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Environmental psychological aspects of new generation offices

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THEORETICAL BACKGROUND

1. Relevance of the topic and objectives

One of the most major places in our adult life is our workplace, using an environmental psychological term it is a primary territory for us (Altman, 1975). Worldwide, more hundred milions of people are affected directly by the issue of the quality of office design. But only in the last few years, it came into focus how the social-physical environment of the workplace can best serve the well-being of the employee. In my thesis, I argue that a paradigm shift is taking place in the *concept of the office* nowadays, which can already be seen in practice. One element of this change is that the classic, dedicated workstation systems are slowly being replaced by more flexible and sustainable structures fitting better the current labor market trends (Gensler Study, 2013; Fox, 2018). I will call these systems *new generation offices*, one example for that is the combination of home office and shared desk systems. The latter is the model where there are fewer workstations in the office space than employees the organization have.

Many psychological advantages and riks of the new system seem to be outlined, but systematic, environmental psychological examination has not been made about the effects of it. One of the reasons for this is that business executives consider the change of office design primarily as a matter of interior design and economics. On the other hand, science has not been able to track the speed of the changes in practice. In my thesis I undertake to take the first steps in understanding new generation offices from environmental psychological perspective.

2. Psychological attributes of the classic office systems

In order to formulate hypotheses for the new generation office systems, it is necessary to take into account the literature on the classic office systems from the last four decades. In this chapter I summarize that briefly.

2.1.The role of ambient environment

Ambient stimuli are considered to be on the periphery of awareness. In a qualitative research made by our research team more than 500 people described the most important criteria for an excellent working environment in their opinion (Frankó & Dúll, *in press*). Our result was that three of the five most frequently mentioned answers were ambient factors: illumination (128 mention), noise (69 mention) and temperature (66 mention).

The results suggest that space users are becoming increasingly aware of the impact of ambient stimuli. In our study *clean*, *ergonomic*, *comfortable*, *good colleagues*, *well-equipped* and *friendly* got into the top 10 criteria (Frankó & Dúll, *in press).*

In terms of *illumination*, the needs of the employees point into the same direction: more natural light an office space has, the higher the satisfaction with the working environment and with the employer. The amount of sleep at night is higher too (Yildirim et al., 2007), as well the less workers leave their offices in the break and long term the organisation (Oldham & Fried, 1987).

In terms of *nois level*, the needs of space users also point into one direction: the quieter an office is, the more employees have chosen it. Noisy environments decrease reading performance, memory capacity on social situations and reduce helpfulness to others. (Dúll, 2007, 2009). One of the main reasons of open office unpopularity is the high and uncontrollable noise level (Kim & de Dear, 2013).

The issue of *temperature* is unique among the amnient stimuli regarding the fact that there are considerable differences between the space users in judging the ideal state. (Veitch et al., 2007). The perception of the office tempreture is deepeding on for example the function or the gender. Women tend to be more sensitive to physical environmental extremes, such as too high or low temperatures (Kim et al., 2013)

Air quality and odors also affect performance (Oh, 2005, in Clements-Croome, 2006; Fisk, 1999), which effect is even more sharp when practicing thinking tasks than routine tasks (Kosonen & Tan, 2004).

2.2. Crowding, distruption

The literature has often linked the experienced crowding and unwanted disruptions with large open-plan offices. However, it is important to emphasize that neither crowding nor frequent disruption is a direct consequence of office design: while the crowding depends on the density of workstations, distruption depends on actual unwanted interactions. It is proved that crowded office spaces can result higher fluctuations, lower level of performance and various health risks such as high blood pressure. (Oldham & Fried, 1987). The random disruption can cause up to 60-100 minutes loss of daily work time (Sykes, 2001).

2.3.Colors, aesthetic elements

Aesthetics or even gamification of spaces are gaining more and more role in office spaces. However, based on the comprehensive research of Kim and de Dear (2013) and based on our own qualitative research (Frankó & Dúll, *in press*), we can tell that the role of colors and textures at workplace is not one of the most important predictors of satisfaction in office environments.

2.4.Natural environment

The topic of office enviroments is usually discussed as a built environment, but it is also important to emphasize the natural environmental aspects of that, because nature plays an important role in recreation and stress reduction (Kaplan, 1995). This effect could be caused not only by the nature beyond the window (Yildirim et al., 2007), but by office plants or even the picture of it (Kaplan, 1983; Kaplan, 1995; Felsten, 2009). Sometimes employees create their own green environments on their workstations (see personalization later).

The results presented in this chapter are derived from the research of the classical systems but it can be easily adapted to the new generation offices too.

3. New generation offices

There is still little knowledge about the new generation offices in an environmental psychological context, but the most important characteristics are already apparent from practice. In this chapter I will briefly introduce two important aspects of the new generation office concepts: home office and desk sharing.

3.1. Home office

With the advent of digitalization and mobile work devices, home office has become a real opportunity in more and more professions. However, statistical data shows that this option is not really popular by itself but with combining with other work alternatives (such as at new generation offices, Bloom et al., 2013). Olson (1983) collected the basic conditions of successfully working from home: he defined the task aspects and the personal aspects. In terms of the task he emphatized minimal physical conditions, individually variable time table, well-defined performance indicators and the need for relatively high concentration and low communication. From the person's side Olson emphasized high self-control, intrinsic motivated work and family status. Olson (1983) considered social isolation as the greatest risk of working from home. De Croon (et al., 2005) considered proven based on a meta-analysis that home office creates greater sense of autonomy than the office work, since the person can better control the time and the way of his activity. Among the disadvantages, it has been confirmed that overtime is more common in the home office and at the end of the work day adrenaline level returns back to the baseline (De Croon et al., 2005).

3.2. Shared desk system

Bodin Danielsson and Bodin (2009) defined the shared desk as the most open office design in the enclosed-open spectrum, however, in my opinion, shared desk can not be placed in this dimension. I argue, that this system represent a completely different quality of work environments. The advantage of a shared desk system on the employers' side is cost reduction, on the employees' side is greater spatial flexibility and autonomy. To achieve these advantages, the organization must provide appropriate physical (eg, alternative workspaces) and virtual environments (eg, appropriate online communication softwares). On the other hand, the lack of an own territory can be considered as a risk factor (cf. Fried, 1963; Dúll, 2015b).

4. Critical aspects of new generation offices from an environmental psychological perspective: territorial behavior, place attachment and experienced privacy

In this chapter I will discuss environmental psychological consepts, which can be regarded as the psychologically critical points of the new generation offices, and psychological advantages and risks of the structure can be grasped as well.

4.1. Human territorial behavior

Irwin Altman, one of the first and most important theorists in this field, defined human territorial behavior as a boundary-regulation mechanism, *"thet involves personalization of or marking of a place or object and communication that it is "owned" by a person or group"* (Altman, 1975, 107). He.). The main function of human territorial behavior is the protection of privacy, the communication of psychological ownership, personal identity and roles (Altman, 1975; Wells, 2000; Wells & Thelen 2002).

The expressions of human territorial behavior can be grouped in several ways. The question can be examined depending on *among whom* the territorial behavior happens: between groups or individuals belonging to a group (Taylor, 1988). We can also approach the topic from the angle of the *place*, Altman (1975) distinguishes primary, secondary and public territories. It is widely devided in literature what category the workplace should be classified. Based on the traditions of our research group (Dúll & Tauszik, 2006; Dúll, 2009; Frankó & Dúll, 2017, 2018), we consider classical office structures with fix workstations as primary territories based on the high level of ownership and control on it.

The territorial behavior can be categorized according their *content* as well. Altman (1975) separates four patterns. I summarize and illustrate them with office-related examples in Table 1.

Type	Definition	Office example
Identity-oriented marking (Personalization)	Intended decoration. It is typical when having clear territorial conditions. Its level is related to the satisfaction with the physical environment and the job, and indirectly with well-being. *(*Wells, 2000, Wells, 2007, Brown 2009).	Placing pictures, diplomas
Control-oriented marking	Designing and communicating borders. It appears when territorial relations are might not clear. (Brown, 2009)	fencing your own workstation with plants, cables, and folders
Anticipatory defending	Its purpose is to prevent an attempt. It happens when communication is no longer possible or enough. (Brown, 2005).	Using passwords and lockers
Reactive defending	It responds to the already existing territorial violation. Its purpose is to express negative emotions or to restore the original conditions. (Brief & Weiss, 2002 in Brown 2005).	ajtó csapkodás, bepanaszolás a felettesnek

Table 1. – Types of Human Territorial Behavior Along Its Content (Own Editing)

4.2. Place attachment

The concept of place attachment is closely related with territorial behavior. It can be considered as one of the human variants of territorial behavior (Taylor 1988). Altman and Low (1992) define it as an emotional relationship or an emotional component of a relationship between a person and a place.

In the context of employer-emloyee relationship, workplace attachment is the discussed phenomenon in the literature. Our research group argued what can be the smallest, meaningful transactional unit in this field (Frankó & Dúll, 2018). We described workstation attachment as this smallest, meaningful unit since lot of important psychological processes within the office space are related to the employees' own place. (Frankó & Dúll, 2018). In the field of place attachment, the literature describes that the pattern of different place attachments overlapping eachother can be varied (Altman & Low, 1992). It means we can develop attachment with different strength to the workstation, to the workplace includes the workstation, or to the city includes the workplace.

4. Experienced privacy

The phenomenon of experienced privacy is also closely linked to the human territorial behavior, namely it is generally regulated by territorial behavioral actions. According Altman (1975, p. 18), it means the "*selective control of access to the self or to one's group*".

Optimizing the level of the privacy is a complex boundary control process which help us to regulate the quality and quantity of the interaction with others.

In office environments, the relationship between experienced and architectural privacy has been often discussed in the past 4 decades. Namely, the question was which office design supports their users and the boundary control process of the users' better. Based on the results, it can be stated that employees working in large open space offices are generally less satisfied with their experienced privacy (Oldham, 1988; Laurence et al., 2013).

5. Relationship between environmental psychological variables and well-being

Under subjective well-being we mean people's assessment of their own lives (Diener et al., 1997). According to the literature of the last decades, the integration of well-being into environmental psychological studies has greatly contributed to the understanding of the workplace-personal transaction (Vinsel et al., 1980; Wells, 2000; Bridger & Brasher, 2011). Office design and the physical environment of the workplace therefore have an impact on the personal-environment transaction, they may even appear as motivators (Frank & Dúll, in press). The effect of the physical environment appears in the level of environmental psychological variables, which are predictors of mental health constructions such as emotional exhaustion or well-being.

A comprehensive model of the relationship between environmental psychological variables has not yet been developed. Therefore, it would be difficult to outline such a model for new generation offices, as even the nature and evolution of the variables in these systems are still unclear.

In my dissertation I present a case study where some of the employees remained in the classical office system while the other part of the empoyees exchanged to the new generation system (shared desk + home office 1 day a week). It was an individual decision of the employees wheter they wanted to stay or change. In case of those who kept their own workstations, I did not assume any change in the level of environmental psychological variables and well-being, because in their case (apparently) there was no change in the office design either. My hypotheses and their justification regarding the employee who gave up their own workstations are summarized in Table 2.

Variable	Proposed direction of change	Justification
Personalization **(Territorial behaviour)**	Decrease	The amount of physical space controlled by the individual is reduced.
Control-oriented marking **Anticipatory and reactive defending** **(Territorial behaviour)**	Increase	Territorial relations become unclear and an attempt is made to create a new balance.
Workplace attachment	Doesn't change	Workers have been able to decide whether to enter the new generation system or not, and in this case their decision can be considered as the favorable one.
Workstation attachment	Decrease	Every day they need to attach to a new territory.
Experienced Privacy	U-shape	In the short term, I assumed to appear the experience of loss due to the loss of the own place. In medium term when "learning" home office strategies the loss can be compensated.
Well-being	reverse U-shape	The greater autonomy of the new type of work can bring a rise in the level of well-being in short term, which, after adaptation, re-emerges to pre-change levels.

Table 2. – Summary of hypotheses (own editing)

METHOD

The study was carried out at a large multinational company in Western Hungary where the organization was partially change from a classic office system with dedicated workstations to a shared desk model with home office opportunity once a week. Groups could join this initiative in a pilot program. In addition, the employees of the joining groups also had the right to decide whether to change or remain in the classical system. With the help of the survey reserch I tried to understand the psychological impacts of this design change. The questionnaire was recorded at 3 times: *before the introduction*, *2 and 6 months later*. The quantitative data was supplemented with focus group discussions conducted 4 months after the introduction. The data collection tools are summarized in Table 3.

Kérdőív	
Irodai territoriális viselkedés (Identity-oriented marking, Control-oriented marking Anticipatory and reactive defending)	Based on the Territorial Behavior Questionnaire by Graham Brown (2009). The validity of the Hungarian-language questionnaire was carried out within the framework of the dissertation.
Észlelt magánszféra	Experienced Privacy Questionnaire (Frankó & Dúll, 2017)
Workplace attachment	Workplace Attachment Questionnaire (Frankó & Dúll, 2018)
Workstation attachment	Workplace Attachment Questionnaire (Frankó & Dúll, 2018)
Well-being	WHO, Susánszky et al. (2006)
Focus groups	
Focus group conversations with 2 x 4 people	- General experiences of transition - Evolution of space usage patterns - Benefits of the new system - Disadvantages of the new system and coping strategies - Social interactions - Home office experiences

Table 3. - Summary of data collection methods (own editing)

I made measurements in four groups. From the three survey dates, a total of 235 evaluable questionnaires were received: 66 from the first, 72 from the second and 97 from the third measuring point. The data distribution is presented in Table 4.

For the adaptation of the Territorial Behavioral Questionnaire I used a bigger sample of 219 individuals from two different studies.

	Before implementation	2 month later	6 months later	Sum
1. grupo	**45**	**29**	**33**	**107**
Doesn't have own workstation	-	24	26	50
Has worksation	45	5	7	57
2. grupo	**21**	**8**	**14**	**43**
Doesn't have own workstation	-		2	2
Has worksation	21	8	12	41
3. group		**18**	**44**	**62**
Doesn't have own workstation	-	7	32	39
Has worksation	-	11	12	23
4. group		**15**	**6**	**21**
Doesn't have own workstation	-	8	4	11
Has worksation	-	9	2	10
Sum	**66**	**72**	**97**	**235**

Table 4. – Number of participants by groups, by measurement date and by workstation status
(own editing)

RESULTS

- **Adaptation of the Territorial Behavioral Questionnaire to Hungarian**

The questionnaire was examined in Hungarian with confirmative factor analysis. The values obtained are not perfect along the absolute indices (Schereiber et al., 2006), but can still be considered acceptable (see Table 5). So I used this instrument in the followings with the original factor structure published by Brown (2009). Based on the Shapiro-Wilk test, the distribution of all four sub-scales of the Hungarian language version are asymmetric and significantly different from normal, therefore I used non-parametric tests to investigate the evolution of this variable.

	chí^2	df	CFI	TLI	RMSEA	SRMR	AIC
Magyar változat	663,10	226	0.835	0.815	0.094	0.092	15283.398

Khí^2 = chí^2 fitness indicator; df=degree of freedom; RMSEA = Root-Mean-Square Error of Approximation; AIC = Akaike Information Criterion; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; SRMR = Standardized Square Root Mean Residual.

Table 5. – Fitness of the 4-factor-structure of Territorial Behavioral Questionnaire
with Confidential Factor Analysis (Own Editing)

- **The development of territorial behavior**

The extent of personalization (see Figure 1) was significantly reduced not only by employees who lost their workstations, but in the whole population based on the Kruskal-Wallis test result (chi^2 = 26.911, df = 2, p <0.001, r = 0.302). There was no significant difference between the two subgroups at any time of the survey. The same tendency was confirmed for the full-scale value of territorial behavior as well (chi2 = 28,348, df = 2, p <0.001, r = 0.31). There was no significant change in the level of the other three sub-scales of territorial behavior (control-oriented marking, anticipatory and reactive defending).
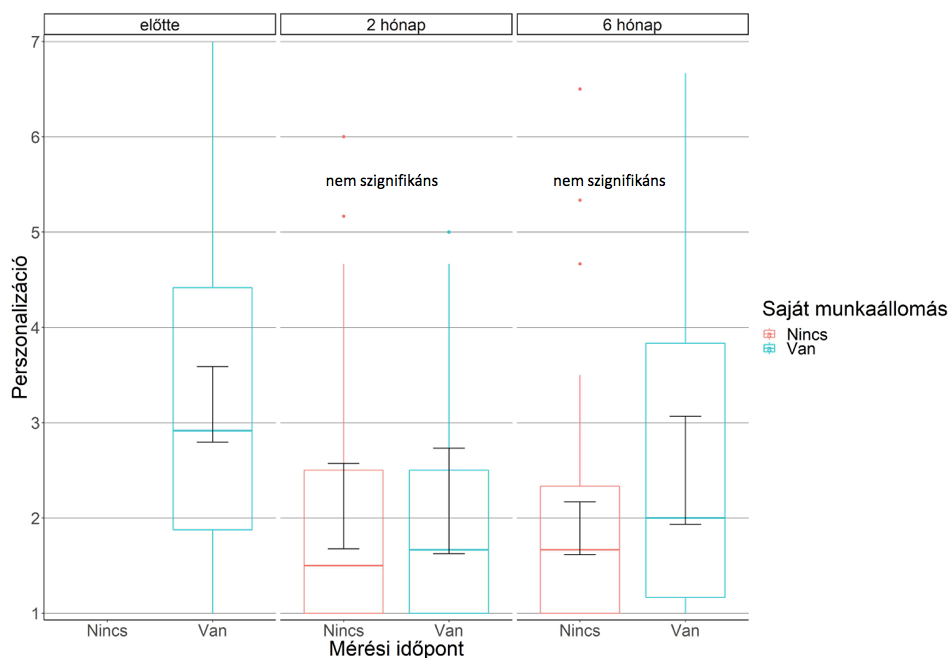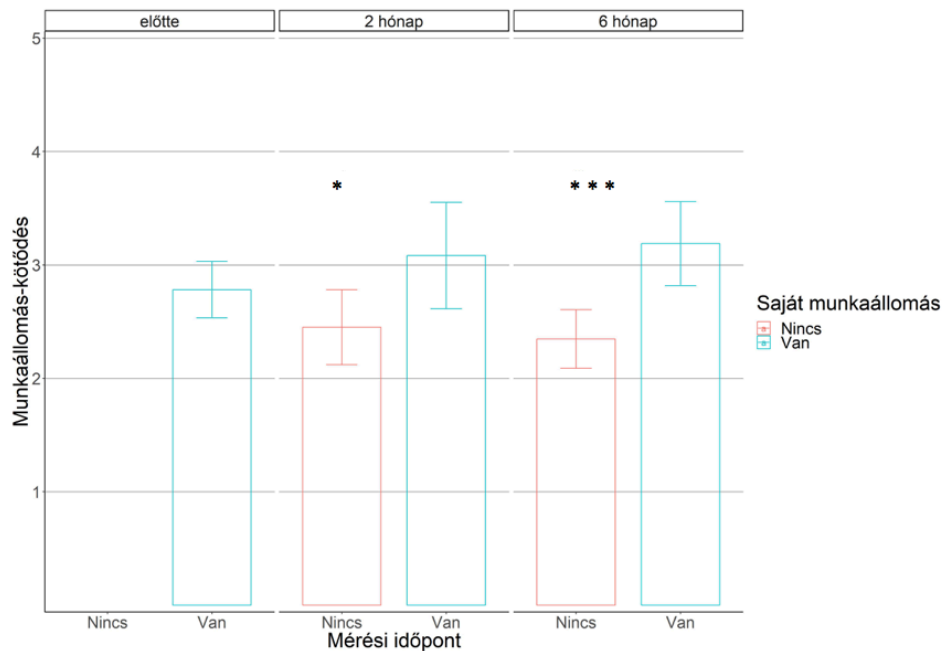

Figure 1 - The evolution of personalization in the light of the presence and absence of a workstation and the passage of time (own editing)

- **The development of place attachment**

According to the hypotheses, I did not get any significant change in the level of workplace attachment in any of the subgroups at any of the measuring points.
In terms of workstation attachment, I expected the values of the two groups to come apart. I already got significant difference between the two subgroups at the 2-month measurement (t=-2.25, df = 53, p = 0.029, d = 0.29), this difference increased for the 6-month measurement (t = -3.76, df = 63, p <0.001 , d = 0.43). Half year after the implementation the workstation

attachment of those who lost their workstations was significantly lower than the baseline measurement (t = 2.42, df = 124, p = 0.017, d = 0.21).
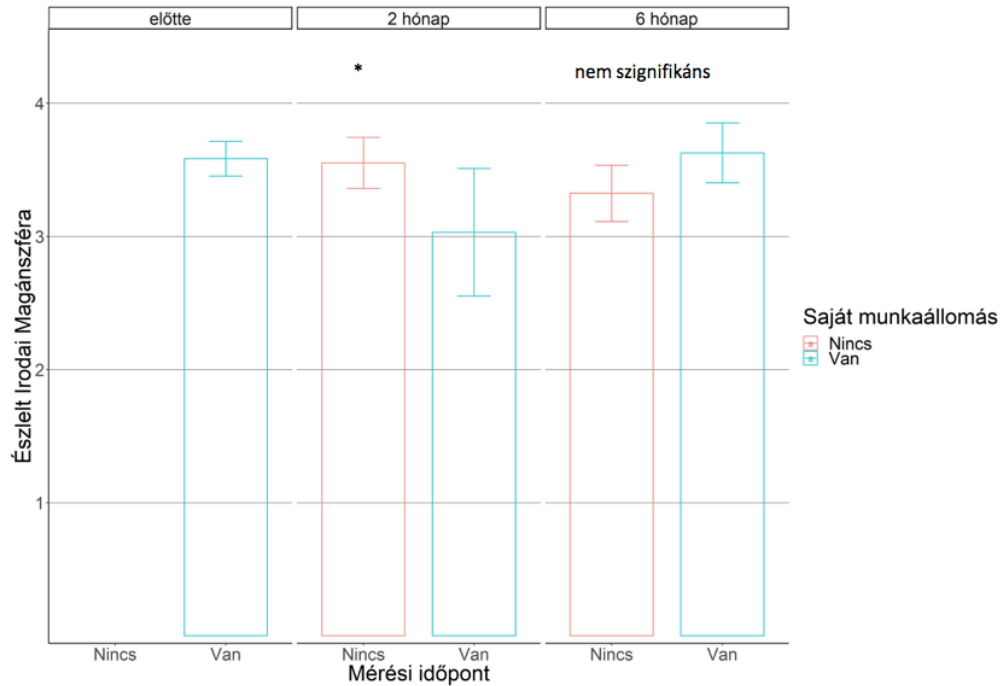

* <0,05, ** < 0.01; *** < 0.001

Figure 2 - The evolution of workstation attachment in the light of the presence and absence of a workstation and the passage of time (own editing)

- **The development of experienced privacy**

Compared to the baseline, the privacy of those who kept their own workstation decreased by 2 month (t = 2.269, sf = 37, p = 0.029, d = 0.349). In this measurement phase, the privacy of those who kept their own workstation was significantly lower than the people who gave it up (t=2.06, df = 42, p = 0.046, d = 0.302). By the time of the 6-month measurement, the trend reversed: the experienced privacy of those who kept their own workstations began to grow, and the others' began to shrink. The difference between the subgroups at the 6-month measurement point just did not reach the significance level.

* <0,05, ** < 0.01; *** < 0.001

Figure 3 - Evolution of the experienced privacy in the light of the presence and absence of a
workstation and the passage of time (own editing)

- **The development of well-being**

I did not get any significant change at any time and in any subgroup.

- **The relationship between variables**

I made the correlation matrix of the measured variables (Table 6.)

	Territorial behavior	Identity-oriented marking	Workplace attachment	Workstation attachment	Experienced privacy	Well-being
Territorial behavior	1	0,745***	0,304***	0,368***	0,017	-0,099
Identity-oriented marking		1	0,288***	0,321***	0,125***	-0,086
Workplace attachment			1	0.610 ***	0,100	-0,053
Workstation attachment				1	-0,027	-0,334***
Experienced privacy					1	0,190**

* <0,05, ** < 0.01; *** < 0.001

Table 6. – Correlation of environmental psychological variables measured in the case study

- **Focus group**

General experiences of transition	There is a general positive response, but there are also opponents. Organization of work takes more time. "Mistrust decisions" can undermine the benefits of the system (eg home office can only be limited to specified days)
Evolution of space usage patterns	The transition was sudden, but the majority quickly adapted. The implementation did not affect colleagues in the same way. The possibility of personalization has been reduced. Territorial conflicts have appeared. More virtual interactions.
Benefits of the new system	Falling congestion, quieter office. Less commuting. Increased effectiveness
Disadvantages of the new system and coping strategies	IT and hygiene conditions are not appropriate. Less sharp work-life boundaries. The issue of collective responsibility (the one who is in the office is responsible). The appearance of mistrust towards one another (who is at home, not working).
Social interactions	New relationships are emerging. More virtual interactions.
Home office experiences	It is a great advantage for the system, but not a real option for everyone.

DISCUSSION

According to the results of the dissertation, with the introduction of the new generation office design, the form and content of office personalization is transformed, and transferred from workstations to temporary, group and virtual spaces. Although the level of control-oriented behavior has not changed with time, the introduction of the online booking system can be categorized into this content category, which was not explicitly measured by the questionnaire. Defending behaviors did not appear, which suggests that the booking system is able to settle the territorial relations.

The development of the workplace attachment and workstation attachment showed a different tendency, however we got a strong positive correlation between them. Therefore, the validity of the workstation attachment concept was confirmed and proved by the fact that the variable can be interpreted even in the new generation system with temporary workstations.

In terms of experienced privacy, the results show that the benefits of the system appear soon, but in a couple of weeks they become evident. At the same time, the system's disadvantages begin to emerge in medium term, possibly after getting into a difficult or conflicting situation.

The level of well-being stagnated with time, which may be good news for employers considering the implementation. A very important result in terms of well-being is that its level is significantly and inversely correlates with the level of workstation attachment. Without knowing the causal directions, this can also be interpreted as high workstation attachment can be a risk factor of office design change in terms of well-being.

The results underline that the personal-environment transaction has been transformed at many points with the implementation. We cannot state in general wether the new generation office is good or bad for the employees, that depends always on the actual space-user fitness

CONSEQUENCES

The new generation office can also be considered as a primary territory in the future, which statement is supported by the constant level of workplace attachment within time. The details of the implementation, the organizational, physical, and virtual environment surrounding the system, and the fintess of the system with the personal conditions can decide in each case whether a new generation office will be liked or not. We can also say the tracking the psychological variables in the new system is essential, cause they are constantly and dynamically changing.

Trust is an important element of the success of the new generation office system, organizational maturity is necessary for introducing new generation offices. In the new system, it is essential to provide choices and alternatives. At the examined organization, it was really important for the colleagues that they could decide about the participation.
So we don't have to decide whether a paradigm shift in office design is good or bad, but we must understand the psychodynamic contextual processes more thoroughly, and explore possible causal relationships and build valid models in the near future.

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