

ERGONOMICS – FUTURE DIRECTIONS

DAVID C. CAPLE*

President, International Ergonomics Association, Australia

**Email: david@caple.com.au*

The International Ergonomics Association plays a leadership role in shaping the future of ergonomics. Having formed nearly 50 years ago for researchers to meet and exchange their findings, it still provides a wide range of opportunities for promoting research and teaching. In 2006, the IEA is also an outward looking organisation with linkages to governments, international agencies and other professional associations. We have many opportunities to extend our engagement with industry and the community through the IEA communication strategy and Technical Committees. Whilst the IEA now has 20 Technical Committees that demonstrate the diversity of ergonomics research there is a growing trend towards integration of specialist areas. The emergence of a holistic approach to research and application of ergonomics is making a new direction for the ergonomics profession. Apart from the role of a technical specialist, the Ergonomist is also a team member with a range of other stakeholders. To be effective in practice, the Ergonomist needs to be a good communicator and “agent of change” who can mentor others to develop simple cost effective interventions. Research is fundamental to the science of ergonomics. Evaluation of interventions remains a major component of future ergonomics research. Sustainable positive outcomes based on a holistic approach will result in a broad uptake of ergonomics findings. In industry future challenges relating to psychological health in developed countries and the informal sector in developing countries are emerging as new areas for research and application of ergonomics.

Key words: ergonomics; future directions; research; ergonomics profession; interventions.

INTRODUCTION

The International Ergonomics Association (IEA) has 42 countries who are represented on the Council as Federated Societies and 2 affiliated societies. In 2006 the IEA celebrated its 50th anniversary since its inception at a meeting in Leiden, The Netherlands in 1956. The past history of ergonomics as a science dates back to the 16th and 17th century with the early research on physiology, anatomy and biomechanics. Researchers such as Da Vinci, Vauben, Borelli have been described in the 25-year history of the IEA (Kuorinka, 2000).

The term ergonomics is derived from “Ergonomia” which was originally published in Poland in 1857 by a Polish engineer Dr. W. Jastrzebowski. The engineer and psychologist J.K.F. Murrel has been credited for the term “Ergonomics” in 1949. This was the name to be the basis of the discipline known as “Fitting the Task to the Man” (Monod, 2000).

The growth of the science to be known as ergonomics escalated after World War 2 in Europe as part of the broader strategy of redevelopment and reconstruction. Since this time, it has developed into a broad based multidisciplinary science with wide applications across industry.

1. Education and research

1.1 Education in ergonomics

The IEA has been developing a generic curriculum program for a Masters degree status to assist

universities involved in education to ensure that the basic competencies of an Ergonomist are specified. This initiative also assists organizations involved in the certification program of ergonomists to utilize a consistent approach to assessing educational based competencies of an Ergonomist. The future of graduate education in ergonomics will need to reflect these competencies to encourage graduates to consider certification recognition as a career option.

However, the future of education in ergonomics is under pressure as funding restrictions from governments and universities continue to challenge the viability of ergonomics courses to be offered. For example, at the IEA Council meeting in 2006, it was reported that funding for programs in Germany, Switzerland and the United Kingdom have all been under pressure resulting in the closure of some of the well established research laboratories and teaching programs. In developed countries there is an ongoing emergence of other disciplines that are requesting university based teaching and research programs which compete with the funding requirements for the ergonomics-teaching programs.

A growing trend in the selection of teaching programs by students relates to their desire for career linked courses to maximize their chances for future employment. Consequently, there is a trend in developed countries for teaching programs in ergonomics to be linked with other degree programs that will provide greater career based prospects. These include degrees in areas such as engineering, psychology, physiotherapy, and occupational health and safety.

This change in the educational programs for ergonomics provides greater challenges for the continuation of ergonomics as a research-based science to attract qualified graduates and funding to compete with the vocationally based programs.

1.2 Ergonomics research

The funding of research in ergonomics is now highly dependent on funding from external agencies. These include private research funds, government and industry-based resources. As a consequence, the research directions tend to be targeted towards current industry and community-based issues.

It was interesting to note the debate of the proposed “Ergonomics Rule (2000)” in the USA where considerable question was directed towards the scientific rigor and adequate evidence-based research that ergonomics interventions actually produced the claimed results within the workplace. Such debates provide incentives for ongoing long term research projects to verify that the risk factors identified in ergonomics research can be adequately controlled through the recommended intervention strategies.

An emerging trend in ergonomics research is a greater dependence of collaboration between ergonomists and other professional areas. This is best reflected in programs conducted at an international level such as the World Health Organization (WHO) 2006/2010 Strategic Plan. This includes a wide range of research projects including ergonomics where multi disciplinary teams are formed at an international level to study a range of health related programs. This is also evident through major research programs funded by governments such as the European Union involving representatives from various countries in both the developed and the developing world.

Within the IEA, there are currently 20 Technical Committees operating in 2006. These are summarized in Table 1.

At the IEA Council meeting in 2006, 3 new Technical Committees were approved. These are:-

- Gender and Work
- Ergonomics in Design
- Slips, Trips and Falls

As the diversity of ergonomic application increases, so too will the range of Technical Committees that bring together scientists and practitioners interested in specific research and application areas.

Table 1. Technical Committees of the IEA (July 2006).

1. Activity Theories for Work Analysis and Design	11. Human-Computer Interaction
2. Aging	12. Human Reliability
3. Agriculture	13. Musculoskeletal Disorders
4. Auditory Ergonomics	14. Organizational Design And Management
5. Building and Construction	15. Process Control
6. Ergonomics for Children and Education Environments	16. Psychophysiology in Ergonomics
7. Ergonomics in Design	17. Quality Management
8. Gender and Work	18. Safety and Health
9. Healthcare Ergonomics	19. Slips, Trips and Falls
10. Human Aspects of Advanced Manufacturing	20. Standards

2. *Role of governments*

The role of governments to provide leadership in the adoption of findings from ergonomics research in industry is fundamental to the future of the growth in this science.

Many countries of the world have detailed legislation requirements relating to occupational health and safety in the workplace. Countries such as the UK, Sweden, Australia, have specific legislation relating to the prevention of musculoskeletal disorders (MSD) that have been in place for the last 20 years.

The effectiveness of these legislation programs are constantly challenged by the major stakeholders such as employers, unions and the government in these countries to assess their role and effectiveness to prevent workplace-related health and safety injuries.

It is therefore important in the future that the ergonomists and their representative societies including the IEA, engage and participate in government debates that relate to the adoption of legislation and guidelines that embrace the results of the ergonomics research.

The model used in The Netherlands, involves the unions and the employers debating the relative merits of workplace safety and to come to the government with a proposed initiative. In this way, the tripartite approach has the support of the major stakeholders before introduction. This model could be useful for further consideration by other countries and for identifying the role of the ergonomist in each of the stakeholder parties.

The role of the government in supporting research and promotion of ergonomics within specific industry sectors is an important foundation for future intervention programs. Significant impact has already been evident in introducing ergonomics research in industries such as healthcare, transport, manufacturing and mining.

3. *Ergonomists – “Agents of Change”*

The future of ergonomics to impact on industry will depend on the role that ergonomists seek for themselves and are given by stakeholder groups.

It is proposed that there are three primary roles that ergonomists will provide in the future. These include the following.

3.1 *Researchers and technical specialists*

These ergonomists are actively involved in research and can provide current knowledge to stakeholders in relation to industry-based issues. Scientific rigor in terms of methodology and evaluation can be brought to the debate through their participation.

Their participation in linking with other research and other disciplines around the world enables contemporary methodologies to be identified and incorporated where appropriate. Such researchers will tend to have specialist areas of contribution such as biomechanics, cognition and aging.

3.2 Generalist ergonomics advisers

Within many large companies and government departments, ergonomists are employed to be part of a multidisciplinary team. They are often engaged as occupational health and safety advisers to overview a range of injury prevention and rehabilitation programs.

In this role, a holistic view of ergonomics within the broader business and government priorities and programs is essential.

Communication skills are fundamental to ensure that the Ergonomist can effectively engage with managers and workers to achieve an outcome of mutual agreement.

When technical areas of ergonomics are identified, they can engage a technical specialist to assist as part of the project teams.

3.3 Independent ergonomics consultants

These ergonomists are often self employed, or members of consulting companies who can be engaged on a project basis for either research or practice programs.

Within the political environment of the workplace, the credibility of these consultants is important to be established that they are seen to be independent and to provide technical and industry-based knowledge to the program.

Again, facilitation skills and communication skills are essential for their effective contribution.

The focus of the ergonomics consultants is to assist the workplace towards identifying practical outcomes that provide sustainable solutions to their problems.

There are many ergonomists that combine aspects of these areas of work but it is important for the future of ergonomics contribution that their role is clearly understood by the ergonomist and the stakeholders.

The role of the ergonomist in a holistic approach to resolving workplace issues requires a broad appreciation of the role of the other stakeholders and how ergonomics can effectively contribute to the team. Hence the ergonomist must be a team player to provide an effective contribution.

3.4 Competencies of “Agents of Change”

It is important that the education of ergonomists recognizes their role as an “agent of change” and provides them a focus towards being a team member and to develop good communication and consultation skills.

A strong technical basis to the work is essential through the ergonomics education and research programs. If the contribution of the ergonomist does not result in a tangible outcome, the credibility of the ergonomics would be questioned.

The future employment of ergonomists by governments and industry is dependent on them establishing trust and credibility to provide strong technical and practical focus to the contributions that are made.

Through good scientific rigor, the ergonomist can bring a technical approach to contribute towards the practical outcomes. However we need to be aware that whilst ergonomists can contribute to improvements to workstations and the design of technology we may inadvertently contribute to work intensification with adverse health and safety outcomes. Hence the holistic approach needs to address the broad implications of being an “Agent of Change”.

4. Engagement with the community

The IEA and the Federated Societies themselves, have a range of initiatives that promote the adoption of ergonomics within community programs.

As an example, the Ergonomics Society in the United Kingdom has supported the development of a website known as “Ergonomics 4 Schools”. This presents a practical interactive approach to promote the adoption of ergonomics principles relating to children and their specific needs within a school environment.

The IEA has a Technical Committee called “Ergonomics for Children in Education Environments

(ECEE)" that brings together research from around the world relating to issues associated with children in the educational setting.

This group looks at a range of emerging issues from the use of computers in the education environment through to load-bearing activities such as the wearing of backpacks by children. These are issues of concern across the community and assist in the profile of ergonomics with children before they enter the workforce.

As part of the IEA International Development Program, a range of resources have been developed targeted towards specific industry sectors in developing countries.

In collaboration with the International Labour Office (ILO), the IEA has developed a collection of 120 "Ergonomic Checkpoints" (1996). These provide practical advice on a wide range of workplace risks. A subsequent publication on "Ergonomic Checkpoints in Agriculture" is currently being developed. This is targeted towards agriculture within developing countries and provides practical solutions to a diversity of ergonomic risks.

Engagement with the community on issues of concern that relate to ergonomics research will help to integrate ergonomics into the broad areas of application. The term "community ergonomics" (Cohen and Smith, 1994) expands the concept of "fit" of the worker in the workplace to also include the implications for their cities and society. These are based on the macro-ergonomics studies relating to theories of management and the control of complex systems. (Smith, et al., 1994).

For example, the participation of ergonomists on International Standards committees through the International Standards Organization (ISO) ensures their contribution at a technical level.

Opportunities arise in the media and public debates relating to issues covered in ergonomics research. These include issues such as aging, fatigue, road safety and musculoskeletal disorders. Through the issuing of press releases, participation in media interviews and television programs, the ergonomists will establish a profile as a diverse science with practical application across a range of community issues.

CONCLUSION

The future of ergonomics will be strongly dependent on the ability of Ergonomists to integrate outside our profession with a range of stakeholders. These include universities and external funding agencies that will support the education and research programs required to sustain vitality in the profession. It will include international agencies such as the WHO and ILO as well as national governments to include ergonomics in their policies and programs. A broader connection will be required with the community to engage in debates where ergonomics research can contribute to improve community health. The development of simple practical resources that enable the research findings to be accessible in developing countries will enable the science to remain a strong outreach to the diversity of their needs.

The future for ergonomists will require development of wide-based skills that include strong technical and research competencies. It also requires good communication skills and recognition that they are an Agent of Change working within a team with multiple stakeholders. This requires a holistic approach to ergonomics to achieve practical outcomes to the benefit of the stakeholders.

REFERENCES

- Cohen, WJ, and Smith, JH (1994) Community Ergonomics: Past Approaches and Future Prospects towards America's Urban Crisis. *In: Proceedings of the Human Factors and Ergonomics Society, USA:* pp. 734-738.
- Ergonomics Society, Ergonomics 4 Schools. <http://www.ergonomics.org.uk>
- International Ergonomics Association. <http://www.iea.cc>
- International Labour Office (1996) Ergonomic Checkpoints, ILO, Geneva.
- Kuorinka, I (2000) History of the International Ergonomics Association: The First Quarter of a Century. The IEA Press,

International Ergonomic Association.

Monod, H (2000) Proto- Ergonomics, *In: History of the International Ergonomics Association: The First Quarter of a Century*. The IEA Press, International Ergonomics Association.

Occupational Health and Safety Administration (2000) Ergonomics Rule, USA Department of Labour, Washington.

Smith, M, Carayon, P, Smith, J, Cohen, W, and Upton, J (1994) Community Ergonomics: A theoretical Model for Rebuilding the Inner City. *In: Proceedings of the Human Factors and Ergonomics Society 38th Annual Meeting*, USA: pp. 724-728.