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Psychological implications of modern technologies: "technofobia" *versus* "technophilia"

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Abstract

The purpose of this article is to present the psychological consequences, favourable or not, of the modern technologies. Modern technologies, also known as "new technology", caused the appearance of the psychological ambivalence, because, modern technologies, generate, in the same measure, comfort and disasters. At the psycho-dynamic level, this ambivalence is expressed by technophilia (attraction to technology) and technophobia (rejection of technology). Technophilia and technophobia are the two extremes of the relationship between technology and the human being, but especially, between technology and society

Keywords: Technology, Psychology, Technophilia, Technofobia.

> Motto:
> *The same technology that simplifies life by providing more functions in each device also complicates life by making the device harder to learn, harder to use. This is the paradox of technology.* (Norman, 1990, p.31).

1. Introduction

Technology is everywhere ... at work, home or at leisure time. Obviously this is not new, since cars, computers,

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mobile phones (especially, smartphones) and the various gadgets which had occupy our existence for quite a while. In the twentieth century, the exponential growth in various technical fields and the emergence of modern technologies (consecutive, especially to the progress of computer science) caused the appearance of the psychological ambivalence, because, modern technologies, generate, in the same measure, comfort and disasters.

Between the two extreme positions formed, represent by *technophilia* and *technophobia*, arose a variety of issues on the psychological and social impact of modern technology, which has fueled and will further fuel a intense debate on the advantages and simultaneously carrying dangers involves by the development of techniques (and technologies!), but also on how its rules. At the psycho-dynamic level, *technophilia* (attraction to technology) generates its psychological opposite, namely, *technophobia* (rejection of technology). Technophilia and technophobia are the two extremes of the relationship between technology and the human being, but especially, between technology and society.

The reason for which, in this article we intend to "linger" on psychological implications, favorable or not, it had while the emergence of what is known as modern technology and "new technologies", often associated with personal computers (*personal computer* - PC).

2. Technophilia and technophobia – terminology

The person attracted to technology, the "technophile", takes the most or all technologies in a positive manner, enthusiastically adopting new forms of technology and view this as a way to improve his living conditions and combat social problems (Amichai-Hambrurger, 2009).

However, it was found that, with the continued proliferation of modern technologies in almost every aspect of our existence, the number of people who manifest fear of them is increasing. Fear can go from avoiding technology to organic symptoms such sweating and palpitations, even if they only think about using such technology ... The phenomenon would affect about one third of all population.

The avoidance of the new technologies by some people, has led to the hypothesis of "technophobia" or "computerophobia" (these terms are used interchangeably). When factors as anxiety and attitude, or more specifically, the computer anxiety and the attitude toward computer are beginning to combine, the first condition is a requirement for the second, heving as result the appearance of irrational fears and anxieties expressed by avoiding behavior, paradoxical, sometimes absurd. Basically, the technophobia beginning to take shape.

Mental resistance to new technology, manifested in the form of avoidance of computers was well presented in the literature, by the term "technophobe" or "computerophobe", used to describe people who refuse to use computers when they has this opportunity or are required to do. Although we can't speak about a phobia in the classic sense of the term (as in agoraphobia, for example), but there are many similarities at etiology and "treatment", that justify the term of "technophobia".

Technophobia not mean fears about giving up, change the job or concerns about radiation emitted from the screen, but rather an emotional response and negative attitudes relative to technology, that the technophobe recognizes to be irrational. The prejudgement that technophobia is a phenomenon that only affects the elderly population, has been disproved long time ago. Current research shows that things are far from beeing improved.

2.1. Technophilia

Technophilia (from the Greek τέχνη - *technē*, "art/ artifact, skill and understanding" and φίλος - philos, "love"), refers generally to the enthusiasm generated by the use of technology, particularly new technologies, such as: personal computers, Internet, mobile phones and even the technologies of "home cinema". The term emerged in the 1960s, is mainly used in sociology, when is examined the interaction between individuals and society.

Technophilia is defined as attraction, enthusiasm of the human individual determinated by the activities which involve the use of advanced technologies. It is expressed by easily adaptation to the social changes brought by technological innovations. The term of technophilia is used to highlight how technology can evoke strong futuristic positive feelings. However, reverent attitude towards technology that determines technophilia can sometimes prevent a realistic assessment of environmental and social impact of technology on society.

The technophiles has no fear about the effects of technological development on society, as is the case for technophobes. Technophilia refers to "technological determinism", theory emphasize that human society has not the power to resist towards the influences of technology. A number of technologies are used as an expression of

personal narcissism. The technophiles enjoy using technology and focus on its egocentric benefits.

The concept of addiction is often associated negatively with technophilia, while targeting only those technophiles who become excessive and obsessive bound to the forms of technology they possess.

So far as, in the eighteenth century, industrialized societies (notably the UK and France) have relied on their development and expansion of the multiplication and improvement techniques in order to obtain *effective / efficient* to their producers and *confort* to consumers it can be said that *such societies are by their nature technophiles*. Undoubtedly, *technophilia tend to be the norm* in most contemporary societies. As technophilia is associated with the phenomenon of psychological and social "normality", we will not insist on this theoretical approach. We remember only that in the extreme forms, such as Internet Addiction - that we expose briefly, in the following lines -, technophilia can acquire a pathological aspect.

2.1.1. Internet Addiction

Internet Addiction or *Internet Addiction Disorder* (IAD) is now known mainly as the *compulsive internet use* (CIU). The tendency is to avoid the term addiction, reflecting the long-term dependence and is not limited to a single cause. Online activities (e.g., shopping on the net) are considered problematic if its has a compulsive nature. Other activities, such as reading or playing video games become problematic only when excessively interferes with daily life. In 1949, Otto Fenichel was the one who would speak first of "addiction without drugs", which is the direct expression of Internet addiction.

The Anglophone term *Internet Addiction* was first used by the American psychologist Kimberly Young, at a colloquium of the American Psychological Association (APA), in Toronto (1996) and was subsequently taken over in specialized terminology. However, the term IAD was originally proposed, also by an American psychologist, named Ivan Goldberg in 1995 (but he use it in the pejorative sense). Currently, IAD is an nosographic entity present in textbooks of DSM (*Diagnostic and Statistical Manual of Mental Disorders*), from DSM-IV. Although in the DSM-IV, Internet Addiction has emerged as independent entity, *American Medical Association* (AMA) and the *American Society of Addiction Medicine* (ASAM) are against to inclusion of Internet Addiction as a formal diagnosis in DSM and recommends the study of addictions, especially relative to video games. (in Price, 2011).

In the opinion of I. Goldberg, Internet Addiction is more a symptom and not a disorder itself. To describe hypothetical Internet Addiction, Goldberg draws an analogy with gambling. Goldberg notes that "Internet addiction can cause the denial or the avoidance of other current issues of life." The addictive behaviour expresses the socio-emotional immaturity in the individual's inability to build a true and solid psychosocial identity. The cyberdependence is characterized by "all mental disorders related to the use of computer equipment, harmful to the human individual". This latest disorder can be diagnosed with tests which highlighted the obsessional behavior. The results of these tests should be interpreted, but with caution.

Associated to the Internet Addiction apppear the *Communication Addiction Disorder* (CAD or *compulsive talking*), behavioral disorder linked to the need to constantly communicate with others, even when there is no real justification for such communication. CAD is a "theoretical" disorder in which users become to be addicted to social networks (or "social media elements" of the Internet!), such as Facebook or YouTube. Sometimes it happens that these activities generate intrapsychic conflict and guilt. (Bucy, & Newhagen, 2004).

2.2. Technophobia

Technophobia (from the Greek τέχνη - *technē* and φόβος - phobos, "fear") is fear, dislike or discomfort by using modern technologies and complex technical devices (especially computers). The term is related to *cyberphobia*. Technophobia is defined as an irrational fear or anxiety caused by side effects of advanced technologies. Definition involves two components: first the fear for side effects of technological development on society and the environment; and second, the fear of using technological devices such as computers and advanced technology.

A number of authors consider that technophobia always has a pathological character, since it refers to an exaggerated and unjustified fear. Although the accent is on pathological, abnormal aspects, some of these fears may be rightly justified (e.g., radiation exposure). Technical progress can sometimes be detrimental to ecosystem health. The main reasons for the opposition in terms of technical development are not only ecological (it is considered that technology destroys the environment), and ethics (biometrics and video surveillance, for example, are regarded as indicating serious damage of individual freedom, creating a progressively social control likely to degenerate into a

new form of totalitarianism).

Some examples of technophobe ideas can be found in various art forms: from literary works such as *Frankenstein*, movies like *Metropolis* or famous Charlie Chaplin's, *Modern Times*. Many of these works portray the dark side of technology as perceived by technophobes.

The term "technophobe" is used to designate the opponents, to a particular technology, even is a moderate opposition. Dr. Larry Rosen (1993), professor at the University of California, psychologist, researcher and computers instructor, identified three dominant types of technophobes: "uncomfortable users", "cognitive computerphobes" and "anxious computerphobes". "Uncomfortable users" are slightly anxious because they do not have enough information about the effective use of computers; "cognitive computerphobes" may appear cool, calm, controlled externally but are bombarding themselves with negative cognitions internally; "anxious computerphobes" are persona who exhibiting the classic signs of anxiety when they use a computer (sweaty palms, heart palpitations, etc.). It is noted that these three types are differentiated by the reactions of computerophobes people while using the computer, not in its absence. This demonstrates an important point: *the technophobes not completely avoid the source of their anxiety*.

It is possible to deduce indirectly that a high level of anxiety can lead to avoid technologies, but can also lead to poor performance, without total avoidance of them, which makes *the specific of technophobia compared to the other phobias.*

As modern technologies become more complex and difficult to understand, increase the probability of their use to produce anxiety. In the early 90s, in the journal *Computers in Human Behavior*, was published a study on students from different countries, highlighting that a high level of technophobia is present in 29% percent of American students, 58% of Japanese students, 82% of the Indians and 53% of the Mexican students. A similar study published in early 2000 showed that about 85-90% of the new employees of an organization may experience discomfort in relation to new technologies and, in some extent, are technophobes.

It is true that today, the computers are used in schools at young ages, but some research shows that many people over 50 years are less anxious when they use the computer, that persons aged under 30 years, suggesting that away to reduce anxiety, computer experience activities can increase anxiety levels.

Commonly related to computers, technophobia is not limited to computers. For example, introducing a camera in a classroom, had as a result, increasing the anxiety of students and decreasing vocabulary acquisition. (MacIntyre & Gardner, 1994).

Even there are many interpretations of technophobia, its seem to become increasingly more complex as technology continues to advance in an unstoppable rhythm. There are several definitions of tehnofobiei, but most often cited is the definition proposed by Jay (1981 in Brosnan, p. 47), which describes it as: 1. a form of mental resistance that occurs to people who talk or just think about computers; 2. fear or anxiety towards computer; 3. hostile or aggressive thoughts about computers. Therefore, the author identifies three components of tehnofobiei: behavioural, emotional and attitudinal, extending thus its research area. In another research, Rosen and Weil (1990, p. 276) have defined technophobia as including: 1. anxiety relative to current or future interactions with computers or computer-related technology; 2. negative global attitudes about to computers, their operation or their social impact; and / or 3. specific negative cognitions or self-critical internal dialogues during actual computer interaction or when contemplating future interaction. The label computerphobic (or technophobic) describes individuals suffering from severe reactions on all three dimensions, to mild discomfort on a single dimension.

Following the definition postulated by Jay, in 1981, were developed several questionnaires on anxiety and attitudes towards computers, in an attempt to identify potential technophobe. Overall, there were a series of scales created independent of each other, based on an underlying theoretical framework in developing anxieties about the origin and attitude towards computer. The most frequently used assessment tool to computer anxiety is *Computer Anxiety Rating Scale* (CARS-Heinssen *et al.*, 1987).

A number of recent theories claim that anxiety and attitude toward computer are subsumed under the general concept of technophobia: both anxiety[†] and attitudes[‡] (negative attitudes) were identified as fundamental

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[†] As indicators of computer anxiety was identified the following behaviors: 1 avoiding computers and areas in which they are located; 2 excessive caution with computers; 3 negative remarks in relation to computers; 4 attempts to minimize the use of computers. (Maurer & Simonson, 1984 in Bronson, 1998).

[‡] Attitudes Rating Scale toward computer (Loyd & Gressard, 1984) reveals three main types of attitudes: 1. anxiety or fear of computers; 2.

factors that contribute to technophobia ("fundamental components of technophobia").

The researches revealed that anxiety towards computer is higher when it is like a personality trait rather than a transient mental state. The degree of neuroticism correlate positively with anxiety toward the computer, while introversion-extraversion dimension of personality, do not show any relevance.

2.2.1. Psychological models of technophobia

In an attempt to identify the factors which may influence the performance, Brosnan (1994) assessed a number of given subjects [upon]: computer anxiety, cognitive style, locus of control and *self-efficacy*. Subjects were asked to perform a computer-based task, which involved searching for information in data tables. The task can be accomplished using two strategies: either by visual scanning data tables using a concrete way of achievement of "trial and error" or structuring the "query" / "questioning" abstract content of tables (similar to what happens in the natural experiment between dependent and independent variable). The second strategy involves structuring and abstraction, two aspects of beach independent strategies (Witkin *et al*., 1977, McKenney & Keen, 1974; Fowler *et al*., 1985, Vicente & Williges, 1988).

Subjects were permitted to apply both strategies, indicating the number of tables used to structure the abstract content to try solving task. Multiple regression (used to highlight the relationship between a dependent variable - explained endogenous outcome - and a lot of independent variables - explanatory factors, exogenous predictors) revealed that the highest level of structuring the abstract content was predicted by the *self-efficiency*.
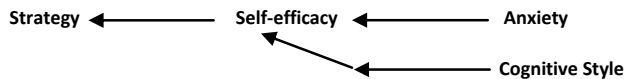
Subjects which proved confident in themselves, were helped by questions to find data in tables, while those who had less confidence in them, searched data, line by line, to find the required information.

The next stage of the analysis was focused on the experimental factors, mentioned earlier, which can predict the level of the *self-efficiency*. It was noted that the *self-efficiency* was predicted by the degree of anxiety, although, in principle, at least theoretically, the relations is reversed. In addition, the cognitive style was a predictor of *self-efficiency*. Thus, the subjects less anxious and more analytical had high scores of *self-efficiency*. The cognitive style assessment was made based on known psychological tests and tasks to be performed by a computer, has been described as such. An interesting variation to investigate the predictive nature of cognitive style, could be correlation with the degree of empathy for persons working with computers. Such analysis would not involve attitudes, but that component of personality which underlies technology acceptance (cf. Davis, 1986).

Davis (1986/1989) introduced the "Technology Acceptance Model" (TAM) to count the psychological factors that influence the computer acceptance of the human individual. Based on *Theory of Reasoned Action* – TRA (Fishbein & Ajzen, 1975), TAM was formulated to determine the impact of external factors on personal / internal beliefs, attitudes and intentions. TRA suggests that behavioral intention (BI) is a measure of a person's intention to perform a specific behavior and attitude (A) expresses the feelings of an individual about performing the behavior (Fishbein & Ajzen, 1975). TAM combines these two concepts with perceived usefulness and perceived ease of use (perceived usefulness - U and perceived ease of use - EU).

Perceived usefulness (U) is defined as the subjective probability of the prospective users which users improve their performance tasks using a specific application system. Perceived ease of use (EOU) refers to the degree to which the potential user expects the target system does not involve effort (Davis, 1989). U and EOU are both psychologically and statistically, distinct factors, that allow for a system to be perceived as useful, but not easy to use, and *vice versa*. The four components (BI, A, U, EOU) combine to predict computer usage as below:

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pleasure or joy of working with computers; 3. confidence in ability to use or to inquire about computers. The authors considered anxiety as "a kind of attitude". Koohang (1989) defines anxiety as "a form of attitude". Indeed, between computer anxiety and attitudes are often established significant correlations. (Popovici *et al*. 1987). Heinssen *et al*. (1984) postulates that computer anxiety should be distinguished from negative attitude toward computers. Anxiety towards computer involves mainly an affective reaction, such as resistance (to) and avoidance of modern technology, while attitude would mainly require a behavioral response. (Bronson, 1998, p. 33).
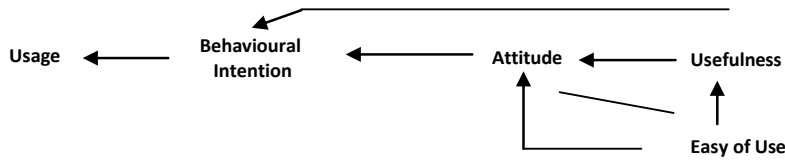
Figure 1. Technology Acceptance Model (TAM)

Thus, this model predicts that computer use is determined by behavioral intention manifested by attitude and perceived usefulness. (BI = A + U). In addition, perceived usefulness, jointly with perceived ease of use along with determines a certain attitude. (A = U + EOU). It is also assumed that ease of use would have a significant effect on perceived usefulness. Davis *et al.* (1989) asserts that the relative weights can be obtained by multiple regression. The authors of TAM model, support and self-efficacy influences the ease of use. Thus, if the experience and anxiety influence the perception of *self-efficacy*, is obtained an extension of the TAM as follows:
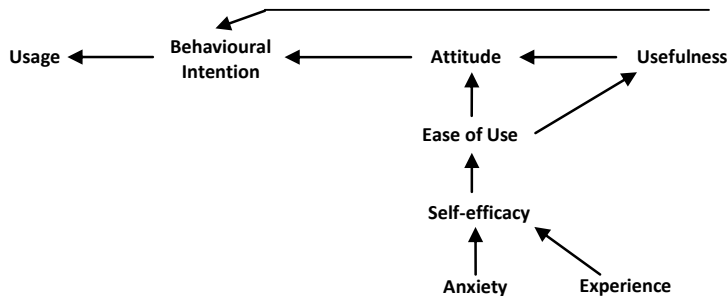
Figure 2. The influence of *self-efficacy* on TAM

A potential improvement of the TAM model refers to the relationship between attitudes, perception of usefulness and perception of ease of use. Through factor analysis, Todman and Dick (1993) identified three subscales of attitude assessment, namely: entertainment, utility and ease of use. According to this conceptualization, between TAM components (derived from model TRA) was established a new interrelationships. Thus, the model becomes:
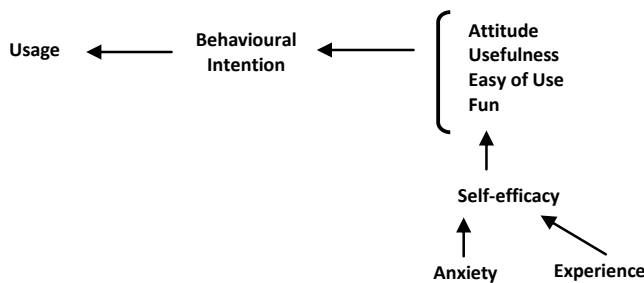
Figure 3. Brosnan's model of Technology Acceptance

However, the directionality of some of these relationships has been questioned. For example, *self-efficacy* has been argued to be determined by ease of use (Henry & Stone, 1995) and perceived usefulness (Hill *et al.*, 1987). Therefore, all these factors were placed in a multiple regression by Donald Brosnan (1998, p.120). The actual model was not as accurate as the theoretical model:
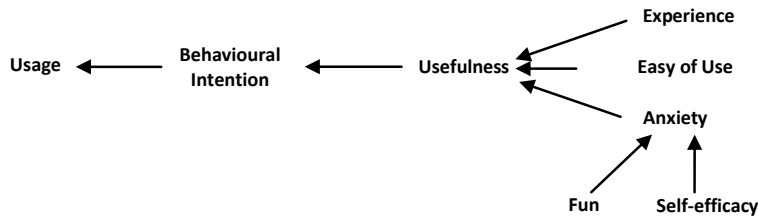
Figure 4. The current theoretical model of technophobia

Effective use is predicted by intention to use the computer, confirming the link between behavioral intention and actual behavior (Davis *et al*., 1989). The intention to use the computer, was in turn predicted by perceived usefulness of computer use. Inherently perceived usefulness refers to the focus on the task. If technology facilitates a task, then it should facilitate and focus on the task. In addition, if the technology is not perceived to be useful in a task, this will result in load shifting focus person in the technological environment. Usefulness itself is predicted by prior experience, perceived ease of use and computer anxiety. So, those who say they have used the computer intensively in the past, currently perceive the computer to be easy to use and are not anxious during these activities will consider the computer to be useful.

As suggested in the previous model (Figure 3), Byrd & Koohang (1989) found that the experience use of the computer has a significant correlation with a better perception of the usefulness of computers. Igbaria (1994) found that computer anxiety has an indirect effect on technology acceptance through perceived usefulness. It was concluded that *self-efficacy* is a good predictor for anxiety, rather than *vice versa*, emphasizing that the inconclusive nature of the bidirectionality between these two variables. Finally, the perception of computers as "fun", allowing accurate predictions regarding the low level of anxiety. Cognitive style may be also included in this model.

The current model (Figure 4) is not a definitive model of technophobia. Rather it highlights how different variables can be combined to predict how and when people will (or will not) use computers. Depending upon the context of computer interaction, we may expect different variables become prominent, and the relationships between them to vary. This is in contrast with the results reflecting the lack of correlation between attitude and behavior (Schewe, 1976). Swanson (1982) argued that certain „user-relevant" components of user attitudes are not yet well understood.

The work of Mahmoodand Medewitz (1990) make a distinction between attitudes (structure of technophobia) and opinions (which refers to "assessment in terms of the value of a person or thing"). The authors found that whilst increasing familiarity with computer did not affect attitudes, in turn, led to an improvement in views/ opinions about technology. Therefore, a program to reduce the degree of technophobia have focused on improving opinions about computers, not on changing attitudes towards them. Davis *et al.* (1989) distinguishes attitudes from perceptions of usefulness, but this is not equivalent to setting a progress suggest that perceptions about the usefulness may constitute, in fact, an opinion. It seems that negative attitudes discourage interaction with the computer, until positive opinions would "override" the influence of negative attitudes in determining avoidant behavior, without actually eliminating these negative attitudes. It can be concluded that when computer users are focused on the task, and not on the means by which the task is completed (e.g., computer), the psychological influences on performance are minimized. Effective use is predicted by intention to use the computer, which in turn is predicted by perceived usefulness of the computer. Perception of computer as useful, facilitates focusing on task, focus, which in turn, minimizes the adverse effects of technophobia.

Undoubtedly, technophobia is a multifaceted phenomenon that can be controlled by identifying the primary factors involved in this appearance. The individual factors (person attributes) of technophobia only represent one aspect of the model. Additional (and related) factors include the usefulness (task factors), the perceived ease of use (system factors) as well as the context (organizational factors). It is important to consider the significance of context in relation upon motivations to perfom an behavior in and interrelationships between variables. Psychological approach itself, which is only one type of analysis of technophobia must always be placed in context.

3. Conclusions
There is an opinion that computers have to be complicated, and if not so, then "can not be perceived as computers."

Donald Norman, quoted in the opening words, argues that the computers of the future will be "invisible" and we will use often against our will. This is already happening: when we use computers with modern cars, when using microwave ovens and various gadgets, CD players, games etc.. They do not always see whereas the performance of the various activities using various devices, without being aware that they include in their composition mechanisms based on new technologies. (Norman, 1990, p. 185). Transferring all the modern technologies in an "invisible plan", will prove a turning point. But until the technology becomes "invisible", we find that it produced anxiety to enough many people, expressed in its extreme form, namely - technophobia.

The technophobia is a legitimate response to technology, being associated with the ubiquity of the latter, especially, in the personal computer version. Although it is a more recent phenomenon, the determination and the knowledge of the nature of the factors involved in its appearance, seems to be more important than ever.

By the scientific and systematic approach of technophobia, the phenomenon became apparent in all his extent. Since a number of studies have revealed that technophobia is present in a proportion of about 50% of the population in different categories, anxious feelings towards computer can't be marginalized or ignored. If some modern technology, especially computers, induce anxiety in about half of the population, then technophobia can be established as "norm", and the manifesting symptoms, considered to arise from inadequacies in design technologies.

"Digital revolution" known as the "second industrial revolution" has shown that information technology plays a major role in the educational process, in work activities and in leisure. At the organizational level, is entitled assessing technology skills when it comes to employment. Therefore, for technophobes the potential market is decreasing. The technology provides a relatively new medium, which evaluates the performance. The aspects of "familiarity" related to the use of the computer and the lack of technophobia is currently a "critical filter" or "elimination test" in employment in various jobs. (Chmiel, 1998). If the usage of the computer has become as important as literacy, should the educational system be given the same importance as the skills of writing and reading skill.

The educational process can amplify the technophobia. It is imperative that those who teach technology and computers, to be themselves confident in technology. Although it seems natural for things to happen in that way, but the studies has shown that many teachers suffer of technophobia. In an educational system that use technology throughout the curriculum, it is essential that all teachers to have confidence in teaching activities performed with computers. This is more important than the education with a specific software packages because is possible that educational software used to be updated during the teacher's career. Moreover, the selection of appropriate educational software is essential. In the educational plan should be noted that parents can act as role models for interaction with technology. Researches suggests that, if parents manifest technophobia, has to hide it in the presence of children.

What should be done about the technophobia and if it has a problematic character or not, depends on the perception of technophobia legitimacy itself. If technophobia is perceived as "a condition that must and can be overcome", then, the technophobe will be invariably associated with pathological registry. (Gorayska, & Mey, 1996). That wouldn't happened if the technophobia would be recognized as a legitimate and rational response to an imposed technology. Providing a program for reduction of technophobia, support, by default, the first point of view. Mitigation programs for technophobia use mental techniques based on situational etiology of technophobia, not on the individual etiology, which relates to personality traits of the technophobe.

Since technology has become a crucial element in most professions, many companies offer support for those suffering from anxiety because of the use of computers or those who recommended themselves as technophobes. Articles containing tips for practicing exercises or techniques related to tehnophobia, but also in terms of useful instructions on how technophobe person can feel as comfortable around the object generating the phobia are offered to the employees.

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