

OFFICE FURNITURE: (FOR) A NEW GENERATION

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1. Introduction: Changing the office

Office concepts are rapidly changing. Increasing flexibility with regard to time and place of work and person at work demands renewal of the office design process. The previous “office revolution”, the large scale introduction of computers, did not basically affect the structure and function of the office. The “flexibility revolution”, however, has the potential to change the nature of the office. Workplace and workspace design become more and more dependent on the design of the organization, the use of (communication) technology and the formation of task complexes. Ergonomics research into social and psychological aspects of flexible offices, attention and concentration, and ever faster changing interaction with technical systems of increasing complexity is necessary to adapt and improve design methodology. [Spenkelnik 1998]

The next generation of human-computer interaction is determined by a number of new contexts and challenges that have evolved during the last five to ten years and will be evolving more rapidly in the next five to ten years. They are now rooted in new, emerging technologies as well as in new application areas asking for a new approaches and visions of the future. [Streitz *et al* 2002].

2. Survey: Design by the existing concept

Designed products and environments survey shows a very small amount of solutions respecting true complexity and value of aforementioned changes.

Gradual introduction of changes was, actually, the unsystematic redesign of the existing products by the principle «one at a time» within the existing office design concept, taken over from the pre-information era and based on a writing-desk and a chair as the office backbone.

Users of the office equipment, furniture and space are brought into situation that demands and imposes more complex adjustment to a new workplace. At the same time, each of them, from the user's standpoint, faces new issues arising from the use of the given environment.

An immediate user, the office staff member, undergoes increasingly structured additional training in the use of both the working equipment and tools as well as of the increasingly complex design of the furniture and its various additional elements. In parallel, there are general restrictions and risks of serious and persistent health problems due to negligence of the restrictions. The contradictions occur (e.g. recommended break for exercise or change of the activity untowardly influences user's concentration and may lead to psychical stress), as well as restrictions rather than free will (e.g. either interruption of activities rather than the choice of several options, or limitation of body motion to the only to date approved optimal - motion along the two axes supported by a dynamic chair - rather than free motion and body movement in as much stable and safe positions as possible).

An indirect user, employer and consignee of the equipment and furniture, faces growing purchasing and maintenance costs and has to provide logistic support either in the correct use and control of the equipment or in handling the increasing number of employees' sick leaves.

The manufacturers of office furniture face the costs of the increasingly complex production technologies of more complex redesigned details and accessories for the existing products, and with the organization and financing of training in their use.

Simultaneously, computer equipment, as the novelty, must by its shape and usage practice utmost resemble the equipment it replaces and match the existing concept, which has for long time delayed its usage and applications.

Even though furniture design process (as well as design of environment and equipment) is supposed to start with a user and his/her needs, it was (as usual) a complex of growing problems and costs related to a user and his/her interaction with the working equipment and environment that demanded reconsideration of the office design approach. Although not in a praiseworthy manner, they brought the user back into the focus.

Apparently, the available solutions do not fit into current aspects and cannot meet actual needs of a dynamic office user. Some ergonomics standards, e.g. for office furniture and office space, lose part of their significance. In order to achieve real adoptive workplaces new solutions in furniture will have to be developed and design processes must be revised. They require a holistic and multidisciplinary approach, with reconsideration of all design parameters and the needs upon it.

3. Changing the design approach

Revision of design processes should respect growing awareness on users' needs and demands complexity. Workplace and workspace should serve a more complex role than function and aesthetics alone. Design approach (associated to ergonomics) should be an integrated body-mind perspective, involving the whole human being, focusing in a practical way on complex interactions of task and activity, posture and movement, emotion, self-concept, and cultural values. Design solutions in products and environments can (and should) enable freedom of choice between alternatives rather than restrictions.

4. The future user

Structural analysis of the office staff shows coming of a new generation of users, in many ways different from the generations to date. The reasons should be sought for primarily in the new living conditions and in the contemporary pedagogic and academic system.

Firstly, future users grow surrounded by computer technology and, as a rule, adopt it more promptly, readily and comprehensively than the adults. This will require less additional training and more aptness for the adoption of the increasingly rapid development of innovations and applications, accompanied by more complex performance requirements.

Complexity of the requirements upon motivation, satisfaction and productivity is markedly affected by fundamental changes in the academic system: incentives to individualization and creativity rather than uniformity, encouragement of self-reliance and sensitivity rather than the imposed discipline and the «carpe diem» philosophy i.e. an attempt to reach maximal experience based on conscious as well as sub-conscious input.

The analysis of contemporary pedagogic and academic principles and of the computer games system and the comparison of the commitment of the computer graphic designers and operators in three-dimensional programs, shows positive and useful stimulativeness of the two interesting events: balanced combinations of the stimulated several organs of senses during specific activities, and of the work and teaching through entertainment and games.

Recorded differences in the needs and requirements and potential advantages should be incorporated into organization and design of the working environment. Available solutions to the office environment do not support such attempts. This points out the need in new solutions.

5. Functionality

In tackling the issue of functionality, being one of the basic design requirements, fundamental starting points are anthropometric data and the selected optimal, ergonomically foremost, performance practices. Considering design for the future, it is crucial to take into account the fact that both are not constant.

According to all to date research, anthropometric data are undergoing the changes caused by evolution of the mankind. Owing to tardiness and the established regularity they are predictable to the satisfactory degree. Also, a whole lot of research in the inclusive design generates the changes and accrues anthropometric data. They arise from the fact that a very small number of users fit into the data applicable to young and healthy individuals and from the awareness about the importance of movements and strength of (individual parts of) the body, rather than from its mere dimensions.

Functionality is undergoing the changes caused by rapid progress of computer technology and work processes. Numerous applications strongly influence performance of office operations and practices. Also, they bring possibility of introducing supplement tools rather than only one optimal tool.

Electronic systems used within the office, home and in public places are increasingly sophisticated. Also, they often cause misunderstandings and rejection. Simplifying the interface between people and these systems is a major design challenge.

The research shows that the manners in which some activities are performed are, as a rule, developed through reduction of body activity in favor of mental activity. Whereas ergonomists have traditionally concerned themselves with anthropometric design, work posture and visual performance, the introduction of computers into work situation has led to increasing emphasis being put on human information processing and cognition. In addition to the standards and recommendations related to physical and psychological parameters, there are also the recommendations of cognitive ergonomics which deals with the influence of body environment on the ability to think, create and link the facts.

However, ergonomic prevention strategies that aim to minimize the risk of symptoms of work related disorders should not only focus on physical but also psychosocial risk factors at work. Also, most ergonomic data and guidelines come from research done in connection with occupational safety and performance and much of it is difficult to apply to the design of consumer products. Designers, together with ergonomists, need to develop research methods and guidelines that are more easily applied within the design process.

6. Comfort

Numerous researches show that performance is significantly affected by comfort and performer's satisfaction in addition to functionality, safety and health. However, the concepts of comfort and discomfort are under debate. There is no widely accepted definition, although it is beyond dispute that comfort and discomfort are feelings or emotions that are subjective in nature. Discomfort is related to biomechanics and fatigue factors, and comfort to a sense of well-being and aesthetics. Also, both are related to complex perception of physical and psychosocial aspects of work environment. Therefore, the analysis of users' needs and requirements must include entire perception i.e. all stimuli rather than mere physical and visual.

From the aspect of comfort, the aforementioned health refers also to safe harmonization of physical and mental activities throughout all work stages, even to the encouragement of healthy psychophysical development and maintenance of good health and fitness during the very work. Natural rhythm [Kumashiro 1986], from the intense work to relaxation, in the manner that ensures natural course of the activity and body postures with mental and intellectual activity, grossly contributes to the users' productivity and satisfaction.

7. Posture and motion

Users postures and motions, requiring adequate design of the office working environment, must follow optimal working practices i.e. interaction between the users and optimally designed and applied equipment.

Office application of computer equipment reveals two options that have not been exercised. In the first place, instead of selecting only one optimal working practice of a specific activity there may be freedom of choice between several practices. Secondly, equipment support in the reduction of necessary and restricted physical activities in favor of the mental ones gives more freedom to the user in individual selection of the working postures and free body motion.

Sitting posture i.e. partial relaxation of the body supported in the stable position, is optimal aggregation of the body postures during “one point” work i.e. when visual occupation by work impairs the control of motion. In this posture the body uses approximately 20% less energy than when standing erect, although standing posture must be considered as one of the supplement postures.

Passive sitting has had for a longer period the status of the least safe posture. Yet, it is still the theoretical model in many research works, for development of dynamic sitting, and the basis of regulations and standards regarding healthy sitting.

Dynamic sitting, supported by individually adjustable and flexible chairs, provides partial freedom of movement and better match between the body posture and mental activity. It enables a continuous cycle through the upright, reclined and forward tilting positions.

Active sitting, based on theoretical advantages of sitting on a ball (e.g. a saddle-chair or a spring-chair), provides the body with much more freedom in spatial motion in line with mental activity, as well as with continuous muscle activity, which is beneficial for the whole body. Although it offers many options, this type of sitting has not been entirely elucidated and developed, particularly as regards potential issues related to specific postures, the ability to monitor working rhythm and the influence of the increased physical activity on concentration and fatigue.

Supine and semi-supine postures have been adopted as additional working postures for less intense mental activities. However, given complexity of the postures change and a marked drop in concentration and sleepiness effect during supine and prone posture, some do not advocate them.

Walking, as physically and mentally stimulating activity, has been utilized at all times, but rarely planned as a temporary or supplement working posture. It is (only) space demanding.

8. Organization of information, work and space

In addition to the changes in business operation, the fact that in the user-equipment interaction the furniture (as spatial support to the equipment) becomes useless, is a crucial factor in spatial organization and design. [Streitz *et al* 2002] This leads to furniture-equipment integration where the equipment becomes “invisible” and the furniture becomes «smart».

Research into the issues of a user-computer interaction (generated during mental data processing) has brought us to a sound conclusion that data processing practices (irrespective of a computer capabilities) are tailored to the computer practices rather than the user’s natural thinking and mental processes. Development of a «user-friendly» working environment is still at its early stage and limited mostly to software and software use. However, its benefits, in the terms of transparency and simplicity, explain why the principle of anthropomorphism i.e. user’s natural human processes should be (re)incorporated into design and organization of the office equipment and space. [Fishman 1966]

Introduction of the open hours from 9.00 am till 5.00 pm and, more importantly, of around the clock availability for the project needs, significantly reduced out-of-office social contact. Consequently, users’ needs in humane interrelations contributed to the development of strong and specific social links between the office associates. It has also shown that the development of frank and open social relations in a task force increases team performance. These processes are deliberately triggered and facilitated by the employers through “active task force weekends”. Therefore, the design of office environment and space must take into account the respective social component.

There is a growing trend towards home-based work which offers a range of benefits to both employees and employers. [Brandis and Crunden 2001] The home-office has become an important part of culture today, and its popularity and prevalence are only expected to increase. Possibility in balancing private and professional is a crucial advantage; need in such balancing is a crucial disadvantage. An individual user determines the rate and duration of work, the breaks and working environment. There is no stress about personal office contacts and noise. Several tasks, business and private, can be harmonized and

carried out simultaneously. However, furniture is often ergonomically inappropriate for a prolonged use. Positioning of the work place within the residential area, particularly when a user has family, causes frequent concentration and work interruptions at the most unsuitable time, which can generate more severe stress than the office environment.

With all due respect for the humane and private dimensions and in order to increase users' satisfaction and performance, office space organization and design (materials, shape and ambient) may and must establish the balance between the collective and individual i.e. balance between business and private aspects.

9. Conclusion

Contemporary attempts and requirements to increase safety and comfort of the office environment and performance are realized in many ways. However, majority of these practices, irrespective of the development and application of computer equipment that offers new solutions in designing office work place, are based on the rooted concept, grounded on the pre-information era principles. Current aspects and actual needs of a dynamic user surpass the available solutions.

Future practices of office work, cooperation and organization will be determined by the level of dynamism, flexibility and mobility that exceeds most of the present achievements and solutions. Tasks and participants, environment, processes and structures of cooperation will be changing permanently, in various manners and under the increasing number of innovations. The role of the physical office space will change. Designers, together with ergonomists, need to develop research methods and guidelines that are more easily applied within the design process. It is the time now to accept these changes through designing equally dynamic, flexible and mobile working environment.

The recommendations as to the design of the office furniture, set in this article, should be the guidelines to all direct and indirect users of the office working environment, particularly to designers, constructors and manufacturers of the office furniture and equipment. The overall social goal is to create a healthy and relieved end user. This goal is achievable only through responsible and knowledgeable approach to problem solving. «Furniture for safe, healthy and comfortable sitting» project of the Faculty of Forestry, University of Zagreb, approved by the Croatian Ministry of Science and Technology, is a step forward and a contribution to resolving the respective issues. Hopefully, its multidisciplinary expert task team comprising various professions will find the answers to many issues related to the subject matter. It is only with the multidisciplinary approach and a teamwork that corresponding solution can be found to optimal office furniture.

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