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ERGONOMICS APPLIED BY ROMANIANS

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Abstract. *The study was conducted in the Cabinet of insolvency "X" in Piatra Neamt, Neamt County. The aim of the study - applying cognitive ergonomics in the use of electronic computers for the relationship "man - claims - environment, which is achieved through three objectives: 1. Diagnosis by identifying deficiencies in the organization of space and jobs - List-Quiz 2. Interdisciplinary analysis of the working places and the jobs 3. Assimilation of expertise and experience through 'learning - application ", workers actually participating in the organization of their own working space. The study will cover the* ***first stage*** *of the analysis area and employment, the* ***second phase*** *(ongoing) refers to the process of work, work study and work rules. The study concludes with achievements, contributions, proposals and conclusions.*

Keywords: ergonomics, health, informatics, interdisciplinary, comfort.

1.Introduction

In Session " *Sciens Home at Romanians*" fit and ergonomics, scientists using both its own laws and specific laws of other sciences, which feeds its contents to study "man" in various poses of his work to achieve a balance of opportunities and factors they require different forms and at different times of life.

Ergonomics as a science has its realization in ergonomic organization of work as a set of methods and techniques developed in the light of ergonomics requirements in order to increase productivity as the physical and intellectual possibilities of "human" in the energy economy of his body.
In this paper we refer to cognitive ergonomics by applying the methods, techniques, principles, specific rules and organization of **space and jobs in office work**.

We all know that the penetration of display screen equipment is an important area of our society, which spread rapidly in various fields of economic, social, cultural and managerial. Using computers at companies and institutions, counties, regions and the macroeconomic / office, has brought real benefits and improvements in information and communication.

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Equipped with computers, enterprises and institutions have developed rapidly and transmission system data / information to beneficiaries and providers, making savings of time, effort and real-time opportunities to progress in relation with the pace of life.

Meanwhile, equipment display screen with some risk and health disorders caused by non usability, especially for poor understanding and knowledge of this discipline.

On these issues, which affect not only users but also health and employment status, family, social and economic outcomes, we want to refer to this study.

The aim of the study was the application of cognitive ergonomics in use display screen equipment, **home to Romanian**.

The aim of the study was done by the following **objectives**:

• The diagnosis by identifying deficiencies in the organization of space and jobs - list - Survey control and analysis of work space and workplace.

•Interdisciplinary analysis of spatial and employment.

•Assimilation of expertise and experience by workers through their correspondent terms "learning - application" actually participated in organizing their own space and ergonomic workplace.

Our research concerned the application of cognitive ergonomics of Insolvency Office "X" in Piatra Neamt, with the object of "legal settlement companies declared insolvent.

The Cabinet Office operates an insolvency practitioner who holds office, a lawyer, a chartered accountant and an economist.

The study authors have proposed conducting research in two stages:

• The first step towards organizing work space and room for individual employment.Results of the first stage will be presented in this session.

• The second stage concerns the work process, work methods and Workloads. This phase will be completed in semester I 2011.

2.The need for ergonomics in office work using equipment with screens

Expansion of computer's usage in daily activity of enterprises and institutions, in addition to significant benefits through information - fast communication unquestioned was associated with a variety of ergonomic issues:

- for some professional occupations, the computer is the only tool for long periods of time, even for an active generation, resulting side effects;

- work for collecting requires operators / workers a prolonged concentration of attention on the text and figures from the spreadsheet program, operating in fast-sensitive implications on his mental state. New groups have appeared jobs

performed a significant amount of intellectual activity with neuro-psychiatric tension.

- lifelong active worker faces rapid emergence of new types of computer equipment, which requires a constant adjustmentl;

- ability to read the screen is lower than paper documents, leading to visual overload.

Foreign researchers (Resk & Mansfield, USA) have done studies on the correlation between the number of hours of video terminal used weekly and health problems as shown in the following situation:

	Less than 15 hours	**Between 15 to 30 hours**	**Over 30 hours**
- Voltage eye	33%	37%	63%
- Headache	20%	27%	47%
- Back Pain	23%	26%	40%
- Dizziness	4%	6%	5%

Similar studies were conducted by comparing users and non-users of video terminals with regard to issues of color discrimination: 40% of users compared with 9% ofnon-users, blurred vision in 71% users and 35% to non-users (after Smith).

According to a report from the Internet[1] in Romania was to increase the number of Internet users at 5.5 million Romanian in 2006 (there are no newer data sources).

We estimate that there are the same amount of jobs in which operates with keyboard and mouse. The negative effect on health of these workers: visual symptoms, symptoms of the hands, forearms, arms and shoulders, back pain, the neck and spine symptoms, nervous symptoms, etc.[2]

The cause of these adverse health effects is the backwardness of the actions of acquiring knowledge of ergonomics compared with the quick change of electronics in institutions.

Is similar to the interaction between productive forces which grow more rapidly and the production relations which are slow and hinder development. This case was accompanied by a desire / interest of employees to quickly start using computers in view of its benefits and advantages, without knowing elements of ergonomics and occupational medicine, to keep health. Under these conditions **the problem to be solved** is that most users with display screen equipment symptoms

[1] http://www.mediawebdesign.ro

[2] Annex 5 - The negative impact of the work on equipment with screens on users (diseases, causes, remedies).

that affect their health, with negative consequences on multiple levels.

Solution: information through various means of computer users in knowledge and application usability, to optimize the relationship man - applications - environmental.

Peculiarities of computer work was subject to a set of international rules, which have become standards in the Romanian sign SR EN ISO 9241 and EN 29241-2: 1994.

Romanian legislation exists, there is more literature and information sources (Internet), so not only have to act, to raise awareness and acknowledge the leadership of enterprises and institutions on all workers to promote science and practice of ergonomics **at home**.

Need is linked to opportunity, to justify the accumulation of facts and phenomena, while, from the use of electronic computers and ergonomic intervention time is "**now"** and no **"tomorrow**".

3. Research Methodology

For our research we considered most appropriate method, ie: ergonomic review and analysing check - list, participatory approach; SWOT diagnostic method, antithesis method, interdisciplinary cooperation between science method, method of observation on the spot, the evaluation techniques, quantitative and qualitative assessment calculations, analysis and synthesis method, methods of organization ergonomic principles, rules and regulations, etc. ergonomic recommendations, practical training methods.

4. Researches in ergonomics

Global and on the European level there are annual initiating congresses, conferences, symposia, scientific sessions organized by the International Ergonomics Association and other professional bodies on different continents and countries.

Example:

•Ergonomics International Congress held in Australia;

•16th Congress of International Association of Radiology on "Ergonomics in the dental office;

• International Congress of Occupational Health in Italy and one in cardiology, occupational medicine, psychology, pharmacy, etc.

In our country:

•Labour Medicine International Congress on "general ergonomic principles and environmental factors" held in Arad.

• Psychologists Association Banat symposium on "Public Transportation".
• Association for multidisciplinary research in the Western Romania, Timisoara occupational health problems.Ergonomics applications were made to:
• SMURD Targu Mures - in the field of organizational ergonomics on "duration of working time organization of emergency service".
• ergonomic organization of classrooms at the University of Bacau.
• Study on workplace ergonomics at Computing Office Timisoara.

Concerns also exist in construction,in promoting the product's ergonomics etc.

A remarkable study was prepared by the Institute of Psychology "Michael Ralea" at the Romanian Academy, entitled "Strategies to increase the usability and basic skills development of Romania's population to use information technology".

In this study, the authors stress that "man is subject and beneficiary of building the Information Society - Knowledge Society" (IS - KS).The study treated human interfacing ergonomics - technology, skills training strategy and action consequences of inaction were delayed.

5.Interdisciplinary approach of the working space and jobs

From the interdisciplinary requirements, the fundamental law of ergonomics cooperation between disciplines, we formed an interdisciplinary working group composed of the authors of the study as representatives of four subjects: ergonomics, occupational medicine, computer science and economics. Specialists in these fields have mono-disciplinary training, so the first condition was to want to participate with interest in ergonomic organization of the Cabinet of Insolvency 'X'.

The second condition was informing the group, each member, about the contribution it can bring in joint research discipline they represent, and that he expects support from other disciplines cooperating. This information has a practical - functional character to include as many questions and request to other domains that trigger interdisciplinary creative thinking. This created a common body of cooperation / dialogue.

The third condition was the study of ergonomics checklists[1] developed in different countries:
- Ergonomic Swiss questionnaire, developed by Prof. E. Granjean, consisting in 73 questions.

[1] First Congress of the International Ergonomics Association, held at Stockholin (1961) reported the need for useful research tools and methods. Thus was developed checklist / ergonomic questionnaire

- Japanese ergonomic questionnaire, developed by Japanese National Commission, which seeks technical organization of work.
- Swedish ergonomic questionnaire, developed by Hultgren, which establishes requirements for recruiting workers for a fair application of ergonomic corrective measures.
- Romanian ergonomic questionnaire, developed by Professor James Mihaila, containing 151 questions grouped into: safety, job planning, aesthetic considerations, physiological organization of labor, use of light and color, temperature and health protection.

For the ergonomic efficiency of the research team each member has acquired a minimum level of knowledge, strictly necessary, in specialties of the other members, to be able to carry on a dialogue with them. In this way each member of the interdisciplinary team cooperates with colleagues regarding phenomena, following links between cases located within a scientific field and the effects in another area.

An idea that was the basis for our work was to guide:
- Ergonomic specialist thinking for optimizing the relationship "man - requirements - environment;
- Doctor's thinking to focusing on prevention, especially in the matters regarding working conditions and health of the working environment;
- Design of the computers and of the equipments with screens to the operator interface / computer;
- Economically efficiency.

6. Introducing Control Lists - Questionnaire[1], ergonomic analysis and SWOT analysis

Support for the interdisciplinary work was the two lists developed by the working group, namely: Ergonomic **Control List - Questionnaire "A"** and the analysis of *working space* in the Cabinet „X" activity, which uses display screen equipment and Ergonomic **Control List-Questionnaire "B"** and the analysis of the *individual working space* inside Cabinet "X", which uses equipments with screens;

Elements common to both lists - Questionnaire:

- The duration of the Cabinet of establishment: one year
- Number of workers who use display screen equipment involved in giving answers to questions: four

[1] Unlike Ergonomic Control Lists - Questionnaire in which responses were having only the controlling role, of not omitting the key ergonomic elements by answering with Yes, No, Partially in this type of closed survey, we introduced the type of open questionnaire, with explanations by SWOT components: strengths, weaknesses, opportunities and risks.

- Type of questionnaire: open
- Area working with furniture and equipment and machinery
- Grouping and number of questions
- SWOT analysis of strengths, weaknesses, opportunities and risks.

Lists - structured questionnaire were six columns in the table below:

Question	*Answer*	*SWOT Answers*			
		PT	*PS*	*O*	*R*
1	2	3	4	5	6

Table no. 1. Structure of the Control Lists - Questionnaire and ergonomic analysis**.**

For our research List - Questionnaire had the following role:
- The role to check that the main ergonomic components of the working area organising were identified and included in the list;
- The role of SWOT analysis on the same form, to save time and energy (comparative method);
- The role to form tools for space planning and workplace's ergonomic organising;
- Role of educational standard questionnaire includes questions, recommendations, rules, ergonomic principles and standards to understand and focus on the four employees on correct responses, thus making a start / awareness in ergonomic organization of space and room work area.

7. Centralization and analysis of results drawn from Ergonomic Control List - Questionnaire and SWOT analysis

7.1 For working space

Specific elements of the room of working space:

Grupe de întrebări propuse Groups of questions	*SWOT Answers*			
	PTPT PT	*P PS*	*A*	*RR*
1. 1. Basic elements for the working space ergonomics.	15 15	4 4		
2. Egonomics visual ambiance.	11 11			
3. Ergonomics color ambiance.	6 6			
4. 4. Ergonomics of the noise.	6 6	2 2	2 2	2 2
5.5. Electromagnetic radiation.	3 3	1	1	
6. 6. Ergonomic of the air purity.	3 3	1	1	1 1
7. 7. Ergonomic microclimate (temperature, humidity, calorific radiation, air movement).	9 9 3		1	
8. 8. Ergonomics of the functional music.	3	1 1	1	1 1
9. 9. Ergonomics of the social conditions.	3 3			
TOTAL = 75 of which:	59 8 8 4	4 4	4	59

Tabelul nr.2 Grupe de elemente specifice cuprinse în Lista – Chestionar „A" Table no 2.
Groups of the specific elements contained in the List - Questionnaire "A"

Înregistrarea a 59 de puncte tari se datorează faptului că spaţiul a fost neocupat iniţial iar la organizare ergonomică au participat în mod real angajaţii Cabinetului „X" prin „învăţare – aplicare". 59 records of strengths is due to the fact that space was unoccupied and the organization initially ergonomic employees actually participated in the Cabinet "X" through "learning – applying". Celelalte elemente SWOT sunt minore şi vor fi cuprinse în programul de măsuri spre rezolvare. SWOT other items are minor and will be included in the measure program for resolving.

6.2 Pentru locul de muncă individual 7.2 For individually working place

Elemente specifice locului de muncă individual: Job specific elements:

Grupe de întrebări propuse Groups of questions	*Răspunsuri SWOT SWOT Answers* *2* *3* *4* *5*			
	PT PT	*PS PS*	*O A*	*R R*
1. 1. Elelemente de bază pentru ergonomia locului de muncă individualBasic elements for the ergonomic of the working place.	10 10 9 9 5 5	2 2 2 2		
2. 2. Erergonomia Zonei de muncă Ergonomics of the work zone	3 3 6 6	1 1 1 1	1 1 1	1 1 1
3. 3. Mmobilierul ergonomic individual Individual furniture	9 9 4 4	1 1 1	1	1
4. 4. Cconcepţia constructivăConstructive concept	3 3	1	1 1	1 1

5. 5. Ininterfaţa operator/ calculator Interface operator / computer 6. 6. Erergonomia echipamentului* Ergonomics of the equipment * 7. 7. Erergonomia tastaturii* Ergonomics of the keyboard * 8. 8. Erergonomia mobilierului* Ergonomics of the furniture * 9. 9. Erergonomia mobilierului Ergonomics of the furniture 10. 10.mediu de muncă Working environment	6 6 9 9	4 4	3 3	3 3
TOTAL = 88 din care: TOTAL = 88 of which:	64 64	12	6	6

Table no 3. 3 Grupe de elemente specifice cuprinse în Lista – Chestionar „B ” Groups of specific items contained in the List - Questionnaire "B"

Principalul rezultat îl constituie cele 64 puncte tari din analiza SWOT, iar celelalte elemente sunt aproximativ aceleaşi cu cele rezultate din analiza spaţiului de muncă. The main result is the 64 strengths in the SWOT analysis and other elements are approximately the same as the results of analysis of working space. They are applied in Section 6.

7. 8. Analiza interdisciplinară a amenajării ergonomice a SPAŢIULUI şi a Interdisciplinary analysis of land space and ergonomic LOCULUI DE MUNCĂ la care se utilizează echipamente cu ecran de vizualizare Work at who uses display screen equipment

Interdisciplinaritatea ca lege fundamentală a ergonomiei abordează acelaşi obiect, fenomen, proces etc., de către discipline diferite în spirit de întrepătrundere a aparatului tehnic – metodologic, utilizat într-o concepţie unitară integratoare de intercondiţionare. Interdisciplinarity as a fundamental law of ergonomics addresses the same subject, phenomenon, process, etc.. By different disciplines in a spirit of interpenetration of technical apparatus - the method used in a unified conception of inter-inclusive.

Metodologia de lucru utilizată a constituit-o *metoda participativă metoda antitezei* a opoziţiei dialectice dintre două judecăţi, idei, soluţii, care se pun astfel reciproc în relief şi *metoda tratării interdisciplinare* de cooperare între discipline.

Working methodology used was the *antithesis* of *participatory methods method* dialectical opposition between two judgments, ideas and solutions, which are thus raised and each *treatment method interdisciplinary* cooperation between disciplines.La acestea intervin metodele şi tehnicile proprii disciplinelor cooperante, în măsura în care răspund scopului cercetării comune şi numai prin întrepătrundere cu metodele celorlalte discipline. These methods and techniques involved in their disciplines cooperating to the extent that only serve the purpose of joint research and methods by intermingling with other disciplines. Se

realizează astfel o simbioză în comunicarea de idei şi integrarea reciprocă a concepţiilor de cercetare, inclusiv a terminologiei folosite. Symbiosis is done as a communication of ideas and mutual integration of research concepts, including terminology.

În scopul tratării interdisciplinare a răspunsurilor rezultate din Lista – Chestionar şi din analiza SWOT grupul constituit a conceput suportul de analiză interdisciplinară *(Tabel 4)*, în care s-au înregistrat rezultatele: In order to approach in a interdisciplinary way the responses from List – Questionnaire and SWOT analysis the group has developed the support for the interdisciplinary analysis *(Table no. 4)*

Interdisciplinary results from spatial analysis

Groups		0	9
Ques tion			75
Response			75
SWOT Analysis	PT		59
	PS		8
	A		4
	R		4
Cooperation between	Ergonomist		1
	Doctor		1
	IT		1
	Economist		1
Compatible			75
Incompatible			7
Solved			7
Eliminated			-
Opportunities risk, measures etc.			Program measure

Table no.4. 4 Suportul de analiză interdisciplinară pentru spaţiul de mAnalytical support for interdisciplinary work space

Interdisciplinary results from the analysis of the individual work place

Groups		0	10
Ques tion			88
Response			88
SWOT Analysis	PT		64
	PS		-
	A		6
	R		6
Cooperation between	Ergonomist		1
	Doctor		1

	IT		1
	Economist		1
Compatible			64
Incompatible			4
Solved			-
Eliminated			-
Opportunities risk, measures etc.			Program measure

Table no.5 Suportul de analiză interdisciplinară pentru locul de muncă individual 5
Iinterdisciplinary analytical support for individual work place

9. SPACE ergonomic organising in Insolvency "X"Cabinet's room

To discern the most appropriate ergonomic organization of space, the authors group has developed several versions of the location of furniture and machinery taking into account the principles and rules of ergonomics. The final version is presented in Figure no. 1. This variant was the final unanimous decision of the interdisciplinary group of workers of Insolvency Office.

Targeted purchased furniture include: desks, chairs, shelves with four modules, bookshelf etc. meant to provide:

- - working table dimensions (1.3 m × 0.63 m) in terms of comfort for workers and making normal movements while working.
- dimensioning the passing spaces for the employees to provide proper access routes to work placs and between them and the walls surrounding the room.
- existing seats not being ergonomic must lead to purchasing of the ones fit for computer users.

The figure illustrating the location shows that the four desks are arranged parallel to the window and door (desk no.4, the door having window), thus ensuring natural light. Common rule that the light must come from the left side which was specific for handwriting was dropped.

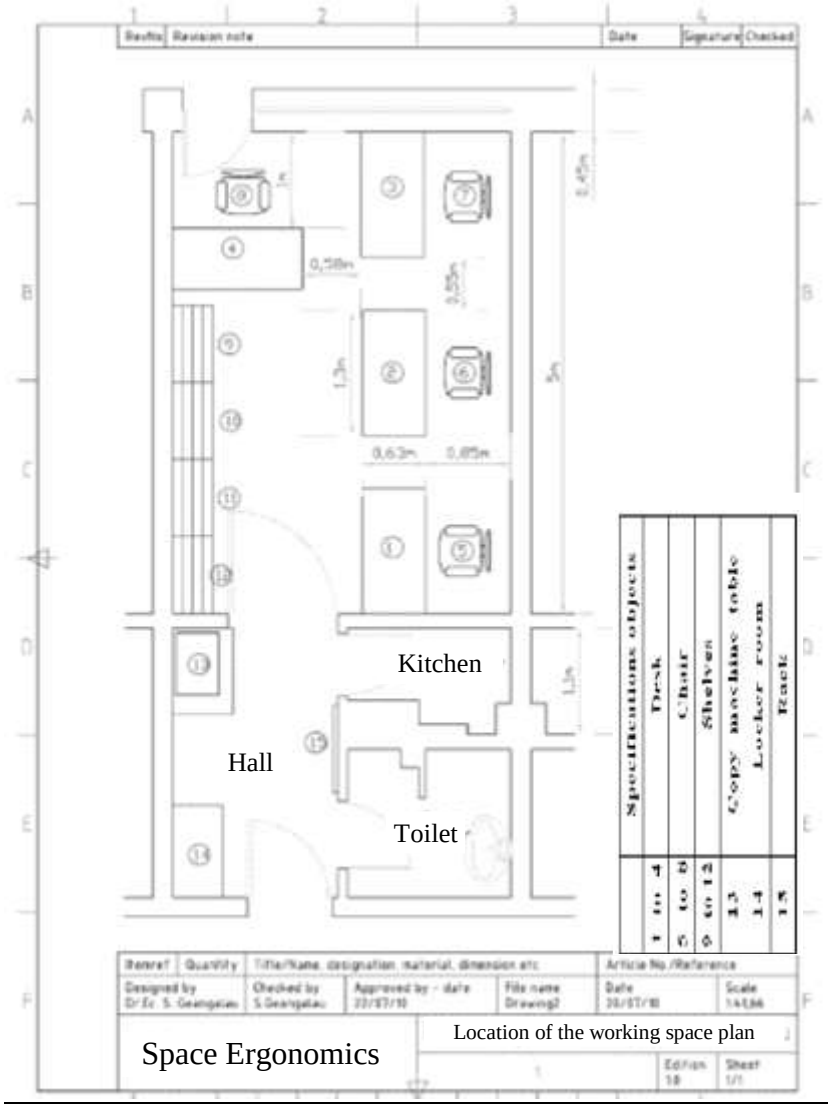
- Ergonomics value physical comfort, microclimate ambience, music and social conditions all for mentaining the health of workers, with little action and operational interventions.

10. Organization of ergonomic workplaces in the Cabinet of Insolvency "X"

With the basic elements into practice learned from list - Ergonomic Control Questionnaire, SWOT analysis and we started organizing the interdisciplinary analysis of the factual employment for the holder of the Cabinet, to be extended to three other jobs with relatively similar conditions.

For this, the working group continued research focusing on *the working table* surface with two zones: the normal maximum recommended classical ergonomics.

a) The normal work - motion carried performer category III - (fingers, hand, forearm) that pivots around the elbow



Scheme nr.1 – Final version of the location of furniture and working place

ERGONOMIC RECOMANDED OPERATIVE AREA

HORIZONTAL WORKING AREA
Speace included in normal or maximum working area

a) The normal work - motion carried performer category III - (fingers, hand, forearm) that pivots around the elbow.

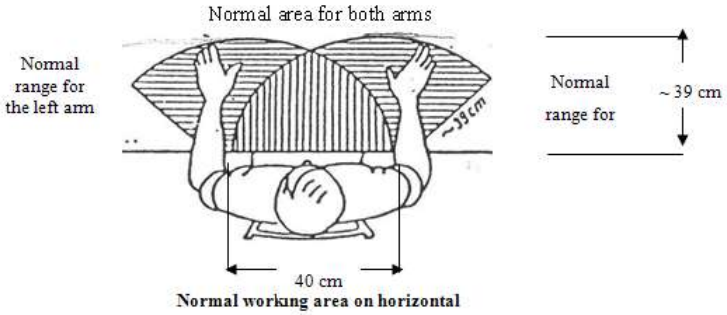


Fig. no.1 . (after Cours d'agent d'etude du travail – B.I.T.)

b) Maximum working area - the executor made movements category IV (fingers, palm, forearm, arm) which pivots from the shoulder joint.

Maximum area for both arms.

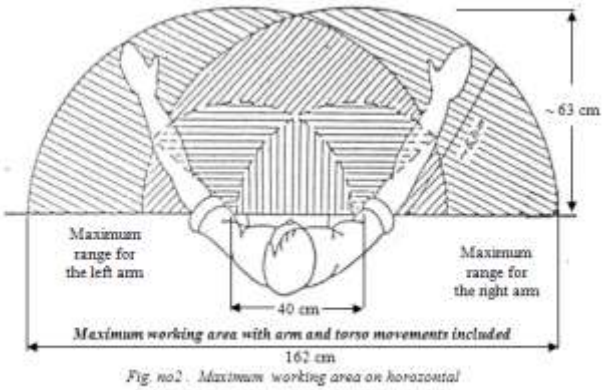


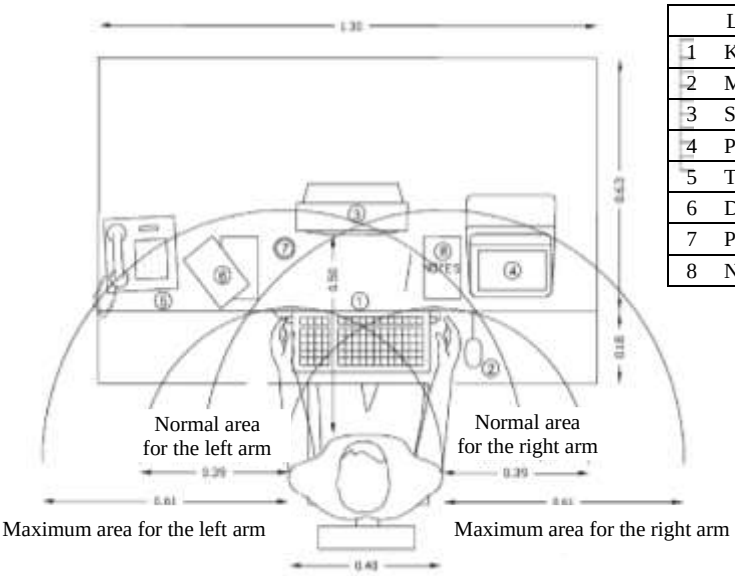
Fig. no2 . Maximum working area on horizontal (after Cours d'agent d'etude du travail – B.I.T.)

The assessment of that work areas, work area in a horizontal plane and the **normal maximum** working horizontally recommended classical ergonomics found that they were appropriate industrial activities and office work. These types of areas are exemplified in *Figures 1 and 2.*

In these conditions the past it was started the redesign of working areas suitable for office work using equipments with screens. The result is shown in Figure. 3. 3.

In the normal area keyboard and mouse are located.

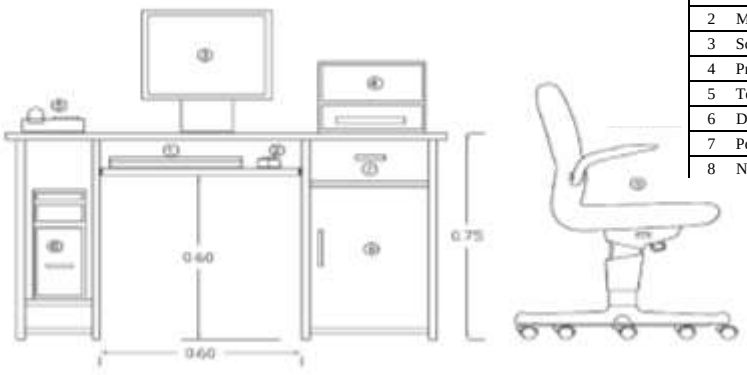
In maximum area are located: the screen, printer, phone / fax, processed documents, birotics.



LEGEND	
1	Keyboard
2	Mouse
3	Screen
4	Printer
5	Tel / Fax
6	Documents
7	Pens, Markers
8	Notes

Fig. nr. 3 - Ergonomic location of equipment, furniture and stuff

Research headed then to the space from under the desk surface. This area, to our knowledge, has not been examined and developed so far in terms of ergonomic workplace organising, so we proceeded to design it which is shown in fig. no. 4.



LEGEND	
1	Keyboard
2	Mouse
3	Screen
4	Printer
5	Tel / Fax
6	Documents
7	Pens, Markers
8	Notes

Fig. no. 4 - The space from under desk

This organising has been studied in terms of ergonomic principles and rules of motion economy optimizing relationship "man-applications - environment" and has been endorsed, accepted by the four workers involved in this action, the ergonomic organising of their work places.

• Working space of 16 m and four individual work areas ergonomically organized in terms of optimizing the relationship "man-requirements-environment.
• Two types of ergonomic control Lists - Questionnaire (open) and SWOT analysis of the work area in office where are equipments with screens.
• Designing the support and the interdisciplinary analysis for the proper location of the work area.
• Normal area and maximum area-specific to the desk work, designed and redesigned.
• Area from under the work space, conceived and designed.
• Developed/designed docyments: tables, charts, appendices, etc.
• Dealing with expertise and experience in cognitive ergonomics in relation to the four employees' learning - application.

Original contributions:

We believe that thel study is original, it's our own creative - innovative concept, the four authors,asjusted to the Cabinet of Insolvency "X" in Piatra Neamt.

Suggestions:

• Initiation by the Ministry of Labour, Family and Social Protection of Romania to include the occupation of "specialist in ergonomics" and "ergonomics technician" in the Occupations Code and developing occupational standards by the National Adult Training Board (NATB) for enable the organising of the training courses for adults.

• Proposals made during the scientific events organized by RSA to be taken and analyzed in order to make interventions in the institutions concerned for their transposition into practice.

The final conclusion:

• Technical - scientific innovation imposed by the rapid emergence of a variety of equipments with screens on the market, but was not accompanied by cognitive ergonomics developement at the same pace, lagging behind and affecting the health of users. These issues must be synchronized.

• It requires a change in management of the desk work where are used in electronic computers combining technical resources towards the application of cognitive ergonomics, to adapt work to man and man to his trade. Only in this way can be eliminated the disfunctions created so far and which affects workers' health. For this we need ergonomic specialist **today** and no **tomorrow.**