to be associated with the status of officeholder, with high status officeholders preferring the closed or desk-as-a-barrier position. Moreover, visitors to an office in which the desk is arranged in a closed position feel less comfortable and less welcome (Campbell, 1979; Morrow & McElroy, 1981; Zweigenhaft, 1976) than do those visiting an open desk placement office.

Research has demonstrated that desk placement affects some visitor attributions of officeholder characteristics but not others. For example, students visiting faculty members' offices with closed, as opposed to open, desk placements view those faculty as less friendly, less confident in dealing with others, less interested in students, and less extroverted (Morrow & McElroy, 1981). However, desk placement appears to have no effect on perceptions of how busy the occupant is (Campbell, 1979; Morrow & McElroy, 1981) or on their level of achievement orientation, competitiveness, or interest in research (Morrow & McElroy, 1981). Hence, desk placement should not predict work-related attributions. Interestingly, research has confirmed that visitor attributions about officeholders produced by desk placement are fairly accurate; e.g., extraverted officeholders do tend to prefer an open desk arrangement (McElroy, Morrow, & Ackerman, 1983).

While no research linking any other personality trait beyond extraversion to desk placement has been identified, there are logical reasons why some traits might be inferred by visitors upon encountering various desk placements. Openness to experience (being imaginative, unconventional, curious, preferring variety) and agreeableness (being friendly, sympathetic, and getting along with others) might be more attributed to the receptivity suggested by an open desk placement. Neuroticism, on the other hand, may be more frequently inferred from the defensiveness suggested by closed desk placement. Conscientiousness, however, is not logically related to either form of desk placement. Based on these observations we propose that:

H2. Open desk arrangements will be associated with higher attributions of officeholder extraversion, agreeableness, and openness to new experience and lower attributions of neuroticism.

2.3. Technology

Since the majority of empirical studies on office design and visitor reactions date to the late 1970s and early 1980s (Campbell, 1979; Morrow & McElroy, 1981), inattention to the role of computer technology in Ornstein's review of the office design literature (Ornstein, 1989) is not surprising. Initially, the display of a computer might have been perceived as a

status symbol, similar to diplomas or artwork, but now computers are a standard office furnishing and are part of the normal office landscape. However, considerable variability in the nature of computer technology leaves open the question of the specific impressions conveyed to visitors. Computer technology can vary on a number of dimensions including innovativeness (defined as an office with a lot of "cutting edge" computer technology versus an office with just the basics) and the degree to which the computer technology is portable.

The messages conveyed by technology are not well understood. For example, an office displaying highly innovative technology, (e.g., a computer system with multiple flat panel monitors and a PDA – personal digital assistant), may suggest that the officeholder is less extraverted. That is, the officeholder would rather interact with technology than with people. On the other hand, a lack of state-of-the-art technology may imply that the officeholder is less open to new ideas. Moderately innovative computer systems (e.g., a single flat panel computer), similar to intermediary levels of messiness, may elicit the most favorable visitor reactions by suggesting that the officeholder is comfortable with computer technology but not willing to replace technological interactions with human ones.

Another way to conceptualize computer technology is by its portability. A notebook computer, for example, suggests that work can occur outside the confines of the office more than does a desktop computer. One might also infer that officeholders with notebook computers are working outside of regular office hours, have continuous access to files and people, and are, therefore, more industrious and/or conscientious than are those with desktop computers. Study 2 will examine this facet of computer technology.

No explicit studies examining perceived personality traits of officeholders based on the innovativeness or portability of computer devices were identified. However, Goffman's (1959) work suggests that people may create physical settings to support the image they desire to convey. For example, research by Tornatzky and Klein (1982) and Moore and Benbasat (1991) identified social approval or image as one of the determinants of the adoption of technology innovation. Relatedly, Rogers (1983) argued that social status is one of the most important motivations to adopt a technological innovation. By testing the role of technology as an element of office design we hope to determine whether one's image is affected by computer technology.

Assuming that the degree and type of computer technology in an office may be determined by the officeholder, empirical research linking personality traits to computer/Internet use may provide a reasonable basis for formulating hypotheses. Kraut et al. found that Internet usage was associated with declining social interaction among Internet users in their first two years online (Kraut, Kiesler, Mukhopadhyay, Scherlis, & Patterson, 1998; Kraut, Patterson et al., 1998). In a follow up study, they found that while the effects of reduced social interaction dissipated over the next few years, Internet usage exacerbated the behavior associated with a given personality trait of users. Extraverted people easily adapted and incorporated the new social medium, whereas introverted people drew further into themselves (Kraut et al., 2002). Among college students, extraversion, agreeableness, and conscientiousness have been observed to be negatively related to amount of Internet usage while openness to new experiences and neuroticism were found to be unrelated (Landers & Lounsbury, 2004). They speculate that extroverted students prefer spending more time in social activities than introverts and that Internet activities require less agreeableness than face-to-face interactions. Moreover, one could argue that those more open to new experiences are more likely to acquire and use the latest in computer technology.

The link between Internet usage and conscientiousness is more complex as Landers and Lounsbury's detailed analyses indicate that academic use of the Internet is high among highly conscientious students, but lower for leisure purposes. Furthermore, people who are more conscientious are more likely to engage in work-related activities beyond regular work hours, a practice facilitated by notebook technology. Relatedly, Amiel and Sargent (2004) report that motives for using the Internet vary systematically with personality. They observed that those high in neuroticism use the Internet to feel a sense of "belonging" and extraverts use it only for instrumental purposes. This leads us to offer the following exploratory hypotheses:

H3a. The innovativeness of computer technology on display in an office is expected to be positively associated with more favorable work-related attributions of officeholders and levels of officeholder neuroticism and openness to new experience, but negatively related to attributions of extraversion and agreeableness.

H3b. Use of a notebook, as opposed to a desktop computer will be associated with more favorable work-related attributions and higher attributions of officeholder conscientiousness.

2.4. Interactions among design elements

Because this research focuses on computer technology as object language, hypotheses involving interaction effects are limited to those dealing with technology. The prophecy surrounding the advent of computers was that information technology would lead us to a paperless society (Lewis, 1989). Consequently, the addition of more sophisticated technology to one's office should reduce the amount of paper within that office. As such, occupants with clean offices should be viewed more favorably than those occupants of technologically innovative offices that are either somewhat (organized stacks) or very messy. Perceptions of occupants of offices with moderately innovative computer technology should conform to the more conventional messages sent by messiness, with the most favorable perceptions accompanying the intermediary level of computer innovativeness, based on extrapolating previous research on messiness (Morrow & McElroy, 1981). Moreover, the portability of a notebook computer would be inconsistent with having an office characterized by large messy piles of hard copy information, in that such paperwork is far less transportable. As such, we would expect:

H4a. An interaction between innovativeness of computer technology and office messiness such that the messier a high tech office is, the more unfavorable the work-related and personality attributions about the officeholder, while in less technologically innovative offices a curvilinear relationship is expected such that the most favorable ratings occur in offices characterized by an organized stacks level of messiness.

H4b. An interaction between portability of computer technology and office messiness such that, in offices displaying a notebook computer, higher levels of messiness would lead to less favorable attributions about the officeholder, while in offices with a desktop computer a curvilinear relationship is expected such that the most favorable ratings occur in offices characterized by an organized stacks level of messiness.

With no research, one can only speculate on the nature of a possible technology by desk placement interaction. Coupling the finding that visitors report feeling less comfortable in offices with closed desk arrangements (Campbell, 1979; Morrow & McElroy, 1981) with

the notion that some visitors may be intimidated by high levels of technology, suggests that innovative computer technology in closed desk placement offices would be viewed as least favorable. This should lead to less favorable work-related and personality attributions (e.g., more neurotic, less extraverted) of the office occupant as compared with other combinations of technology and desk placement. There is no logical reason to pose such a relationship, however, when computer technology is operationalized in terms of its portability. Thus, we hypothesize:

H5. There will be a desk placement by innovativeness of computer technology interaction such that visitor attributions of officeholders' work-related activities and personality characteristics will be less favorable in offices characterized as highly technologically innovative and incorporating a closed desk arrangement as compared to offices incorporating less innovative technology and/or open desk arrangements.

Finally, predicting three-way interactions involving the role of computer technology is extremely difficult given the absence of previous research. However, if the above two-way interactions hold, one might expect that the least favorable messages would be sent by offices designed in either the most incompatible or the most intimidating manner and the most favorable messages resulting from the most compatible and least intimidating arrangements.

H6a. Office messiness, desk placement and innovativeness of computer technology are expected to interact such that the most favorable officeholder work-related and personality attributions are elicited by high technology offices that are clean and employ an open desk arrangement, and less technologically innovative offices that maintain organized stacks and an open desk placement. Least favorable attributions should accompany offices that are messy and employ a closed desk arrangement, regardless of technology.

H6b. Office messiness, desk placement and portability of computer technology are expected to interact such that the most favorable officeholder work-related and personality attributions are elicited by offices that have open desk arrangements and organized stacks, regardless of technology portability, and the least favorable attributions will be produced by messy offices having portable computers and a closed desk arrangement.

2.5. Data analysis

Office messiness and desk placement are less ambiguous design concepts, than computer technology. Because computer technology can take many forms, two studies are undertaken in order to investigate whether the messages transmitted by technology are contingent upon how it is defined. Hypotheses 1, 2, 3a, 4a, 5 and 6a are tested in Study 1 using the innovativeness of computer technology displayed in an office. Study 2 replicates Hypotheses 1 and 2 and tests Hypothesis 3b, 4b and 6b focusing on the portability of the computer technology.

3. Study 1: Innovativeness of computer technology

Study 1 uses innovativeness of computer technology as the vehicle for testing technology as an office design variable. Innovativeness of computer technology was operationalized in terms of the nature and quantity of equipment on display in an office.

3.1. Method

3.1.1. Participants

Participants were 358 undergraduate students enrolled in introductory management courses at a large Midwestern university. The sample was 64% male and represented 14 different majors, with no major accounting for more than 22% of the sample. No gender differences were evident in any of the dependent variables, so gender was not used as a covariate in the analysis. Subjects earned a small amount of extra credit for their voluntary participation in the study. Each student received a packet containing a single 8 1/2″ by 11″ photograph of a hypothetical faculty office and a short questionnaire. The experimental design was a $3 \times 2 \times 3$ full factorial with each picture containing one of three levels of office messiness, one of two desk placement arrangements, and one of three degrees of technology. Consequently, each of the 18 unique pictures had between 18 and 22 subjects examine the picture, respond to the questionnaire, return both to the envelope, and turn it in. A sample of the office pictures for both Study 1 and Study 2 are shown in Fig. 1.

3.1.2. Independent variables

Messiness. Office messiness was manipulated by the amount of paperwork on the desk surfaces of the office. In the clean condition, the desktops were bare with the exception of the computer monitor, keyboard, mouse, printer, telephone, a coffee cup, a picture, and a pen/pencil holder. In the "organized stacks" condition, the desktop surfaces contained the

Fig. 1. Photographs of sample office configurations from top left to bottom right are: open desk/clean/low tech, closed desk/organized stacks/medium tech, closed desk/messy/high tech, and closed desk/messy/portable tech (which was contrasted in Study 2 against the intermediate level of technology shown above).

same items plus papers, books and academic journals, arranged in a few neat stacks. In the messy condition, the same materials were depicted but instead of stacks, the papers, books and journals were spread out across the desk surfaces in a disorganized fashion.

Desk placement. Desk placement was manipulated by positioning the desk in either an open or closed desk arrangement. An open desk was an "L" shaped arrangement where the desk surfaces were against the walls of the office leaving the officeholder "exposed" to the visitor. The closed desk arrangement positions one of the desktop surfaces between the officeholder and the visitor, an arrangement often referred to as the desk-in-the-barrier position.

Innovativeness of computer technology. Three degrees of technology were depicted across the photographs. In the least innovative condition, the office contained a computer and an old CRT (cathode ray tube) monitor. In the intermediate level, the office contained a single flat panel monitor with speakers. The most innovative office contained a set of dual flat panel monitors, higher quality speakers, and a PDA in a docking station.

3.1.3. Dependent variables

Previous research (e.g., Campbell, 1979; Morrow & McElroy, 1981) utilized single-item measures of visitor attributions. To avoid this limitation, two sets of dependent items were written specifically for this study. All items employed a 9-point bi-polar scale, in which subjects were presented with opposite adjectives or phrases describing an officeholder characteristic and then asked to select the number corresponding to the degree to which they felt the officeholder was more like one or the other of those adjectives. One set of items captured attributions about officeholders' work activities, including how organized, busy, and successful subjects thought the officeholder was. Because these items were not established scales and because they might be inter-related, factor analysis was conducted. Factor analysis with varimax rotation yielded two factors and was used to formulate measures of officeholder time management and work success. The precise bi-polar items included in each factor are described more fully below. The second set of items operationalized Big 5 personality factors. Big 5 consists of five constructs asserted to capture the essence of one's personality (Goldberg, 1993): neuroticism, extraversion, agreeableness, conscientiousness, and openness. The adjectives used to construct these scales were taken directly from the factor descriptions in the Revised NEO Personality Inventory Manual (Costa & McCrae, 1992).

Time Management. The four bi-polar items that loaded on a factor we called time management were: chaotic – orderly; very unorganized – very organized; very busy – not busy at all (reverse coded); and spends a lot – spends little time in the office. These items were averaged to form a single scale. Coefficient alpha for this scale was .88.

Work success. Three bi-polar adjective items loaded on a single factor that seemed indicative of a successful career; hence we labeled it work success: low achiever – high achiever; low faculty rank (instructor) – high faculty rank (full professor); low – high occupational status. The items clearly loaded on a single factor and the coefficient alpha for this scale was .69.

Neuroticism. Neuroticism was measured using five items tapping the degree to which respondents felt the office occupant was neurotic – rational (reverse scored); easily frustrated – easy going (reverse coded); anxious – calm (reverse coded); easily discouraged – not easily discouraged (reverse coded); and vulnerable – confident (reverse coded). Coefficient alpha for the scale was .78.

Extraversion. Five items derived from the definition of extraversion included: introverted – extraverted; a loner – gregarious; stays in the background – is socially active; distant – affectionate; and relaxed – energetic. This scale had a coefficient alpha of .84.

Agreeableness. The bi-polar adjectives used to capture agreeableness included: disagreeable – agreeable; competitive – cooperative; skeptical – trusting; unhelpful – helpful; and arrogant – modest. This scale's reliability was .82.

Conscientiousness. The personality factor of conscientiousness was captured using the following five sets of adjectives: careless – conscientious; inept – competent; disorganized – orderly; unreliable – reliable; and lazy – hard working. The scale had a coefficient alpha of .88.

Openness. The final factor in Big 5, openness to new experiences, was also measured using five sets of adjectives: limited curiosity – open to new ideas; no imagination – vivid imagination; no appreciation – deep appreciation for art and beauty; unwilling – willing to try different things; and dogmatic – willing to re-examine previous positions. Coefficient alpha for this scale was .84. Descriptive statistics for all dependent variables used are reported in Table 1.

3.1.4. Manipulation check variables

Recall that the object language of office design was manipulated by varying the level of office messiness, desk placement, and innovativeness of computer technology in photographs of faculty offices. Manipulation check items were used to assess the success of these manipulations. Office messiness was checked using a two-item scale asking respondents about the degree to which they perceived the office as very messy/clean and very disorganized/organized (coefficient alpha = .91). Manipulation of desk placement was assessed with a single item asking the degree to which the office separates the occupant from the visitor with the desk or places no furniture between the office occupant and the visitor. Finally, innovativeness of technology was assessed via a single item: the office is low tech – the office is high tech.

Table 1
Study 1: Descriptive statistics and correlations ($N = 358$[a])

	Mean	SD	Time mgmt	Work success	Neurot	Extravert	Agreeable	Conscient	Openness
Time management	5.32	2.17	*.88*						
Work success	5.68	1.45	.01	*.69*					
Neuroticism	4.48	1.26	$-.23^{***}$	$-.41^{***}$	*.78*				
Extraversion	4.89	1.38	.10	$.38^{***}$	$-.64^{***}$	*.84*			
Agreeableness	5.66	1.26	$.22^{***}$	$.27^{***}$	$-.54^{***}$	$.50^{***}$	*.82*		
Conscientious	6.28	1.67	$.71^{***}$	$.40^{***}$	$-.44^{***}$	$.29^{***}$	$.45^{***}$	*.88*	
Openness	5.18	1.36	$-.33^{***}$	$.41^{***}$	$-.44^{***}$	$.57^{***}$	$.33^{***}$	.02	*.84*

Note. Scale reliabilities can be found on the diagonal, in italics.
[a] N size varies from 358 to 340 due to missing data.

4. Results: Study 1

4.1. Manipulation checks

A $3 \times 2 \times 3$ ANOVA (three levels of messiness, two levels of desk placement and three degrees of technology innovativeness) was used to assess the success of the experimental manipulations used in developing the photographs. The ANOVA on the two-item messiness manipulation check scale revealed a strong main effect for messiness ($F = 639.97$; $p \leqslant .001$), one that accounted for 79% of the variance in the messiness manipulation check variable. The manipulation checks on both desk placement ($F_{\text{desk placement}} = 697.57$; $p \leqslant .001$) and innovativeness of technology ($F_{\text{technology}} = 41.75$; $p \leqslant .001$) also revealed significant main effects for the manipulations check variables of interest (desk position and on the degree of technology exhibited in the picture). These main effects accounted for 67% and 20% of the variance in the manipulation check items, respectively.

4.2. Dependent variables

Table 1 reports the correlation matrix for the dependent measures involved in this study. In light of the fact that some dependent variables were related, MANOVA was performed to examine the effects of office messiness, desk placement, and degree of computer technology innovativeness across all dependent variables combined. The results in Table 2 show significant main effects for office messiness, desk placement and computer technol-

Table 2
Effects of office messiness, desk placement and innovativeness of computer technology on perceptions of officeholders ($N = 333$)

Source of variation	MANOVA results	Work attributions		Personality attributions				
		Time mgmt	Work success	Neurot	Extravert	Agreeable	Conscient	Openness
Messiness	30.67***	448.86***	3.26*	11.00***	7.07***	7.24***	121.81***	29.01***
	(.41)	(.73)	(.02)	(.06)	(.04)	(.04)	(.42)	(.15)
Desk Placement	4.19***	17.70***	.67	.13	3.74*	6.32**	2.80[a]	.03
	(.09)	(.05)			(.01)	(.02)	(.01)	
Technology	1.87*	2.47[a]	7.36***	.78	1.27	.21	.60	1.58
	(.04)	(.01)	(.04)					
Mess * Tech	1.16	2.04[a]	.51	2.54*	.36	2.66*	1.89	1.04
		(.02)		(.03)		(.03)		
Mess * Desk	2.68***	14.58***	.33	.76	.77	.03	2.08	.44
	(.06)	(.08)						
Tech * Desk	1.27	2.49[a]	1.61	.09	.11	.60	1.72	1.06
		(.01)						
Mess * Tech * Desk	.62	.32	1.18	1.05	.53	.13	.21	.32

Note. Numbers in parentheses are η^2 values.
[a] $p \leqslant .10$.
* $p \leqslant .05$.
** $p \leqslant .01$.
*** $p \leqslant .001$.

ogy innovativeness, along with a significant effect for the messiness by desk placement interaction.

Table 2 also shows the results of ANOVAs performed on each dependent variable. As shown in the table, how messy an office is sends a strong, albeit not uniform, message of the nature of the officeholder. Examination of the means (Table 3) shows that organized stacks resulted in more favorable attributions of officeholder success than did clean offices and higher extraversion ratings than either clean or messy offices. However, clean, rather than organized stacks or messy offices, produced the most favorable time management attributions. Thus Hypothesis 1a was supported on two of the three hypothesized attributions. Hypothesis 1b was partially supported in that clean offices produced the highest conscientiousness ratings while only more favorable agreeableness ratings than messiness (i.e., there was no significant difference between the clean and organized stacks conditions with respect to agreeableness). Finally Hypothesis 1c was fully supported in that messy offices elicited significantly higher attributions of neuroticism and openness to experience than did either clean or organized stacks offices. The strongest messages conveyed by messiness involved perceptions of time management ($\eta^2 = .73$), conscientiousness ($\eta^2 = .42$) and openness ($\eta^2 = .15$), while the smallest effects were found for perceptions of work success ($\eta^2 = .02$), extraversion ($\eta^2 = .04$) and agreeableness ($\eta^2 = .04$). In summary, strong support was found for the effect of office messiness as suggested in Hypothesis 1, though the messages associated with organized stacks and messiness conditions were not always consistent.

The main effect for desk placement in the MANOVA was a function of strong main effects on attributions about the officeholders' time management and the personality factors of extraversion and agreeableness. These findings provide partial support for Hypothesis 2, in that offices employing an open desk arrangement elicited more favorable perceptions of officeholder extraversion, and agreeableness than did offices employing a closed desk arrangement. The significant effect on time management was unexpected and the lack of findings on neuroticism and openness were not supportive of Hypothesis 2. Overall, the effects of desk placement were less influential than those of office messiness

Table 3
Study 1: Mean values for main effects ($N = 333$)

Source of variation	Work attributions		Personality attributions				
	Time mgmt	Work success	Neurot	Extravert	Agreeable	Conscient	Openness
Messiness							
Clean[a]	**7.43**[b,c]	**5.47**[b]	**4.35**[c]	**4.67**[b]	**5.86**[c]	**7.37**[b,c]	**4.49**[b,c]
Org. stacks[b]	**5.57**[a,c]	**5.94**[a]	**4.18**[c]	**5.27**[a,c]	**5.82**[c]	**6.66**[a,c]	**5.31**[a,c]
Messy[c]	**3.05**[a,b]	**5.62**	**4.90**[a,b]	**4.73**[b]	**5.32**[a,b]	**4.85**[a,b]	**5.72**[a,b]
Desk placement							
Open	**5.57**	5.62	4.46	**5.02**	**5.82**	6.38	5.17
Closed	**5.12**	5.73	4.50	**4.75**	**5.50**	6.18	5.18
Computer technology							
CRT monitor[a]	5.25	**5.39**[c]	4.54	4.73	5.60	6.16	5.01
Single flat panel[b]	5.49	**5.57**[c]	4.55	5.02	5.71	6.31	5.22
Dual flat panels[c]	5.29	**6.07**[a,b]	4.36	4.91	5.67	6.37	5.29

Note. Bolded numbers indicate a significant main effect.
Treatment means that are significantly different are indicated by appropriate superscripts.

as evidenced by the smaller amounts of variance explain in these attributions of the office-holder (η^2s were .05, .02, and .01, for time management, agreeableness, and extraversion, respectively).

Computer technology also exhibited a significant main effect in the MANOVA, primarily due to a significant main effect in the ANOVA that explained 4% of the variance in work success. This finding, that a high tech office (dual flat panel monitors and a PDA) was associated with higher ratings of work success, was supportive of one element of Hypothesis 3a, but other predicted effects for technology were not evidenced. Thus, Hypothesis 3a received only partial support for work attributions and no support for personality attributions.

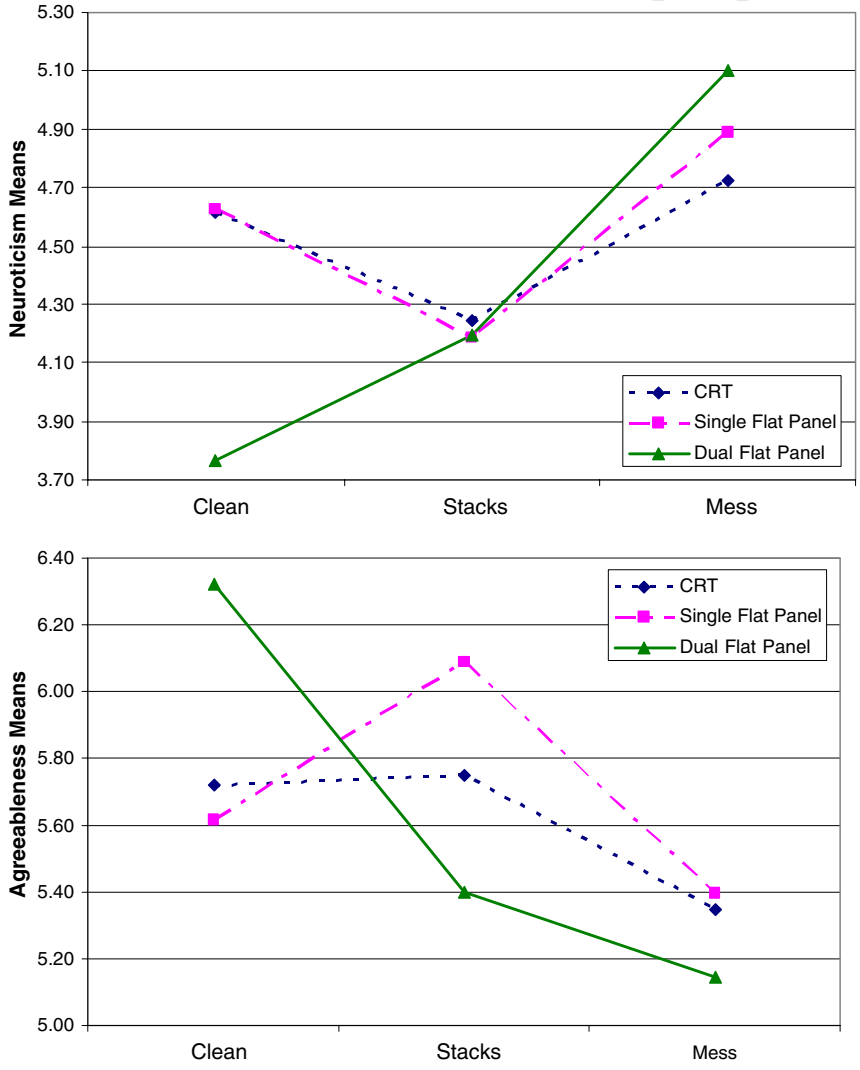

Fig. 2. Effects of the interaction of office messiness and innovativeness of computer technology on visitor attributions of officeholder neuroticism and agreeableness.

Although there was no significant technology by messiness interaction effect in the MANOVA, technology did significantly interact with office messiness in the ANOVA explaining 3% of respondents' perceptions of how neurotic and agreeable, was the office occupant. The specific nature of these interactions is shown in Fig. 2. With respect to occupant neuroticism and agreeableness, this interaction revealed that those occupying high tech offices received much more favorable ratings (i.e., lower neuroticism and higher agreeableness) in the clean office condition than did those occupying offices with low or moderate degrees of technology. In fact, there was a linear relationship between messiness and these ratings of the occupant for those offices in the high tech condition (a positive relationship in the case of neuroticism and a negative relationship in the case of agreeableness). However, for those occupants of offices employing a low tech (a CRT monitor) or intermediate degree of technology (single flat panel monitor), a U-shaped relationship was found with respect to attributions of officeholder neuroticism, with the more favorable ratings (i.e., lower neuroticism) accompanying the intermediate degree of messiness. An inverse pattern was revealed for agreeableness with respect to the intermediary level of technology innovativeness, but agreeableness was only affected (negatively) in the low technology office in the messy condition. These findings provide support for Hypothesis 4a relative to two attributions.

The only other significant MANOVA finding involved a two-way interaction between office messiness and desk placement that explained 8% of the variance on ratings of occupant time management. This relationship was such that there existed a negative relationship between messiness and time management ratings, but while there were no significant differences between open and closed desk arrangements in either very clean or very messy offices, there was a difference in the organized stacks condition. Occupants of offices characterized as "organized stacks" in terms of messiness were rated significantly better at time management in their work if they also employed an open desk arrangement as opposed to a closed desk arrangement.

Finally, the lack of a significant two-way, desk placement by technology or a three-way interaction lends no support to either Hypothesis 5a or 6a. Computer technology, as operationalized by how innovative it is, appears to affect visitor attributions of officeholders either directly or through office messiness.

5. Discussion: Study 1

The results of this study both replicate and extend previous research on office design variables as object language. In line with previous research, messiness sent the clearest messages to visitors about the nature of the officeholder. This study's results replicated those of Morrow and McElroy (1981) showing that the "organized stacks" condition produced the most favorable ratings when it came to perceptions about the officeholder's extraversion and found work success and (lower) neuroticism attributions to be additional benefits of an organized stacks level of messiness. Specifically, occupants in offices that have their paperwork in organized stacks are perceived as more successful than those in very clean offices and less neurotic than those in very messy offices. More importantly, however, this study extends previous work (Morrow & McElroy, 1981) by identifying other consequences of office design configurations and illustrates how clean and messy offices can also send desirable messages as well. Clean offices, for example, promote stronger attributions of good time management than do offices that are messy or that incorpo-

rate organized stacks. Clean and organized stacks arrangements promote stronger attributions of agreeableness and messy offices facilitate attributions of openness significantly more than do clean or organized stacks offices. (See Table 3 superscripts denoting which means are statistically different from one another.) Other comparisons can be articulated but our point is that the results indicate that there is no optimal level of messiness, contrary to what Morrow and McElroy's (1981) findings suggest.

The results for desk placement confirm previous research (Morrow & McElroy, 1981) showing that the open desk arrangement is linked to perceptions of officeholder extraversion. Desk placement was also shown here to send messages concerning time management and agreeableness. Contrary to earlier (Morrow & McElroy, 1981) findings that desk placement was unrelated to busyness, in this study occupants of offices employing an open desk arrangement were perceived as more effective time managers (which includes the perception of being less busy) than those in offices having a closed desk arrangement.

Finally, innovativeness of computer technology was shown to have both a direct effect on visitor attributions about the officeholder and an indirect effect through its interaction with messiness. Specifically, occupants of offices high in computer technology innovativeness are perceived as more successful, although it is quite possible that more sophisticated and innovative technology is the result rather than the cause of officeholder success. Moreover, innovativeness of technology interacted with messiness to affect attributions of the officeholder's neuroticism and agreeableness. The curvilinear relationship between messiness and visitor attributions became linear in the case of the high tech office, with the most favorable attributions emanating from the high tech, clean office.

6. Study 2: Computer technology portability

Study 1 showed that the innovativeness of the computer technology on display sends both direct and indirect (via interacting with messiness) messages to visitors. Study 2 examines an alternative way of operationalizing computer technology; i.e., portability. Specifically, it looks at the messages conveyed by desktop versus notebook computer technologies. Interestingly, the concept of portability as an attribute of physical objects was first noted by Pratt and Rafaeli (2001). They suggest that the use of portable symbols, such as notebook computers, signifies an employee's need to work out of the office and may be a proxy for organizational identification.

6.1. Method

6.1.1. Participants

Participants were 235 undergraduate students enrolled in an introductory management course. There was no overlap with students participating in Study 1. The subjects were predominantly male (61%) and came from 14 different majors, none of which constituted more that 24% of the sample. As in Study 1, gender had no effect on the dependent variables so was excluded from the analysis. The procedure used was identical to that in Study 1. The design of this experiment was a $3 \times 2 \times 2$ full factorial, with the same three levels of messiness, the same two levels of desk placement and two different types of computer technology displayed in the office (a stationary single flat panel desktop versus a portable notebook computer). Each subject was presented with a single picture of one of the 12 possible office combinations. Like Study 1, there were 18–22 students viewing each office picture.

Table 4
Study 2: Descriptive statistics and correlations ($N = 235$[a])

	Mean	SD	Time mgmt	Work success	Neurot	Extravert	Agreeable	Conscient	Openness
Time management	5.68	1.99	*.86*						
Work success	5.47	1.41	.00	*.70*					
Neuroticism	4.51	1.20	$-.29^{***}$	$-.37^{***}$	*.78*				
Extraversion	4.98	1.37	.03	$.44^{***}$	$-.60^{***}$	*.85*			
Agreeableness	5.74	1.23	$.27^{***}$	$.30^{***}$	$-.65^{***}$	$.50^{***}$	*.85*		
Conscientious	6.36	1.53	$.72^{***}$	$.32^{***}$	$-.44^{***}$	$.23^{***}$	$.47^{***}$	*.87*	
Openness	5.17	1.55	$-.16^{*}$	$.36^{***}$	$-.32^{***}$	$.53^{***}$	$.37^{***}$	.11	*.83*

Note. Scale reliabilities can be found on the diagonal, in italics.
[a] N size varies from 225 to 235 due to missing data.

6.1.2. Manipulation check variables

The two item measure used in Study 1 was used to check the degree of messiness exhibited in the photographs ($\alpha = .86$) and the same single item was used to check the desk placement manipulation. Finally, the portability of technology displayed in the office was evaluated using a single 9-point item with "contains a notebook computer – contains a desktop computer" as the anchors.

6.1.3. Independent variables

Office messiness and desk placement were manipulated in the photographs in a manner identical to Study 1. In this study, rather than the offices varying three degrees of computer technology innovativeness, half of the office photographs contained a desktop computer with a single flat panel monitor, while the other half contained a notebook computer.

6.1.4. Dependent variables

The same dependent variables were utilized in this study. Items used in Study 1 to tap attributions about the officeholder's time management and work success were factor analyzed to determine whether they loaded on the same three factors as in Study 1, which they did. The reliabilities of these scales for this study were as follows: time management = .86; and work success = .70 (see Table 4). The same five item scales as used in Study 1 were used here to tap perceptions of officeholder personality, via Big 5 personality factors. Reliability estimates for these scales were also good (ranging from .78 to .87).

7. Results: Study 2

7.1. Manipulation checks

ANOVA was used to determine the success of the manipulations presented in the photographs. As in Study 1, there were strong main effects for each office design element as depicted in the stimulus materials on its corresponding manipulation check. The manipulation check analysis on the messiness scale revealed nearly identical results to Study 1. That is, office messiness ($F = 184.66$; $p \leqslant .001$) explained 63% of the variance in the messiness manipulation check scale, and desk placement ($F = 382.75$; $p \leqslant .001$) explained 63% of the variance in the desk placement manipulation check scale. Finally, the portability of computer technology measure had a strong main effect on perceptions that the office

contained a desktop versus a notebook computer ($F = 612.75$; $p \leqslant .001$), explaining 73% of the variance.

7.2. Dependent variables

Table 4 shows the descriptive statistics and correlation matrix for the dependent variables. MANOVA results, reported in Table 5, show a strong main effect for messiness ($F = 17.47$; $p \leqslant .001$), and significant main effects for desk placement ($F = 3.62$; $p \leqslant .01$) and a messiness by portability of computer technology interaction ($F = 1.80$; $p \leqslant .01$). These findings explained 37%, 11%, and 6% of the variance in the dependent variables, respectively.

ANOVA was used to determine more precisely the nature of these relations as shown in Table 5. Messiness demonstrated a main effect on each of the dependent variables, with the exception of work success, explaining between 3% (extraversion) and 65% of the variance (time management). Organized stacks yielded the most positive ratings only on the agreeableness scale, although it resulted in lower neuroticism ratings than messy offices and higher extraversion ratings than clean offices. Messiness produced the most favorable openness to new experience attributions, while clean offices, on the other hand, led to the most favorable attributions for officeholder time management and conscientiousness. Thus, little support was found for Hypothesis 1a, given the relative lack of significant findings for the organized stacks and messiness conditions on work-related and extraversion attributions. Hypothesis 1b received some support in the positive effects of clean offices on conscientiousness (but not agreeableness). Finally Hypothesis 1c also received some support in the positive effect of messiness on openness, but the effect for messiness on

Table 5
Effects of office messiness, desk placement and portability of computer technology on perceptions of officeholders ($N = 221$)

Source of variation	MANOVA results	Work attributions		Personality attributions				
		Time mgmt	Work success	Neurot	Extravert	Agreeable	Conscient	Openness
Messiness	17.47*** (.37)	207.23*** (.65)	2.04	4.18* (.04)	3.13* (.03)	6.17** (.05)	57.19*** (.34)	5.34** (.05)
Desk placement	3.62** (.11)	4.31* (.02)	4.40* (.19)	3.09[a] (.01)	6.57** (.03)	3.91* (.02)	1.30	.36
Computer technology	1.17	4.56* (.02)	.93	.19	.30	.09	.37	.22
Mess * Tech	1.80* (.06)	1.75	1.90	.42	2.99* (.03)	.17	.09	3.82* (.03)
Mess * Desk	.97	1.97	.96	.74	.05	1.10	2.18	.66
Tech * Desk	.87	1.55	.03	1.10	2.22	.89	2.99[a] (.01)	2.65
Mess * Tech * Desk	1.52[a] (.05)	5.61** (.05)	.90	1.72	1.82	.80	3.94* (.04)	.93

Numbers in parentheses are η^2 values.
[a] $p \leqslant .10$.
* $p \leqslant .05$.
** $p \leqslant .01$.
*** $p \leqslant .001$.

neuroticism was not as clear. Office occupants of messy offices were rated higher in neuroticism than those in organized stacks offices, but not statistically higher than those in clean offices. The mean values are reported in Table 6. Again, as in Study 1, the hypothesized overall effect for messiness was evident, while specific predictions in Hypothesis 1 received mixed support.

Desk placement significantly affected ratings of officeholder time management ($F = 4.31$; $p \leqslant .05$); work success ($F = 4.40$; $p \leqslant .05$); extraversion ($F = 6.57$; $p \leqslant .01$); and agreeableness ($F = 3.91$; $p \leqslant .05$). The amount of variance in these variables explained by desk placement ranged from 2% (time management and agreeableness) to 19% (work success). The open desk arrangement produced the more favorable perceptions of officeholder time management, extraversion, and agreeableness. These results replicate those in Study 1 with the exception of the additional finding relative to work success. In this instance, the closed desk arrangement led to greater attributions of officeholder success than did the open desk arrangement. The results provide some support for the desk placement relationships in Hypothesis 2, with the exception of the significant effects on work attributions and a lack of any effect on neuroticism and openness.

Portability of computer technology (desktop versus notebook) did not exhibit a significant main effect in the MANOVA. Only one significant finding, time management ($F = 4.56$; $p \leqslant .05$), emerged in the subsequent ANOVA results. Officeholders using notebook computers are perceived as being better time managers than are those who use desktop computers. This suggests a lack of support for Hypothesis 3b. However, as in Study 1, the messiness by technology interaction was instructive.

Portability of technology interacted with messiness to explain 6% of the variance in perceptions of officeholders as evidenced by the significant MANOVA interaction term ($F = 1.80$; $p \leqslant .05$). This MANOVA effect is primarily a function of significant ANOVA interaction effects on extraversion ($F = 2.99$; $p \leqslant .05$) and openness ($F = 3.82$; $p \leqslant .05$), explaining 3% of the variance in each of these perceptions. The specific nature of these interactions is shown in Fig. 3. For extraversion, the portability of the computer makes

Table 6
Study 2: Mean values for main effects ($N = 221$)

Source of variation	Work attributions		Personality attributions				
	Time mgmt	Work success	Neurot	Extravert	Agreeable	Conscient	Openness
Messiness							
Clean[a]	**7.37**[b,c]	5.23	**4.50**	**4.68**[b]	**5.71**[b]	**7.26**[b,c]	**4.82**[c]
Org. stacks[b]	**6.15**[a,c]	5.54	**4.24**[c]	**5.20**[a]	**6.09**[a,c]	**6.68**[a,c]	**5.07**[c]
Messy[c]	**3.58**[a,b]	5.65	**4.80**[b]	**5.04**	**5.41**[b]	**5.17**[a,b]	**5.59**[a,b]
Desk placement							
Open	**5.81**	**5.28**	4.38	**5.19**	**5.89**	6.44	5.23
Closed	**5.55**	**5.66**	4.65	**4.76**	**5.58**	6.28	5.12
Computer technology							
Notebook	**5.88**	5.37	4.48	4.93	5.76	6.42	5.11
Desktop	**5.49**	5.57	4.55	5.02	5.71	6.31	5.22

Note. Bolded numbers indicate a significant main effect.
Treatment means that are significantly different are indicated by appropriate superscripts.

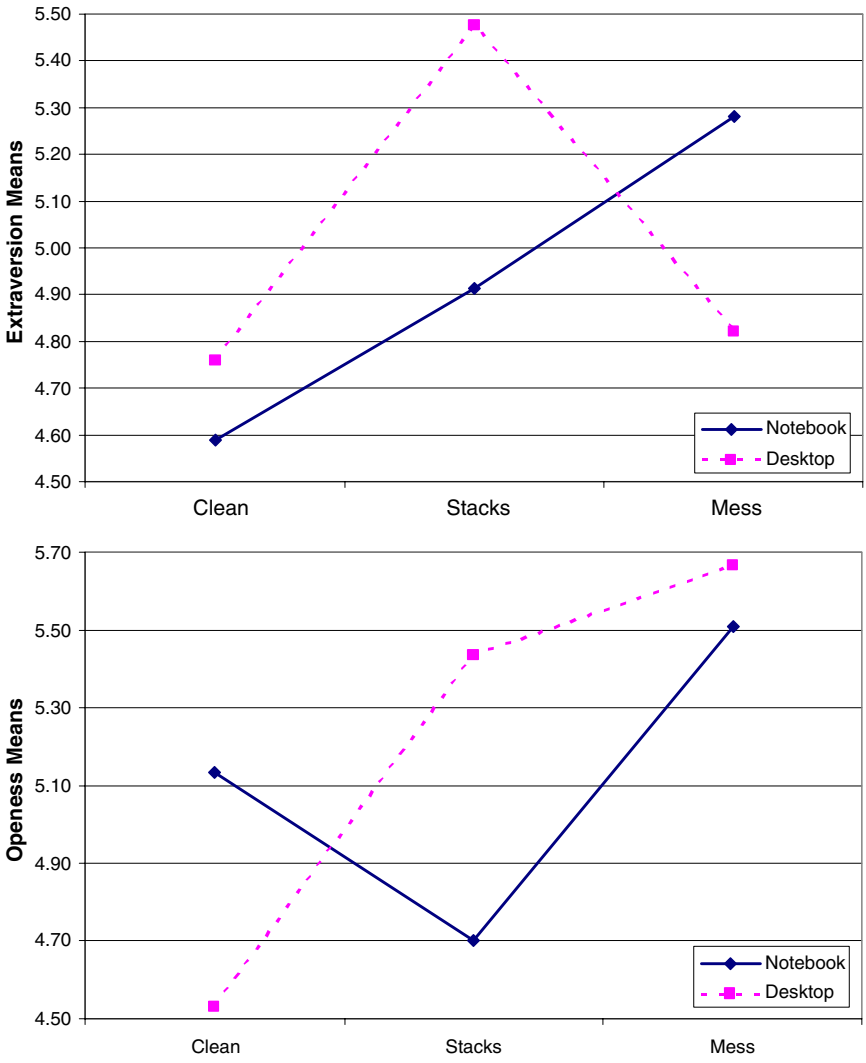

Fig. 3. Effects of the interaction of office messiness and portability of computer technology on visitor attributions of officeholder extraversion and openness.

611 no difference in the clean office condition (both yield low extraversion ratings). The out-
612 come is quite different, however, in organized stacks and messy offices. The desktop com-
613 puter produces the highest perceptions of occupant extraversion in the organized stacks
614 condition, while it is the notebook computer that produces high extraversion attributions
615 in the messy office condition. In terms of openness, an opposite pattern is observed. That
616 is, in messy offices, computer portability evokes little in the way of differential perceptions
617 of occupant openness, but in clean offices, it is the notebook computer that elicits the high-
618 est perceptions of occupant openness. In organized stacks offices, the desktop computer
619 evokes the greatest perceptions of occupant openness to new experience. In summary, with

the exception of the curvilinear relationship between messiness and the use of a desktop computer on extraversion, little support exists for Hypothesis 4b.

The ANOVA results associated with the three-way interactions among office messiness, desk placement, and portability of technology merit comment given the lack of research in this area. Despite its insignificance in the MANOVA, this interaction explained 5% and 4% of the variance in perceptions of officeholder time management and conscientiousness, respectively. In both cases, the open desk arrangement produced similar attributions of the office occupant regardless of the nature of the technology except in the messy office condition. In this instance, a notebook computer served to

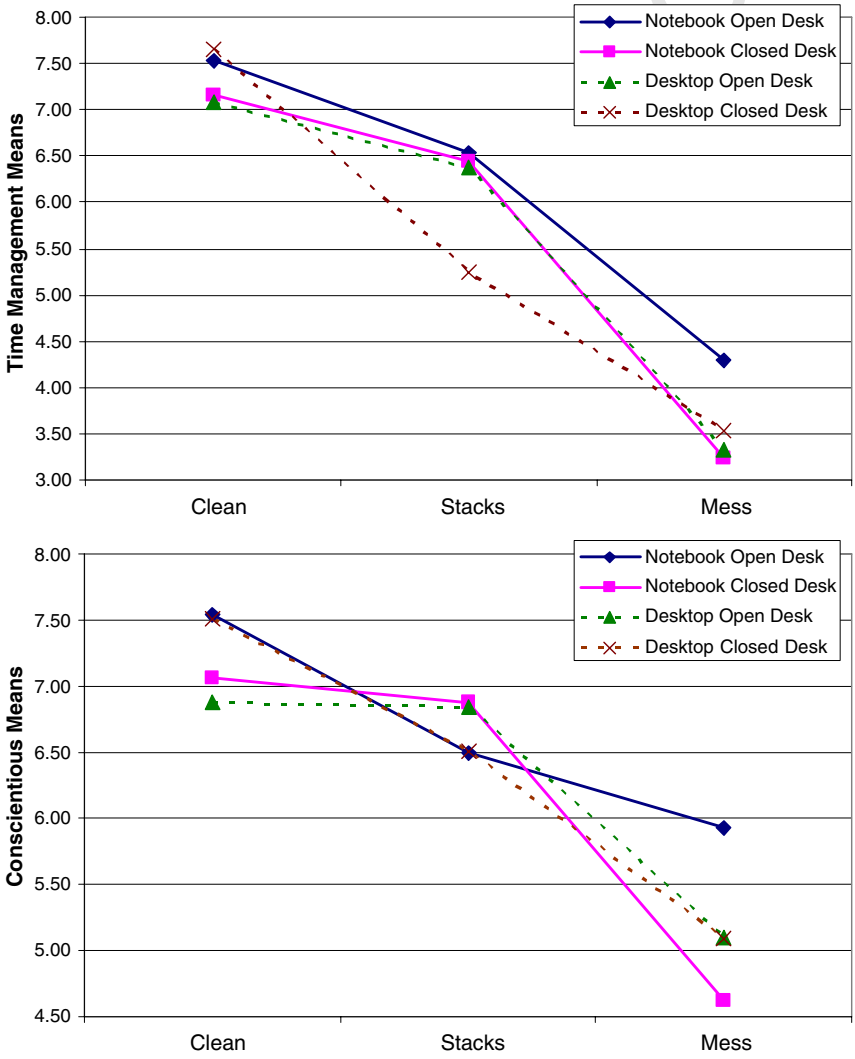

Fig. 4. Effects of the interactions of messiness, desk arrangement and portability of computer technology on visitor attributions of officeholder time management, and conscientiousness.

mitigate the negative messages sent by the messy office. In closed desk arrangement offices the differential effect was produced in the organized stacks offices, where again, the presence of a notebook computer resulted in higher perceptions of officeholder time management and conscientiousness. In the case of perceptions of officeholder conscientiousness, however, the desktop, not the notebook, computer produced higher ratings of this trait in clean and messy offices employing a closed desk arrangement. In each instance, the most noteworthy combination of the three variables was the messy office, with an open desk arrangement, and a notebook computer. This combination produced the most favorable images of the officeholder in the messy condition and broke with the patterns displayed by the other combinations of office design elements. Additionally, in the case of time management, officeholders who had a desktop computer and employed a closed desk arrangement while displaying the organized stacks degree of messiness had lower time management attributions than any other combination of these design elements. These results were unexpected in that Hypothesis 6b predicted that the most favorable responses would come from the organized stacks office with the open desk placement and the notebook computer. But, as shown in Fig. 4, such a combination did not produce more positive attributions of time management and conscientiousness compared to other office design combinations (e.g., clean offices, desktop computers and closed desk arrangements).

8. Discussion: Study 2

This study reaffirms Study 1's predictive effects of messiness and desk placement and the indirect role played by computer technology in establishing a visitor's perception of an officeholder. These three office design elements, separately and in combination, explained between 5% (neuroticism) and 74% (time management) of the variance in visitor attributions of officeholders. Findings with respect to messiness replicated the results of Study 1 for attributions of occupant time management, neuroticism, conscientiousness, and openness. It also replicates the findings for desk placement on time management, extraversion and agreeableness. Study 2 failed to find any direct effect of technology portability on visitor attributions (i.e., no main effect), however it did reaffirm the indirect role of portability of technology in terms of its interaction with messiness. This study suggests that the nature of this interaction is contingent on whether technology is operationalized in terms of portability or innovativeness.

9. Overall discussion

There are two major contributions associated with this research. First, both studies provide continued evidence for office design as a meaningful form of object language. Second, both studies demonstrate that computer technology, a previously unrecognized aspect of office design, also serves as a vehicle for nonverbal communication and impression management.

Specifically, Study 1 and Study 2 confirm previous research that messiness conveys the strongest messages about the nature of the office occupant. Contrary to the expected role of messiness on visitor attributions, based upon Morrow and McElroy (1981), organized stacks did not uniformly produce the most favorable responses. This could be due to either the nature of the attributions involved or how they were measured. It is possible that when

addressing visitor feelings about an office (e.g. welcomeness, comfort) or their perceptions of how people-oriented the occupant is (e.g. friendly, extraverted), organized stacks yields the most favorable attributions (Morrow & McElroy, 1981). However, once one moves into the realm of work related or other personality attributions, different levels of office messiness produce different attributions. An alternative explanation evolves around the fact that Morrow and McElroy (1981) used single-item measures while this study used multi-item measures.

Both studies also reiterated the role of open desk placement in eliciting favorable visitor attributions of time management, extraversion, and agreeableness. This research continues to demonstrate the importance of desk placement as an office design variable. New to this research is the finding that closed desk placement is associated with attributions of office-holder success (Study 2), a result that is consistent with finding that high status (successful) employees prefer closed desk arrangements (Joiner, 1971).

Also new to office design research is the role of computer technology. One of the most intriguing findings was that computer technology was often linked to work attributions but not to personality trait attributions, suggesting that visitors limit their attributions based on computers to work-related phenomena. This suggests that computer technology may have implications only on the instrumental dimension of Vilnai-Yavetz, Rafaeli and Yaacov's (2005) model of artifact sense-making and not on the aesthetic or the symbolic dimensions. This is also consistent with the assertion that portable computers signify a willingness to work even when physically outside of the organization's boundaries (Pratt & Rafaeli, 2001). It was also interesting to note the interactive role of computer technology and messiness on visitor perceptions. Two findings warrant specific mention. First, both studies demonstrate the role played by computer technology as a form of object language through its interaction with messiness. The relationships between messiness and visitor attributions are dependent on the nature of the computer on display in the office. Second, select combinations of messiness and computer technology serve to mitigate the positive image associated with the organized stacks condition found in previous research (Morrow & McElroy, 1981).

These studies demonstrate that computer technology deserves attention as an element of office design as both innovativeness and portability of computers were shown to be salient technological cues. These research findings indicate that the messages conveyed by computers are more indirect and subtle than those conveyed by the more traditional design elements of desk placement and office messiness. This was evidenced by the lack of pervasive main effects for computer technology and by the interaction effects involving computer technology. The primary role of computer technology as a form of object language lies in its ability to exacerbate or ameliorate the effects of office messiness on attributions about the officeholder.

This more subtle role of computer technology as an office design element (as compared with messiness and desk placement) may be a function of several things. First, displays of computer technology are simply smaller than are office messiness and desk placement. These latter design variables may, in effect, visually swamp computer-related artifacts. Second, it has been over 20 years since the original Morrow and McElroy (1981) study, and personal computers have now become so ubiquitous that variation in computer technology is not well differentiated in college students' minds. Therefore, it is possible, that unless computer-related differences are extreme (e.g., virtual reality glasses instead of a monitor, etc.), students do not attend to technological nuances and the visual impact of messiness

and desk placement take precedence. However, permanence versus portability of computer technology may be a more relevant factor, one that is integrated with students' cognitive schema regarding the roles of technology and messiness in forming impressions of officeholders. Lastly, office visitors may themselves be highly variable in their sensitivity to computer-related cues, e.g., older, less tech-savvy visitors may not discern differences in computer innovativeness or portability.

10. Limitations and future direction

The results of these two studies must be viewed with in light of their limitations. Use of pictures to depict offices focuses the respondent on relevant variables of interest but minimizes the potential role of the overall office context (i.e., the ability to "look around" and take in the total office configuration). Therefore, having respondents actually visit a real office constitutes an additional avenue of research. Another limitation is that the measures used in the study were not standardized. We used multiple item measures, which is an improvement over previous research that employed single-item measures (Campbell, 1979; Morrow & McElroy, 1981); but the use of a full-blown personality assessment instrument, such as the 240 item NEO PI-R (Costa & McCrae, 1992), was impractical in this instance (i.e., respondents cannot be expected to be able to make inferences about all of the personality items used in traditional inventories).

These studies raise a number of research questions suitable for future research such as whether such attributions would be different if the officeholder were present or previously known. Second, it was also beyond the scope of this project to ascertain whether the object language is intentionally used by officeholders as a form of impression management. Third, while research has shown that object language accurately reflects some officeholder traits like extraversion (McElroy et al., 1983), our understanding would be enhanced by inclusion of other impressions and personality characteristics. Fourth, office design studies typically examine only the effects on first time visitors' attributions about the officeholder, and thus do not consider the effects of office design variables over time (e.g., would co-worker assessments differ from those of first time visitors). Fifth, the computer manipulations in this research may not have been strong enough to elicit the reactions comparable to those evoked by other design elements, particularly the innovativeness of computer technology. Adding more technological devices to the high tech office (e.g., desktop video camera, scanner) may have made the most computer innovative office more salient. Sixth, future research might examine other variables, such as the location of the computer monitor relative to the visitor; e.g., a monitor could be positioned as an additional barrier where the visitor has no ability to see what is on the occupant's screen or in a very "open" position such that the monitor is readily within the view of a visitor. It would be interesting to see how computer positioning interacts with the open/closed desk arrangements. Seventh, future research could take into account the occupation of the office occupant as a way of clarifying the role of computer technology as an office design element; i.e., computer technology might have a more meaningful role in the office of an information systems analyst than a marketing manager. Lastly, officeholders' reactions to their own work environment are an area that already has a growing research tradition (Fischer, Tarquinio, & Vischer, 2004). Instead, the focus and contribution of this research rests on how object language affects visitors/customers.

More broadly, the most significant impediment to understanding the role of object language in office settings has been the lack of theoretical development concerning how and why objects convey messages. Most work, including this study, has been inductive in nature, seeking to discover whether objects convey consistent messages to others. Theoretical development has also been impeded by the interdisciplinary nature of nonverbal communication research (e.g., management, psychology, communication, computer science) and the diverse range of recipients of nonverbal communication: customers/clients, visitors, coworkers, students, etc. In the absence of such theoretical development, inductive studies such as presented here can help build a body of evidence for the types and contexts of messages being sent by office design elements.

11. Implications

In the best selling book, *Blink*, author Malcolm Gladwell (2005) describes the theory of thin-slicing as ''the ability of our unconscious to find patterns in situations and behavior based on very narrow slices of experience.'' The study of office design as object language is an excellent example of the theory of thin-slicing in action; i.e., visitors form impressions about office occupants based on the messages they receive from the nonverbal cues inherent in office design. In effect, respondents in this research engaged in what is called sensation transference (Hine, 1995). In the marketing literature this refers to transferring sensations about the packaging of the product to the product itself. These two studies show that respondents transfer the sensations they receive from office design elements to the officeholder, confirming the notion that people form complex impressions of others based on limited information (Gilbert, 1998).

The implications of these findings are twofold. First, one can use this information to understand and predict the messages being sent to others and their likely impact on visitors to one's office. Second, one can purposefully use this information as an impression management tactic to create a desired message. In either instance, consider the implications of knowing that office messiness, desk placement and computer technology affect visitor perceptions of the office occupant. Desk placement, in many offices in today's workplace is determined by built-in furniture and is not easily subject to re-arrangement by the officeholder. The nature of one's office technology, as well as its portability, may similarly reflect corporate policies regarding equipment issuance. It is within the realm of messiness that one has the greatest control over the messages conveyed to visitors (both directly and indirectly through the interaction of messiness with desk placement and technology). A better understanding of the language of objects will insure that we will not need that second chance to make a good first impression.

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