International Journal of Business, Human and Social Sciences
ISSN: 2517-9411
Vol:11, No:7, 2017

Interruption Overload in an Office Environment: Hungarian Survey Focusing on the Factors that Affect Job Satisfaction and Work Efficiency

Fruzsina Pataki-Bittó, Edit Németh

***Abstract*—**On the one hand, new technologies and communication tools improve employee productivity and accelerate information and knowledge transfer, while on the other hand, information overload and continuous interruptions make it even harder to concentrate at work. It is a great challenge for companies to find the right balance, while there is also an ongoing demand to recruit and retain the talented employees who are able to adopt the modern work style and effectively use modern communication tools. For this reason, this research does not focus on the objective measures of office interruptions, but aims to find those disruption factors which influence the comfort and job satisfaction of employees, and the way how they feel generally at work. The focus of this research is on how employees feel about the different types of interruptions, which are those they themselves identify as hindering factors, and those they feel as stress factors. By identifying and then reducing these destructive factors, job satisfaction can reach a higher level and employee turnover can be reduced. During the research, we collected information from depth interviews and questionnaires asking about work environment, communication channels used in the workplace, individual communication preferences, factors considered as disruptions, and individual steps taken to avoid interruptions. The questionnaire was completed by 141 office workers from several types of workplaces based in Hungary. Even though 66 respondents are working at Hungarian offices of multinational companies, the research is about the characteristics of the Hungarian labor force. The most important result of the research shows that while more than one third of the respondents consider office noise as a disturbing factor, personal inquiries are welcome and considered useful, even if in such cases the work environment will not be convenient to solve tasks requiring concentration. Analyzing the sizes of the offices, in an open-space environment, the rate of those who consider office noise as a disturbing factor is surprisingly lower than in smaller office rooms. Opinions are more diverse regarding information communication technologies. In addition to the interruption factors affecting the employees' job satisfaction, the research also focuses on the role of the offices in the 21st century.

***Keywords*—**Information overload, interruption, job satisfaction, office environment, work efficiency.

I. Introduction

COLLABORATIVE work environment is considered as a key factor in business, not only because collaboration improves profitability, but it also attracts top talents [1]. On the other hand, collaboration does not exist without continuous communication and connectivity and frequent interruptions, which makes it difficult (and leaves little time) for employees to complete all the critical work [2].

F. Pataki-Bittó and E. Németh are with Department of Ergonomics and Psychology, Budapest University of Technology and Economics, H-1117 Budapest, Magyar Tudósok körútja 2., Hungary (phone: +36-1-4632654; e-mail: bittofruzsina@erg.bme.hu, nemethe@erg.bme.hu).

A. Interruption Science

Researchers focusing on interruptions in the office environment have been investigating the effects, types and structure of interruptions, but also attempted to find solutions to avoid the negative effects: time loss (time pressure), energetic cost (recovery effort), error (failure), emotional strain, and Zeigarnik effect (mental workload) [3]. To be able to measure the negative effects, a subjective measure, the Cost of Interruption, has been often used, which is the price a user would pay to remain undisturbed while working on a computer-based task [4], [5].

Interruption science is focusing on the interruptions caused by communication channels and technologies, such as telephones, instant messengers, email notifications, alerts, and colleagues, but these factors are often analysed together with the **office environment** (office noises, conversations nearby, colleagues' phone conversation, etc.), because noise pollution is also an important disruptive factor and has a negative effect on work efficiency [6].

B. Related Work

A qualitative research project by Sykes [7] identified five basic types of interruptions at a mid-size software development company: telephone, instant messenger and updating software notifications, email notifications, and colleagues. In addition to these interruption types, the distractions by surrounding office noises were also recorded. The result of the research shows that the number, the lengths and the types of interruptions differ by **position**. Employees in higher positions had six times more and significantly longer interruptions than the employees in lower positions. The number of distractions (office noise) was higher for employees in lower position.

Nees and Fortna compared the two main types of interruptions [8]: **virtual and human** during a data entry task. It has been found that the interruption lag - the period from perception of the interruption to the acceptance of the interruptive task [3] - was shorter at human interruption, but there was no difference between the numbers of errors. However, this experiment also confirmed previous outcomes [9], [10] that **timing** is a crucial characteristic of interruptions (both virtual and human).

If the interruption occurs later in the primary task,

especially when the user reaches a strategic stopping point, the interruption causes fewer mistakes and the user can be more productive in the interrupting task as well [8]. Studies showed that if a user is interrupted at a task boundary it causes less annoyance, frustration, and time pressure, and required less mental effort [11]. Regarding error rate and timing: if the interruptions are random, the error rate is double and the time required to complete the primary task is about 30% more than the other case when the interruptions happen at subtask boundaries [12]. If the interruption is at the right moment, it needs less time to restart and resume the original task after the disruption and the annoyance level is also lower [13].

Regarding timing, it was also found that those interruptions which the user knows about in advance have more negative effects on the performance than the sudden interruptions, which suggests that the preparation of an interruption needs additional cognitive resources [14].

The level of negative effect also differs by the **cognitivity** of the primary task: if a person is working on a high cognitive load task or at a stage of the task when the mental workload is high, the negative effect of an interruption is higher than at a routine task [13].

The topic of the interrupting task also matters: it is easier to find the thoughts of the original activity when the interruption is over if the topic is **relevant** to the primary task [15].

In addition to the types and timing of interruption and the cognitivity of the primary task, other individual differences, personality measures were tested as well, for example*:* polychronicity [16], working memory capacity [14], multitasking ability [17], openness to experience and personal need for structure [18].

C.Approaches to Reduce Negative Effects

In order to reduce the negative effects of interruptions there are several possible options, which, according to C.P. Janssen et al. [15] can be categorized by two strategies: 1. Stop unnecessary interruptions from occurring and 2. Change the timing of interruptions. In Table I, we present a summary of the possible techniques.

There are low-cost solutions which can reduce the number of unnecessary interruptions, like education and training. By informing employees of the negative effects of interruptions, employees learn to distinguish between necessary and unnecessary questions [19], [7]. Trainings can also teach how to prevent self-interruptions and unnecessary task-switching, as it is not only the interruptions of others that have negative effects.

Often people feel that it is easier to ask a colleague than to search for the answer in other resources – that is why an improved knowledge management system with a user-friendly knowledge database can also help to reduce unnecessary interruptions.

Another low-cost possibility is an HR tool: work schedule and work arrangements. Regarding the Kelly Services 2016 research, flexible work arrangement is among the top three features that top talents look for (the other two are defined as: culture of innovation and creativity and highly collaborative environment) [1]. Flexible work arrangement can be realized in many different ways and it is also a challenge for the organizations to find the ideal level and mode of flexibility.

The concept of quiet time means that the management defines periods during the working day, when no one could interrupt anyone else in order to complete high mental workload tasks [20].

Organizations can also set up guidelines for the usage of communication channels including the purpose and effective ways of using each available communication device and communication form.

The other approach to reduce the negative impacts of interruptions is based on technology. There are ideas that focus only on one interruption type: for example, Grandhi and Jones suggest phones that provide information on what the call is about to improve call handling decisions [21]. Paul et al. worked on notifications to make them support task management [22], whereas Dan Ariely has created a web app to receive incoming emails and sort them in a way that they are already grouped by indicated purpose, origin and urgency [23].

Donmez et al. introduced a product which helps to control both face-to-face and virtual communication: the user can determine time periods when the software blocks electronic interruptions, while the hardware part indicates the state of the user by color [24].

TABLE I
INTERRUPTION MANAGEMENT TECHNIQUES

Stop unnecessary interruptions from occurring		Changes the timing of interruptions	
	Physical barriers to improve privacy	Organizational rules and regulations	Computer based solutions
• Education, training • Improved knowledge management system	• Floor plan design: focus rooms, phone booths… • Office furniture solutions: screens, wall partitions…	• Quiet time • Flexible work arrangements • Message/email policy and guideline	• Software settings • Intelligent attentional draw • Communication mediator technologies

Interruption researchers together with software developers are working on more complex solutions as well: mediator technologies that can reduce unwelcome interruptions. The aim of the researchers is to develop intelligent technologies that control electronic interruptions based on topic relevancy, priority or user focus at the moment of the interruption. These technologies are monitoring interruptibility using different kinds of sensors [25]-[28].

II. OBJECTIVES

To sum up, there is a wide range of solutions organizations can choose from and combine. With our research, we intend to help organizations find where to start and what to focus on

regarding interruption management. In the survey, it was decided to investigate the employees' overall impression of the disruptive factors and their opinion of the communication channels. It is believed that their personal judgement is significant if the organization intends to improve not only productivity, but the level of job satisfaction as well.

The framework of the survey is based on the presented literature and includes the following topics:

Office environment: Do employees feel that office noise is disruptive?

Cognitivity: Do employees feel that they have trouble with completing tasks that demand concentration?

Communication channels: How do employees feel about the different types of communications?

Written or face-to-face communication: Which one do employees prefer at the workplace?

Negative effect: In the employees' opinion, is there a communication type that keeps them from effective work?

Solutions: What are the strategies employees use to be able to focus on cognitive load tasks?

The research started with in-depth interviews of the listed topics, and based on that, we collected the variables that might influence the opinion on interruption types.

- size of the office room
- position
- age
- type of work (percentage of high cognitive load tasks)
- work arrangements
- communication culture of the organization
- personality

As personality is a complex variable, this survey does not aim to investigate the differences by personality.

III. Survey Method and Participants

The survey was conducted in December 2016, the participants were recruited through email and social media. Our aim was to reach people who work in different environments, conditions and organizational culture. In one month, the survey was completed anonymously by 141 employees who do computer-based work in the office environment.

The questionnaire consisted of five sections:

1) General questions related to the respondent's job and work arrangements.
2) Communication channels used at work.
3) Personal opinion of the communication channels.
4) Questions of the cognitive tasks.
5) Demography.

Nearly half of all respondents (47%) work at the Hungarian office of multinational companies, while the remainder are from Hungarian companies (27%), state-owned institutions (21%) and others (non-governmental organizations, associations, 5%).

Considering the size of the office room, 40% of the respondents are working in small offices (with 2-5 workstations in an office room), 33% in an open-space environment, 14% in private offices, and 13% in medium-size office rooms (with 6-20 workstations). The open-space office is characteristic of multinational companies, whereas small offices are typical of Hungarian companies and institutions.

Some 45% of the people questioned are working in management positions. The majority of respondents are under 45 years of age: 48% are between 35 years and 44 years, and 42% are under 35 years. Regarding working schedule, a little over half of the respondents are working in flexible working schedule.

IV. Survey Results

The information below summarizes statistics of the survey by the framework presented.

A. Office Environment

Do Employees Feel that Office Noise Is Disruptive?

A total of 63% of respondents reported that they are able to block out environmental noises while concentrating on a task, while 37% of respondents chose the following statement: "The noises of the office environment (for example, doors opening/closing, steps or phone calls of colleagues) are very disturbing during work that requires concentration." This fact indicates that the efficiency of over one third of people is influenced by environmental noise.

By analyzing the answers, it appears that office noise as a disturbing factor does not correlate with the size of the office room. The percentage of those who are disturbed by office noise is higher among people working in small offices (2-5 work stations) than those working in open plan offices.

B. Cognitivity

How Many Hours/Day Should Employees Spend on High Cognitive Load Tasks?

As interruptions have the most destructive effect on high cognitive load tasks, it is important to know the proportion of cognitive load tasks during an average working day. Instead of the expression "high cognitive load task", we used the expression "task demanding concentration" for better understanding.

As Fig. 1 shows, more than half of the respondents indicated to have less than two hours of tasks demanding concentration per day, while 38% of respondents have 3-4 hours and 11% reported more than four hours of cognitive load task per day.

Is It Possible to Complete High Cognitive Load Tasks at the Workplace during Working Hours?

This research question aimed to determine whether those tasks demanding concentration were able to be completed during normal working hours or required extra working hours.

Generally speaking, almost half of the people questioned were not able to complete concentration demanding tasks during normal working hours. By analyzing the hours of cognitive load tasks, the results show that less than one hour per day of cognitive load tasks can be performed during normal working hours, while about half of those workers who have more than that have to go in earlier or stay late to

complete their tasks (Table II).

Regarding positions, among **managers**, the percentage of those who can complete their cognitive load tasks during working hours is significantly lower (35%) than among employees (60%), whereas they do not have more cognitive load tasks than others (Table III).

We did have an assumption that those who are working in open plan office find it harder to complete concentration demanding tasks during normal working hours, but the result of this survey suggests that the **size of the office** does not matter.

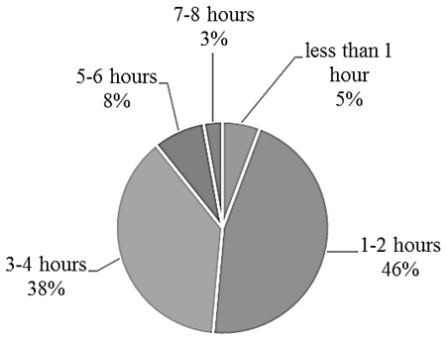

Fig. 1 Hours of cognitive load tasks/day

TABLE II
COMPLETION OF CONCENTRATION DEMANDING TASKS

		Hours of concentration per day				Total
		less than 1	1-2	3-4	more than 4	
In order to complete concentration demanding tasks I go earlier to work or stay late.	Count	0	33	30	6	69
	% within Hours of concentration	0.0%	50.8%	56.6%	40.0%	48,9%
	Adjusted Residual	-2.9	.4	1.4	-.7	
I'm able to complete concentration demanding tasks during normal working hours.	Count	8	32	23	9	72
	% within Hours of concentration	100.0%	49.2%	43.4%	60.0%	51,1%
	Adjusted Residual	2.9	-.4	-1.4	.7	
Total	Count	8	65	53	15	141
	% within Hours of concentration	100,0%	100.0%	100.0%	100.0%	100.0%

Pearson Chi-Square=9.480, p<0.01

TABLE III
COMPLETION OF CONCENTRATION DEMANDING TASKS BY POSITION

		Position		Total
		Employee	Manager	
In order to complete concentration demanding tasks I go earlier to work or stay late.	Count	37	32	69
	% within Position	40.2%	65.3%	48,9%
	Adjusted Residual	-2.8	2.8	
I'm able to complete concentration demanding tasks during normal working hours.	Count	55	17	72
	% within Position	59.8%	34.7%	51,1%
	Adjusted Residual	2.8	-2.8	
Total	Count	92	49	141
	% within Position	100,0%	100.0%	100.0%

Pearson Chi-Square=8.053, p<0.01

TABLE IV
USAGE OF COMMUNICATION FORMS

Communication form	Average	Deviation	0%	1-10%	11-20%	21-30%	31-40%	41-50%	51-100%
Email	36%	19.1	2 %	8 %	16%	25%	13%	17%	19 %
Instant messenger	8 %	11.1	48%	28%	9 %	12%	2 %	1 %	
Online call	2 %	4.9	77%	18%	6 %				
Telephone	18%	14.3	9 %	29%	37%	14%	6 %	2 %	3 %
Video conference	1 %	3.3	84%	14%	1 %				
Meeting (planned)	12%	10.1	12%	55%	20%	10%	2%	1%	
Personal inquiry (unprompted)	22%	18.9	4 %	39%	20%	16%	9%	5%	8 %

C. Communication Forms

What Communication Forms Do Employees Use at Their Organization?

The communication forms that employees use are mostly influenced by the organizational culture, as it was outlined in the in-depth interviews. Still, to better understand the results of the survey, it is necessary to know the level of usage of each communication form.

Respondents had to divide 100% among the communication forms listed (Table IV).

Generally, email (36%) and personal inquiries (22%) rated high, whereas online call and instant messenger were often unused.

How Do Employees Feel about Personal Inquiries?

To express the approach to personal inquiries, respondents had to choose between statements. Some 87% of respondents agree with the statement, "I'm pleased when colleagues come to me with their questions and problems", whereas only 13% feel that colleagues coming with questions are often disturbing. The second pair of statements referred to the usefulness of the personal inquiries: 83% of respondents think that face-to-face conversations are useful, whereas 17% agree with the statement that face-to-face conversations take up too much valuable working time. These facts imply that the majority of employees are happy to receive personal inquiries and consider them useful.

By analyzing the approach to personal inquiries, a significant difference emerged between those respondents who work in flexible **work schedule** and those who work in fixed work schedule. One quarter of respondents who work in fixed work schedule find personal inquiries as a loss of time, whereas among those who work in flexible work schedule, this rate is only 10% (Table V).

TABLE V
OPINION OF FACE-TO-FACE COMMUNICATION BY WORK SCHEDULE

		Working schedule		Total
		Fixed	Flexible	
I think that the face-to-face conversations, chats are usually useful	Count	49	68	117
	% within Working schedule	75.4%	89.5%	83,0%
	Adjusted Residual	-2.2	2.2	
The face-to-face conversations, chats take away too much useful time.	Count	16	8	24
	% within Working schedule	24.6%	10.5%	17,0%
	Adjusted Residual	2.2	-2.2	
Total	Count	65	76	141
	% within Working schedule	100.0%	100.0%	100.0%

Pearson Chi-Square=4.924, $p<0.01$

One of the research questions aimed to determine whether the number of extra working hours (going earlier to work or stay longer) influenced the approach to personal inquiries or not. The results show that extra working hours do not matter either, which indicates that most employees welcome personal inquiries even if they cannot finish their work during normal working hours.

How Do Employees Feel about Email?

From the literature, it is concluded that one of the most important factors influencing the effects of interruptions is timing. Email is a communication channel where the user could control timing. In this survey, the intention was to find out how employees use email, and if they allowed themselves to be interrupted by emails continuously or not.

The majority of respondents (81%) agreed with the statement that "It is annoying to have unread emails in my mailbox", in contrast with the statement "I got used to the fact that there are unread emails in my mailbox".

Some 73% of respondents say they are reading and replying to the emails continuously, while 27% say they set aside time to deal with the emails. When they are in the middle of an attention demanding task, 56% of respondents confirm they try to ignore incoming emails, whereas 44% still read them right away.

To examine the other side of the question, we asked what the expected response time was. Almost two thirds of the respondents do not expect the response sooner than the end of the day. Among those who are answering continuously, only 24% expect the reply in one hour (Table VI). This fact suggests that it is rather an internal urge or a feeling of pressure that makes them answer immediately, rather than a real expectation.

TABLE VI
EXPECTED RESPONSE TIME

Usually I expect the recipient to respond		
Answer	Count	Percentage
immediately	2	1.4%
in 10-15 minutes	5	3.6%
in one hour	22	15.6%
in 2-3 hours	21	14.9%
by the end of the day	51	36.2%
in a few days	39	27.7%
in one week	0	0.0%
at some time (can be more than a week)	1	0.7%

D. Written or Face-To-Face Communication

Which Type Do Employees Prefer at the Workplace?

Some 68% of those questioned prefer personal (face-to-face) incoming inquiries at the workplace, whereas 32% prefer when the questions are in written forms of communication. By checking the opposite direction of communication (when the employee has to ask a question), it turns out that most of the respondents choose the same type of communication (Table VII).

To the question what makes the difference between those who prefer written and those who prefer face-to-face communication, we did not find any answer with this survey (position, type of workplace, size of office room, work schedule, age or sex do not make a difference). We believe that personality matters.

TABLE VII
PREFERRED COMMUNICATION FORM

			Preferred communication form (incoming): written	face-to-face	Total
If I have a question to a colleague (working in the same building) I ask him/her…	in written forms (email, chat)	Count	19	13	32
		% within Preferred communication	42.2%	13.5%	22,7%
		Adjusted Residual	3.8	-3.8	
	to phone	Count	13	26	39
		% within Preferred communication	28.9%	27.1%	27,7%
		Adjusted Residual	.2	-.2	
	personally	Count	13	57	70
		% within Preferred communication	28.9%	59.4%	49,6%
		Adjusted Residual	-3.4	3.4	
Total		Count	45	96	141
		% within Preferred communication	100.0%	100.0%	100.0%

Pearson Chi-Square=16.877, p<0.01

E. Negative Effect

In the Employees' Opinion, Is There a Communication Type that Keeps Them from Effective Work?

Here, the intention was to find out if employees feel any of the communication types are a delay or setback factor at work (Table VIII).

TABLE VIII
COMMUNICATION FORMS AS SETBACK FACTOR

I often feel that because of too much/many… I can't get on with my tasks. Answer	Count	Percentage
Email	31	22%
Instant messenger	6	4.3%
Online call	0	0.0%
Telephone	20	14.2%
Video conference	0	0.0%
Meeting (planned)	13	9.2%
Personal inquiries (work related)	26	18.4%
Informal communication (non-work related)	8	5.7%
I don't feel that	34	24.1%
Others	3	2,1%

Almost a quarter of respondents do not feel that any of the communication types (listed) is influencing their performance badly, while about three quarters feel that one of the communication types has a negative effect on their work. Email and personal inquiries got the highest rate with 22% and 18%, respectively, followed by the telephone (14%). The ranking corresponds to the measure of the usage of communication forms, which means that the most used communication forms are often felt as the reason of delay.

In the next question, respondents could name one communication form that they would like to get rid of (during work hours). This provoking question intended to determine stronger emotions or possible anger that communication forms could cause. For this reason, respondents were asked to write comments and explain their choice. The question was optional, but still 119 people chose an answer from the list and 22 of them wrote comments (Table IX).

TABLE IX
DISAPPROVAL OF COMMUNICATION FORMS

If you could get rid of one communication form which would you choose? Comments would be appreciated. Answers	Count	Percentage
Email	1	0.7%
Instant messenger	8	5.7%
Online call	3	2.1%
Telephone	6	4.3%
Video conference	6	4.3%
Meeting (planned)	2	1.4%
Personal inquiries (work related)	11	7.8%
Informal communication (non-work related)	9	6.4%
Any of them	73	51.8%
Comments	22	15.6%
No answer	22	15.6%

More than half of all respondents say that they do not want to get rid of any of the forms of communication, while 11 respondents expressed disapproval at personal inquiries, nine highlighted informal communication and eight pointed to instant messenger. Emails and meetings got the lowest number of votes.

In the comments, most of the respondents gave some explanation as to why they wanted **to keep all** of the communication forms, but almost all of the comments referred to the consciousness of the user and included the following conditions: use them sensibly, choose the one that is appropriate for the topic, and express the message briefly.

Based on the comments, the general problem with **instant messenger** is that it is not an efficient way of communication. A number of respondents underlined that it is unnecessary, because telephone and email are good enough forms of communication for both short and long discussions, and that they have no capacity for instant messenger. One respondent was of the opinion that instant messenger is good for informal, but not for work related communication.

Few people expressed a negative opinion on **personal inquiries**. The main reasons they disapprove of personal inquiries at the workplace was that they cannot calculate or factor them in advance and take too much time because personal topics cannot be avoided. One respondent suggested

that personal inquiries can be a way to avoid written (traceable) forms of communication.

F. Solutions

What Are the Strategies Employees Use to Be Able to Focus on Cognitive Load Tasks?

Respondents were able to choose more than one from the list of presumed strategies. The list of strategies were based on the preceding in-depth interviews. In general, the most common strategies are ignoring emails and staying at the office longer (Table X).

By analyzing these answers, we double checked the result of the research question whether employees are able to complete cognitive load tasks during normal working hours. At this point, in addition to "go earlier" and "stay longer", we added the option of "take tasks home". The rate of those who chose at least one of these three options is 62% (76% for managers and 54% for employees). By adding the third option, the results show an even higher rate of those who cannot complete high cognitive load tasks in standard work conditions (i.e. during working hours at the workplace).

TABLE X
STRATEGIES TO BE ABLE TO FOCUS AT WORK

If I have to work on tasks which need concentration, I ….		
Answer	Count	Percentage
Go to the office earlier than others	36	25.6%
Stay at the office longer	59	41.8%
Hide away (for example: in a meeting room)	35	24.8%
Close the door (in case of private room)	36	25.5%
Take cognitive tasks home	37	26.2%
Put the phone into silent mode	15	10.6%
Ignore emails	61	43.3%
Put on ear plugs/headset	39	27.7%
Change status to "Do not disturb" on messenger/skype	23	16.3%
Others	4	2.8%

V. CONCLUSION

This section provides a review of the main findings of the survey. In conclusion, the results clearly show that the office environment of the 21st century does not support high cognitive load tasks. On the other hand, we can also conclude that tasks demanding concentration take a smaller proportion of an average employees' time and they can complete the rest of their tasks in the actual work environment. For almost three quarters of the employees, two hours spent in an environment that supports concentration would be sufficient, while three hours interruption-free would cover the needs of about 90% of employees. We refer to it as the **1st challenge** for organizations to find a solution for these hours.

By discovering opinions related to the forms of communication, it was clear that human interruptions (or personal inquiries as it was referred to in the questionnaire) are welcome, even if people feel that these set them back from efficient work. This result corresponds with Kelly Services research [1] that collaboration attracts people. The result of the survey also indicates that flexible work schedule supports collaboration.

The other most used communication channel is email. This survey demonstrates that although there is no doubt that email is an important communication channel, it does have a negative effect on employees. The results suggest that the awareness of unread emails in the mailbox causes a feeling of discomfort and pressure to read and answer them. The expected response time is not less than 2-3 hours in general, which indicates that continuous emailing is unnecessary. Based on these findings, it is important to control emailing habits to avoid the negative effects. We call it, the **2nd challenge** for organizations; although, solutions are readily available (settings, applications).

We defined the **3rd challenge** based on the received comments: learn to use the communication channels wisely. We suggest that the organizations educate employees about the function of each communication channel and how to use them effectively.

Finally, in light of the results, we ask the question: What should the ideal office environment be like in the 21st century? Based on these findings, we suppose that the workplace itself is a base of information, a place to communicate and collaborate. There are interior design trends that make the office look like a creative playground where employees enjoy spending time. But to improve the overall performance and the satisfaction of employees, organizations should also provide the possibility for the employees to hide away and focus on their tasks.

REFERENCES

[1] 2016 Kelly Services, Inc. 16-0019, "KGWI: The Collaborative Work Environment in Europe," retrieved from: http://www.kellyservices.com/uploadedFiles/KOCG10874%20KGWI_CollaborativeWork_Europe_ebook(1).pdf, accessed on 21/04/2017.
[2] R. Cross, R. Rebele, A. Grant, "Collaborative overload," Harvard Business Review, vol. 94/1-2 (2016), pp.74–79.
[3] A. Baethge, T. Rigotti, R. A. Roe, "Just more of the same, or different? An integrative theoretical framework for the study of cumulative interruptions at work," European Journal of Work and Organizational Psychology, vol. 24/2 (2015), pp. 308–323.
[4] E. Horvitz, J. Apacible, "Learning and reasoning about interruption," In Paper presented at the 5th International Conference on Multimodal Interfaces, CMI 2003, pp. 20-27.
[5] E. Horvitz, P. Koch, J. Apacible, "Busybody: Creating and fielding personalized models of the cost of interruption," In Paper presented at the ACM conference on Computer supported cooperative work, CSCW 2004, pp. 507-510.
[6] Zaheeruddin, Garima, "A neuro-fuzzy approach for prediction of human work efficiency in noisy environment," Applied Soft Computing, vol. 6/3 (2006), pp. 283–294.
[7] E. R. Sykes, "Interruptions in the workplace: A case study to reduce their effects," International Journal of Information Management vol. 31 (2011), pp. 385–394.,
[8] M. A. Nees, A. Fortna, "Short Communication: A comparison of human versus virtual interruptions," Ergonomics, vol. 58/5 (2015), pp. 852-856
[9] E. M. Altmann, J. G. Trafton, "Memory for goals: An activation-based model," Cognitive Science, vol. 26 (2002), pp. 39–83.
[10] J. G. Trafton, C. A. Monk, "Task Interruptions," Reviews of Human Factors and Ergonomics vol. 3/1 (2007), pp. 111–126.
[11] P. D. Adamczyk, B. P. Bailey, "If Not Now, When?: The Effects of Interruption at Different Moments Within Task Execution," In Paper presented at the Human Factors in Computing Systems, CHI 2004, pp. 271-278.
[12] B. P. Bailey, J. A. Konstan, "On the need for attention aware systems: Measuring effects of interruption on task performance, error rate, and

affective state," Computers in Human Behavior, vol. 22 (2006), pp. 685–708.
[13] S. Iqbal, B. Bailey, "Investigating the effectiveness of mental workload as a predictor of opportune moments for interruption," Extended Abstracts on Human Factors in Computing Systems CHI 2005, pp. 1489-1492.
[14] F. A. Drews, A. Musters, "Individual Differences in Interrupted Task Performance: One Size Does Not Fit All," International Journal of Human - Computer Studies, vol. 79 (2015), pp. 95-105.
[15] C.P. Janssen et al., "Integrating knowledge of multitasking and interruptions across different perspectives and research methods," International Journal of Human - Computer Studies, vol. 79 (2015), pp. 1–5.
[16] K. R. Sanderson, "Time Orientation in Organizations: Polychronicity and Multitasking," dissertation, Florida International University, 2012.
[17] J. M. Watson, D. L. Strayer, "Supertaskers: Profiles in extraordinary multitasking ability," Psychonomic Bulletin & Review, vol. 17/4 (2010), pp. 479-485
[18] G. Mark, D. Gudith, U. Klocke, "The Cost of Interrupted Work: More Speed and Stress," in Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2008, pp. 107- 110,
[19] R. Solingen, E. Berghout, F. Latum, "Interrupts: Just a minute never is," IEEE Software, vol. 15/5 (1998), pp. 97–103.
[20] L. Perlow, J. Weeks, "Who's helping whom? Layers of culture and workplace behavior," Journal of Organizational Behavior, vol. 23/4 (2002), pp. 345–361.
[21] S. A. Grandhi, Q. Jones, "Knock, knock! Who's there? Putting the user in control of managing interruptions", International Journal of Human - Computer Studies, vol. 79 (2015), pp. 35-50.
[22] C. L. Paul, A. Komlodi, W. Lutters, "Interruptive notifications in support of task management", International Journal of Human - Computer Studies, vol. 79 (2015), pp. 20–34.
[23] D. Ariely, 2014/09/23, "My attempts to reduce email overload…," retrieved from: http://danariely.com/2014/09/23/my-attempts-to-reduce-email-overload, accessed on 21/04/2017.
[24] B. Donmez, Z. Matson, B. Savan, E. Farahani, D. Photiadis, J. Dafoe, "Interruption management and office norms: Technology adoptionlessons from a product commercialization study", International Journal of Information Management, vol. 34 (2014), pp. 741–750.
[25] A. Oulasvirta, A. Salovaara, "A Cognitive Meta-Analysis of Design Approaches to Interruptions in Intelligent Environments," in Late Breaking Results Paper, Conference on Human Factors in Computing Systems, CHI 2004, pp. 1155-1158.
[26] S. A. Grandhi, Q. Jones, 2009: "Conceptualizing Interpersonal Interruption Management: A Theoretical Framework and Research Program," in proceedings of the 42nd Hawaii International Conference on System Sciences, HICSS 2009, pp. 1-10.
[27] M. Haller, C. Richter, P. Brand, S. Gross, G. Schossleitner, A. Schrempf, H. Nii, M. Sugimoto, M. Inami, "Finding the Right Way for Interrupting People Improving Their Sitting Posture," Human-Computer Interaction–INTERACT 2011, pp. 1–17.
[28] T. Tanaka, R. Abe, K. Aoki, K. Fujita, "Interruptibility Estimation Based on Head Motion and PC Operation," International Journal of Human–Computer Interaction, vol. 31 (2015), pp. 167–179.