
Stressed Out by the Information and Communication Technologies of the 21st Century

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Abstract: Human-computer relation and interaction have been areas of significant interest in the last decades. While computers are supposed to increase the physical, cognitive and communication capacities of their users their perception is still multifarious. For most of the users computers are either godsend helps that aid humans with difficult tasks, or mythical objects, which are to be obeyed and complied with. For the members of the latter group computers are a massive source of stress - technostress - in their daily life. Present paper, through the theories of stress, endeavours to search for the reasons of such attitude, and potential ways of amending or modulating it.

Keywords: Stress, ICT, Technostress

1. Introduction

Although the 21st century is the age of internet and information technology, around 85% of the population still feel uncomfortable with technology [1]. Only about 10% of the population are Enthusiastic Adopters, while still around 30% heavily resist the use of any ICT [2].

Rosen and Weil [3] concluded that more than 50% of Americans are technophobic. What is more, according to their research, the number of those hesitant and resistant is increasing. All in all, information technology and the use of internet is a prevalent source of everyday stress. However, avoiding the use of ICT would be very costly [4].

Among others, Bandura [5] has pointed out that the key psychological factor responsible for resistance to technological change is the person's perceived ability to use the technology or the product connected to it successfully.

2. Stress

Although stress is a phenomenon well known by everyone, the meaning and concept of stress are rather complex. Stress might mean the force that inflicts changes on the individual, but as the expression "stressed" goes, it might also involve

the state of body and mind caused by 'stress'. According to Selye [6] stress is a non-specific response of the body given to severe influences or situations; it is adaptation. According to his terminological use stressors are driving forces /causes of stress. Hence he has a reverse definition for stress. The more effort/adaptation is expected from the individual, the more intense the stress is. Consequently, we cannot speak about stress in situations, where the individual thinks him/herself capable of solving the problem.

In this article stress is defined as a state of mind and body that is reached via facing situations/problems perceivably unsolvable with the resources of the individual. Accordingly situations that are likely to cause stress are those that are unpredictable or uncontrollable, ambiguous or unfamiliar, or are involving conflicts. However stress does not (only) lie in the situation, but in the characteristics and perception of the individual [7].

Stress as a process is closely related to the autonomic nervous system, which consists of two parts, the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). In stressful situations SNS stimulates the body triggering physiological, biological and psychological changes to adapt the body to the situation - increases the functioning of organs, dilates pupils, activate sweat glands, elevates blood pressure and increases heart rate [8]. In the

after stress phase PNS induces an opposite process.

According to the transactional model of stress [9], the degree of stress experienced depends on the functioning of two protective physiological mechanisms; the first one is the alarm, and the second is the adaptation [10].

The process of 'alarm' is triggered, when the individual experiences discrepancy between the 'is', and the 'should be' state of things.

Adaptation is happening in the minds of people facing stressful events. It is a complex process of reaction. On the one hand, there is a cognitive evaluation of the situation which is potentially of threatening nature, on the other hand it is the connected bodily reactions that emerge, or right on the contrary, cease to exist owing to the negative, or positive outcome of the evaluation.

It is not only possible to get "stressed" by (too) demanding situations, it is also likely to experience stress, because of being (mentally, emotionally, socially, or physically) under-stimulated. So, parallel to the correlation between arousal and performance, demand and stress also have a kind of U shaped graph [11], where both high and low levels of demand are perceived to be stressful by the individual. What is more an inverse U curve relationship exists between mental effort and mental stress as well, where mental effort is the lowest at the highest mental stress and there is no significant difference in mental effort at low and medium stress levels [12].

Although understanding stress as an individual process is crucial - since the phenomenon is dependent on cognitive processes of the individual, - yet, it is essential to consider stress as a phenomenon stemming from the interaction between the individual and his/her environment. Hence, understanding stress on an individual level is necessary but not sufficient. In line with this, numerous studies lead us to the conclusion that higher levels of work stress give rise to psychological and somatic symptoms and induce lower satisfaction with life, self and the work [13, 14].

Emergence of mental disorders often coincides with low levels of control over work [15, 16]. Among others, Siegrist [17] and Whang, Lee, Chang [18] have found disproportion, or rather imbalance, of effort to reward to be a major potential for development of somatic and mental diseases. Offering their 'job demand – control – support' model, Karasek and Theorell [19] in their DCS model also argue that organizational factors play a key role. (In the Demand-Control-Support model demand represents work stressors such as time pressure or increased pace of work, control is about skill discretion and decision authority, while support would involve all kinds of social support, namely tangible, informational, emotional, and positive social.) Similarly to Siegrist's [17] findings, they found close correlations between workload, control, and employees' stress levels at work. Close correlation of cardiovascular diseases and mortality with low control over the work has also been demonstrated by early medical-sociological studies [20, 21].

Stress is deeply influenced by personal factors, since it is strongly connected to the individual's perceptions. For most

people to have high (physical and/or psychic) pressure, excessive workload and/or elongated working time, is enough to generate stress. Excessive amount of personal responsibility, high probability of job-related failure, or the frequent occurrence of crisis situations as well as the need for intense and wide-range emotional labour on a regular basis can also lead to stress in the employees.

Well-structured and organised work is less demanding, clearly defined goals are easier to meet, hence, not only the nature of work to be done can be stressful, but the organisation thereof is also essential. Uncertainty for example is strongly related to stress. The situation is even more severe at occasions, where employees face insufficient communication of the tasks and expectations or feel themselves unable to influence decisions on the process and content of their work. Several treatises emphasize the fact that little control over performance is instrumental in the development and persistence of stress [22, 23, 24].

According to the DCS (demand-control-support) theory, however, the lack of supporting occupational climate, or social support by colleagues, and a subjective sensation of deficient control over work have an escalating effect on stress arising from stress inherent in the nature of the position and the tasks connected [19, 25]. Supporting this notion, in their researches, Himmel, Dietrich and Kochen [26] and Greenglass, Wolpin and Burke [27] found that information and material support given by colleagues would reduce the risk of stress and burnout resulting from it significantly. Stress is a perceived phenomenon. According to the definition stress - being a state of mind and body that is reached via facing situations/problems perceivably unsolvable with the resources of the individual - the employees' control (or the lack of it) over their own work environment and performance has an essential stake in the process of stress generation.

A study of Greenglass and Burke [28] proves that the fellow-workers' emotional support would not only alleviate stress and feelings such as cynicism, uncertainty about work, or sensation of futility of efforts resulting from detrimental work, but would lead to improved self-evaluation and a sense of being important.

3. Stress Caused by ICT

An increasing part of the workforce use computers and the relative proportion of the tasks connected with the use of computers is growing as well [29]. The introduction of information and communication technologies (ICT) in workplaces has led to multiple benefits for individuals as well as the organizations themselves; however, it has become clear that ICT can be seen as a double-edged sword. On the one hand it is intended to be a tool to alleviate stress for employees by automatizing tedious tasks. Nonetheless, besides creating individual and organizational benefits, it also has detrimental effects [30]. Researchers have even identified ICT as a source of a special kind of stress, which they have labelled as technostress [31]. Technostress (TS) has been defined as a

negative impact on attitudes, thoughts, behaviors, or body physiology that is caused either directly or indirectly by technology [32].

In general, working with computers places high visual and cognitive demands on the users [33]. This is topped by high degree of novelty and unpredictability, when Internet is also involved [34]. What is more, being online even created its own psychiatric disorder, namely that of internet addiction [18, 35, 36]. However, in most of the cases the real stressor is the low control in/over computer work. This is in line with the Law of Requisite Variety [37] that states that an individual can only cope with as many stressors as he/she has responses for.

In present times computers - and here they mean hardware as well as software - are so sophisticated that users most of the time are not able to maintain their systems. They are rather extensions of the systems, than innate parts of it. Hence, whenever the system (ICT) produces unexpected results (e. g. breakdown) they are stuck not only with their work, but also with their normal functioning; hence perceive stress for which they might lack an adequate coping mechanism. In such cases, the choice of a suitable adjustment processes is limited by the individual's inventory of possible actions [38].

Researchers have identified six major categories of technology stressors - factors inducing ICT related stress [31, 39, 40, 41, 42]:

- Overload: users face information overload and the need for extreme multitasking.
- Invasion: users feel to be the prisoners of ICT (always connected, always reachable traceable, ...).
- Complexity: users find it intimidating to learn and use ICT because of it exceeding their own perceived limits.
- Insecurity: users feel insecure about their jobs and whether they would be exchanged for novel ICT or others who might know more about these technologies.
- Uncertainty: users feel anxious because of repeated upgrades and accompanying software and hardware changes.
- Unreliability: users face system malfunctions and other IT hassles that are unforeseen and which they are not able to handle satisfactorily.

However, it is important to keep in mind that TS is still a perceived phenomenon, hence individual characteristics have a high influence on its occurrence and course.

It is easy to understand that age is a very important variable in the equation. Digital immigrants will, and maybe even cannot ever be as comfortable with ICT as the newest generations. However, merely by being born in the 21st century one is not necessarily up to the whole spectrum of challenges ICT could issue. User's skills such as computer literacy [43] and the individual's cognitive construction of reality - making decisions in absence of sufficient information [30] - are also influential factors in the process of evaluating potentially stressful situations.

However, Edwards [43] also emphasises that all stressors are subjects of an intuitive assessment and less of a mechanical subtraction. Hence, individuals, through their uniqueness could perceive the same phenomenon extremely

differently. While one would regard it as acceptable - not sensing discrepancy from the expected situation, - the other might feel stressed and even in a situation, where his/her resources (knowledge, skills and competencies) are considered to be insufficient for solving the situation at hand.

4. Future Prospects

While more and more members of the Millennial generation (people born after 1980), or often labelled as digital natives enter the labour market, for whom ICT is a more integral part of life, the stress induced by the use of computers and Internet is still a prevalent factor in everyday work situations [44]. The ever growing complexity of information, the need for processing multiple streams of information simultaneously, where attention to content often changes at a rapid rate necessitates a whole new set of skills, such as flexibility of attention; which doesn't let the skill of focusing attention to be developed, hence makes its bearer more susceptible to environmental distractions, and as a consequence makes the individual more vulnerable for external threats.

What is more, individual's working memory capacity (WMC), the ability to process the information necessary to complete an active task, - which is able to moderate the impact of overload caused by ICT, - decreases with age [45]. Accordingly, even those, digital natives, who are able to multitask and process information on a much increased pace will lose their ability with time. This means, that technostress is not a phenomenon to be forgotten in the near future. It might change and adapt to the features of the new generations, however, where people are facing 'higher intelligence' (computers) stress is inherent in the nature of the relation.

5. Coping with Technostress

The pace of technological innovation is fast, and instead of gradually slowing down it is forecasted to increase even faster. In order to keep up with this change without being a victim of technostress one needs to learn new ways (competencies and mindset) to cope with the constant demand to learn new skills, meet swifter turnaround times, and be accessible 24 hours a day. For this, there has to be a radical re-thinking of how one relates to technology. Even more so, since, when managed appropriately, technology enhances both the quality and efficiency of everyday life.

Coping with technostress however is pretty much dependent on the individual and his/her perceptions. The feeling of being in charge, being able to control the process and the machine it is centered on or initiated by is one of the main supportive factors. The other solution would be to match the job demand (ICT related and non-related tasks) to the competences of the organizational actors, so that the perceived intensity of stressors would be great enough to generate eustress, but not too enormous to generate the feeling of insufficiency. The third potential organizational solution - according to Karasek and Theorell [19] would be to create a substantive helpful environment, a supportive belt

around each and every employee, which could help them achieve tasks that could not have been accomplished alone, hence providing them with means of exceeding their own limits.

The above listed solutions are not alternatives but might/should be used combined for greater efficacy.

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