

# PAST, PRESENT AND FUTURE IN ERGONOMICS

Professor PhD **Aurel MANOLESCU**  
The Bucharest Academy of Economic Studies, Romania  
Assistant Professor Ph.D **Cristian MARINAȘ**  
The Bucharest Academy of Economic Studies, Romania  
Assistant Professor Ph.D **Irinel MARIN**  
The Bucharest Academy of Economic Studies, Romania

## ABSTRACT

*The International Ergonomics Association, founded in 1957, represents the springboard for Ergonomics to develop as an independent science. Its fundamentals derive from scientific management, developed by F. Taylor and L. Gilbreth, who have ascertained that productivity can be improved by redefining the way work is carried out rather than by using high-fi machines and equipment. The analysis of changes recorded within the field of ergonomics, in the last 40 years, continuous rapport and exchange of experience will bring ergonomics into focus.*

*Future development of ergonomics as an independent science emphasizes the way research outcomes are put into practice. Eventhough the International Ergonomics Association together with its affiliations substantially contribute to the designing of a framework, its long-term development will greatly depend on the extent to which education will have developed within the field of ergonomics as well as on the way scientific research outcomes have been put into practice.*

**KEYWORDS:** *ergonomics, sustainability, partnerships, holistic approach, ergonomics affiliations*

## 1. Introduction

In view of a better understanding of the current contents of ergonomics, one of the main prerequisites is its **historical evolution**. As the literature shows<sup>1</sup>, nowadays, there is no exhaustively elaborated history of ergonomics (**F. Javier Llaneza Álvarez, Gavriel Salvendy**).

Consequently, from the very outset of humanity, ergonomics has proved of high interest, as a means of streamlining work (**Childe, Braidwood**). Thus, awares or unawares, human beings have always been prone to adjust their tools and use them as hand extensions to work upon the environment.

## 2. Ergonomics Development Factors

According to the conclusions drawn up at the first International Symposium on Ergonomics, held in Prague, in 1967, **the main factors responsible for the development of ergonomics** are:

- The progress in technology;

<sup>1</sup> G. Salvendy, *Handbook of human factors and ergonomics*, Third Edition, John Wiley & Sons, Inc., 2006, p. xxi L.J.F. Alvarez, *Ergonomía y psicología aplicada*. Manual para la formación del especialista, 11<sup>th</sup> edición, Editorial: Lex Nova, Espana, 2008, p. 24.

- Man's modern views on work;
- Relative progress or the evolution of technical, economic and social sciences as well as the humanities.

The development of research in ergonomics, greatly influenced by technical and scientific progress, is continuously and positively changing **work efficiency** and the **working conditions** altogether.

Hence, ongoing development and widely spread application of the new technologies **directly and significantly influence both the main work parameters** (tasks, duration, qualifications, role and functions, work intensity, the dynamics of offer and demand for work etc.), and **the extent and form of work's structural aspects** (motric, informative, adjustment, cognitive) **as comprised within the structure of the working process**. As a consequence:

- **The relation between different competences** modifies and their role in man's adjustment to work decreases;

- There is a **tendency to limit division of labour** at a microeconomic level as well as to simultaneously increase the group's sense of responsibility;

- The relation between physical and intellectual work modifies. It is a **process of numerous meanings and characteristics**, leading, sometimes, to certain **states of distress**, to difficulty in capitalizing on the full potential of the working force;

- **Movement speed and precision** increase with a focus on smooth local muscles exertion; maximum simplification of movement form and configuration, dexterity comes in second;

- **Execution functions are reduced**, whereas managerial, monitoring, intervention and check-up functions develop and they are gradually intertwining;

- **Cognitive activities simplify** due to continuously repeated decisions, thus generating certain cognitive competences;

- **The more abstract and collective aspect of work** is highlighted by means of lack of direct contact with the subject of work and the manufactured product;

- Creativity, decision making involvement and degree of responsibility in case of unexpected malfunctions enhance;

- The role of **representations, memory and thinking** becomes significantly important;

- More and more logical activities or functions are being applied to machines, thus, validation of terms such as „**the artificial work of the machine**“, „**the work of the machine**“ or „**the machine is doing the work**“;

- There is a **tendency to form workteams**, highly autonomous, in charge of carrying out a series of interdependent tasks;

- **Increase in the complexity of man – machine relationship** as well as man and his task, based on the dialogue provided by the calculus technique (**man-computer dialogue**);

- **Professionalization of work**, development of quantitative and qualitative knowledge.

Likewise, although technical and scientific progress has determined qualitative changes in the working process and its ever growing efficiency has been paralleled to the improvement of the working conditions, **paradoxically, the quest of fully capitalizing on human potential and reducing the effort is not only actual but, it has become, in time, even more complex**. In fact, paradoxically, the progress of modern technique, somehow negatively affects the human body. Thus, according to some specialists in the domain, the „**3 S**“ are:

- **Body overweight;**
- **Sedentarism;**
- **Stress or work overload.**

### 3. International Views on Ergonomics

Founded a century ago, Ergonomics developed slowly in the first 10-12 years as a result of conservative conceptions of the sciences responsible for its creation.

The evolution of modern technique has encouraged the research in ergonomics that, later on, were applied in industry, arousing the general interest, displayed in the form of international events, such as the congress of the **International Ergonomics Association (International Ergonomics Association – I. E. A.)**, set up in Oxford, in 1959. Moreover, the **French Language Ergonomics Society (Societe d'Ergonomie de Langue Francaise – S. E. L. F.)**, founded in 1963, that, in 1986, consisted of 350 members, organizes numerous specialized symposiums. **Southeast Asian Ergonomics Society (Southeast Asian Ergonomics Society – S. E. A. E. S.)** consists of specialists in different fields of activity, in charge of elaborating a wide range of research studies and programs in the domain of ergonomics, at national and international level, in order to improve working conditions and raising awareness, at the level of organizational management, about the humanization of work. Researches in the field of ergonomics were substantially conducted by the **Ergonomics Research Society**, set up in 1949 (**Ergonomics Research Society – E.R.S.**) and well marked by the publication in 1957 of the **Ergonomics**, starting as an instrument of the British Ergonomics Research Society and, later on, of the International Ergonomics Association. Specialized societies have been set up in different countries, such as: the USA, Sweden, Finland, Russia, France etc.

In compliance with the reports drawn up by the **International Ergonomics Association**, the complexity and diversity of studies and researches conducted in the last 50 years within the field of ergonomics have identified at least 26 distinct technical areas of research which have led to the foundation of specialized committees and commissions. The **International Ergonomics Association** rejoins affiliations and associations from more than 42 countries, currently numbering 20000 members. Moreover, it is the main organizer and promoter of international congresses on ergonomics, being held every three years. Although research in ergonomics has greatly developed, it still displays limits and limited field of research as compared to studies conducted in the field of engineering and medicine. That is why, a series of partnerships have been established between the International Ergonomics Association and the International Labour Organization (I.L.O.), the International Health Organization (W.H.O.), the Finnish Institute of Occupational Health (F.I.O.H.), the International Commission of Occupational Health (I.C.O.H.) etc.

**The first congress on ergonomics** was held in 1961, in Stockholm. The term ergonomics was coined and action guidelines were agreed upon, for example: the ergonomic analysis of the workplace and working environment. Attempts to disseminate and develop this scientific interdisciplinary domain have been made continuously, resulting in the organization of congresses held by the International Ergonomics Association every three years.

In 2009, Beijing played host to the **17th Congress of the International Ergonomics Association**, on *Changes, Challenges and Opportunities*. Its main objective was the elaboration of a framework of professional debates regarding the latest and most relevant theories and practices in the field of ergonomics. Furthermore, it aimed at introducing the most significant outcomes of studies conducted in the domain of *human engineering*.

### 4. National views on ergonomics

**In our country**, the premises of ergonomics are underlined by countless researches in the fields of: occupational health, occupational physiology and psychology, occupational sociology, hygiene and safety, leading to practical ergonomic solutions and applications.

**The first symposium in the field of ergonomics** was held in 1968, and, in 1969, **the first reviews** were published in 1969. Likewise, in 1974, within CEPECA, **the first specialized courses on ergonomics** were delivered to doctors, psychologists, economists, rounded off in ergonomic projects.

Researches in the field of ergonomics have developed in the forthcoming years, in the form of scientific events in the domain of (transports, light industry, automotive, forestry etc.).

The first **National Conference on Ergonomics** was held in 1971, fostering research undertakings. Hence, some research institutes have set up **ergonomic work teams** and **laboratories**, whose main task is to sort out particular interdisciplinary problems. Starting with 1971, there have been published numerous articles and papers that have led to the training and counselling of specialists from different organizations. In 1974, Bucharest played the host to the first **International Conference on Ergonomics**, on the initiative of the Ministry of Labour in collaboration with the International Labour Organization.

After 1989, there was a decrease in research undertakings on ergonomics due to a series of factors such as: the advent of new technologies, the appearance of the multinational companies on the Romanian market, strict requirements regarding the increase in profit and productivity, acting as indicators of work outcomes and efficiency, companies' growing focus on operational activities under the impact of the environment etc. It is worth mentioning the growing interest in the field of ergonomics, shown by specialized studies undertaken as well as by conferences and symposiums held on ergonomics. It is noteworthy the growing number of papers and articles published in this field by now. Moreover, at present, **ergonomics is taught as an independent discipline** within some higher education institutions and professional training centres. This is due to the fact that organizations from different domains of activity have understood the importance of the ergonomic design of the workplaces, as a prerequisite for the employees' well-being as well as for the growth of efficiency and effectiveness of the activity carried out. Even so, the number of specialists in ergonomics is rather small. It is also worth mentioning the Romanian organizations deeply involved in ergonomics: The **Institute of Public Health** (one of its research areas is *ergonomics for schools – a prerequisite for children and adolescents' health maintenance and promotion*), the **Romanian Society of Healthcare Management**, the **Romanian Society of Dental Ergonomics** (one of the specializations is *Ergonomics of the dental office, efficiency enhancement within the dental office*), the **National Institute for Research and Development in Occupational Safety** (one major field of research is the *ergonomic optimization of activities and workplaces*) etc.

In spite of numerous studies conducted within the field of ergonomics, most of them being unilateral, dealing with or solving certain aspects of human activity, in practice, many queries regarding the organization of work remain unanswered.

Little interest shown in ergonomics is the result of **a series of causes creating difficulties in the development of ergonomic researches:**

- insufficient personnel trained in ergonomics;
- insufficiently qualified existing personnel;
- pressure of currently undertaken activities;
- the way ergonomics research is determined and interpreted.

#### **International Current and Future Trends in Ergonomics**

Although ergonomics interdisciplinarity is well-known, it is differently approached from one country to another, thus, displaying several **trends or tendencies:**

- **the American trend** – focus on psychological consequences, sustained by **Prof. Alphons Chapanis**, claiming that 80% of the members affiliated to the American Ergonomics Association are psychologists;
- **the Scandinavian and German trend** - focus on scientific methods of measurement;
- **the Italian and French trend** – the „traditionalist debate” between doctors and young people, coming from different fields of activity, willing to extend their research, inasmuch as ergonomics „colonization” by occupational medicine remains typical of France -country with a long tradition in the field of physiology;
- **the Anglo-Saxon trend** – focus on technology and man and machine’s mutual adjustment;
- **the Swedish and Swiss trend** – focus on workplaces, informational systems approached from a psychological and physiological point of view;
- **the Japanese trend** – focus on both technical as well as psychological, physiological and occupational medicine aspects, considering the efforts of the **Japanese National Commission** to technically organize labour, correct layout of control devices integrated in space and environment, make good use of the data flow, appropriate processing rate and time.

## 5. Conclusions

More and more countries, members of the **International Ergonomics Association** are applying educational programs to the field of ergonomics.

By way of a conclusion, the above mentioned aspects have led to **a new approach** in ergonomics in our country.

Likewise, the outcomes not only ascertain a positive experience but also a springboard for a **planned systematized undertaking in view of applying ergonomics to the managerial practices in the domain of human resources**.

## References

1. Gardell B. – *Work organization and human nature*, The Swedish Environment Fund, Stockholm, 1987
2. Manolescu A. – *Managementul resurselor umane*, ediția a IV-a, Editura Economică, București, 2003
3. Salvendy G. - *Handbook of human factors and ergonomics*, Third Edition, John Wiley & Sons, Inc., 2006
4. Álvarez L. J. - *Ergonomía y psicología aplicada*. Manual para la formación del especialista, 11<sup>a</sup> edición, Editorial: Lex Nova, Espana, 2008
5. Bridger R. – *Introduction to Ergonomics*, Taylor & Francis, 2003