

On the IEA Definition of Human Factors and Ergonomics

August 29, 2018 – Pierre Falzon - Interview with Ian Noy, Past President of the IEA

Foreword : Ian Noy was President of the IEA when a definition of Ergonomics / Human Factors was elaborated, in the period 1997-2000. The interview took place in Florence, Italy, on August 29, 2018.

PF. *Thank you for having accepted this interview. Under your presidency of the IEA, a definition of ergonomics/human factors was elaborated with, and adopted by, the Council. It was an important effort, with a potentially large international impact, and the IEA was indeed a legitimate body for producing a definition of HFE. Devising a definition implies tackling epistemological issues, such as: the nature of the discipline, its definition as a discipline, its branches, etc. I would like to quote an extract of the minutes of the Fifth General Assembly of the IEA (held in Amsterdam on June 5, 1973):*

[...] The second proposal [by E. Grandjean] to charge the Council is to define the term “ergonomics” and to state what disciplines should be included in the field of ergonomics and what not. Davis is not in favour of this proposal and refers to Singleton’s paper on training and education presented at this congress.

H. Monod points out that there are various ideas about ergonomics in various parts of the world and that he for that reason wants to second Grandjean’s proposal. Corlett is of the opinion that the IEA Council should not be asked to do the almost impossible thing of defining ergonomics.

The president agrees that the development of such a definition should not be required from a young organization as the IEA after 7.5 hours of existence, herewith referring to the actual time for discussion that has been available since its foundation.

So, Ian, it seems you did manage to do an impossible thing! But let us begin. My first question is: what led you to think that it was necessary to revise the definition. Where did it start from?

IN. Well, it really was not a question of revising the definition, since there was no official definition of Ergonomics. For a long time, even going back to the 70s and 80s when I was President of the Human Factors Association of Canada, we’ve had a lot of discussions about “What is unique about Ergonomics? How is Human Factors different? How do they relate to other primary disciplines such as Psychology and Engineering? What is the core essence of these fields?”. In particular, it seemed to me that different people had different perspectives about what Ergonomics is about from an epistemological viewpoint. This for me represented a hurdle that we as a community needed to surmount if we really wanted to engage people outside of the community - we need to have a clear and shared understanding of who we are, so that we can explain our competencies to other scientists and practitioners, business owners, risk managers, etc. I regarded the lack of definition as a serious impediment to gaining wider awareness and acceptance.

When I was involved in the IEA Executive (1983-2003), particularly during the years leading up to my presidency, it was also clear to me that the member Societies¹ had

¹ Societies = IEA member societies

different traditions, different perspectives, and different cultures. Some Societies were very academic-oriented; others were practice-oriented while others were heterogeneous and a few widely inclusive in the sense that they were open to whoever wanted to affiliate with the Society. So, there was a diversity in the demographics of member societies, a diversity of perspectives within the global community, and I felt very strongly that we needed to define the field to promulgate a shared understanding of the nature and scope of the field to help articulate the role and benefits of Ergonomics to the broader society. As it was, the lack of definition resulted in inconsistent interpretations and uncertainty in the marketplace, which in my view did little to promote societal acceptance of the field.

Interestingly, by the mid-90s organizations such as BCPE and CREE were being formed to certify professional ergonomists, and although they worked through the IEA to harmonize professional standards and formation models, they differed in substantial ways. Part of the reason for differences was the lack of an agreed definition that would serve to define the core requirements. I felt that it was the responsibility of the IEA, the single-most authoritative body in the world on matters relating to Ergonomics, to define the field. For me, a definition is not merely a statement describing the field – it lays the groundwork for elaborating emerging branches and applications. That is, a sound definition can help the field mature in a proactive and systematic fashion to address evolving needs.

Frankly, the need to define Ergonomics was something that has been plaguing me throughout my career and when I was elected President I realized I had an opportunity to pursue it as a concrete priority. So, that's how it started.

PF. *I would like to get back on one point. You said that there was no existing definition of Ergonomics. To my knowledge, there was one. In fact, with my students I use it to pinpoint the differences with the new one. This first definition is much shorter. But anyway, that's not the way you were thinking then.*

IN. Well, let me be clear. It's not that there was no definition of Ergonomics – it's that there were many, but there was no single, official definition. The definitions reflected personal impressions, different perspectives, different views about the very essence and scope of the field. The problem was that different people understood the field in different ways.

PF. *OK. So you had decided to put this forward at the beginning of your presidency?*

IN. When I started my Presidency, I established five primary objectives that I wanted to cover during the three years of my term. Defining Human Factors and Ergonomics was one of them. And I must say that was not met with a lot of enthusiasm.

PF. *I was about to ask you about this.*

IN. No, actually, there were I would say skeptics within the IEA Executive and Council - people who felt that it would be impossible to reach consensus on a single definition, that it was impossible to breach the gap between Ergonomics as a science and

Ergonomics as a practice. In short, some felt that there were so many different aspects that made the pursuit of a unifying definition futile. Moreover, unlike other fields such as medicine, for example, there was no established scientific or scholarly infrastructure to support it.

PF. *Skepticism within the Council or within the EC, or both?*

IN. Both! I would say the loudest people were actually within the Executive Committee, as I recall. And some of them articulated their concern that because the field is so broad any definition would be necessarily exclusive. They believed that sharpening the field would result in excluding certain applications or people, which they believed was not necessarily constructive or positive.

PF. *Was this considered as a risk?*

IN. Yes it was. I did not fully agree with that concern, but I certainly did not intend to dictate policy – I felt it was important to engage the IEA Council in addressing this matter in a democratic and participatory matter. Fortuitously, it allowed me to pursue yet another objective in tandem – namely, to enhance the IEA Council meetings by engaging members in more substantial issues. Prior to that, the meetings mostly dealt with administrative matters and logistics including reviewing budgetary items and membership dues, selection of candidate venues for the next Congress, election of officers, committee reports and special projects such as the promotion of Ergonomics in Industrially Developing Countries. These were important items, but there was relatively little time allotted to policy deliberations and deeper matters of substance. I felt there was too much emphasis on business and not enough on content. So, a Council discussion related to the definition provided a perfect vehicle to engage the representatives of the international community in addressing important issues.

PF. *...with clever people, normally...*

IN. That's right, and so I allocated a portion of our annual meeting agenda to a workshop style deliberation on current issues of substance, and one of them was the definition of Ergonomics. We split up in small groups around tables to consider questions such "Is the goal of defining the field worthwhile, is it feasible? What should be included? What shouldn't be included?" I presented the first draft definition as a straw man version to initiate discussion, and I said, "okay, here it is, what do you think?"

PF. *You did that by yourself?*

IN. Effectively, yes. I started with a definition that I had created for my own presentations over time, which I edited and proposed to the Executive Committee. I put it to them and said, "here is what I am using, think about it, we can change it - let's have a discussion about whether there is merit in promulgating a consensus definition, and, more importantly, whether or not we can garner widespread acceptance".

PF. *So you gave this definition as a starter. To whom?*

IN. First to the Executive Committee and ultimately to the Council.

PF. *To the Council? Everything was done within the Council?*

IN. Yes, ultimately everything was done within the Council. As I mentioned, it was important to me to engage leaders from around the globe on more weighty issues (both to take advantage of the diverse brainpower in the room as well as to foster closer relationships among societies) and I also knew that to gain traction the definition needed to have extensive input.

PF. *Okay, so there was not some subgroup working on it in-between?*

IN. No. It was a committee of one. I was the only person to work on it between Executive and Council meetings.

PF. *Very democratic! (smile)*

IN. It actually was very democratic because the input came from the Council - I merely served as secretary. I collected the output of Council's deliberations and input from individuals who wrote to me separately. It needed to be the product of the IEA, and I wanted all of the Council members to feel comfortable that it reflected their individual ideas and that it represented a collective consensus based on iterative input. I was very concerned with the initial negative reactions to the project. And, therefore, I was sensitive to the need for buy-in and thought that everyone should feel that this is our collective product.

It was not an easy task by any measure because we started with a very diverse set of perspectives of the field and of the desired form/content of the definition. And it actually took three full years to accomplish the task at hand given the initial level of discord involved and the volume of feedback from the meetings in the form of flip charts, notes, and ideas that people emailed me. In between meetings I processed the feedback and reworded the definition to incorporate as much of the input that retained coherency and then I presented it again. In this iterative manner we managed over time to formulate a definition that reflected the totality of the views held by Council.

PF. In presence of the Council but by mail as well?

IN. At Council meetings we had open discussions and occasional brainstorming breakout groups and between meetings I received further feedback by mail. As you can imagine much of the feedback I received was not coherent or conflicting. My task was to make sense of what I received, referee conflicting views, and formulate language that was

faithful to the overall mission. In the end, while the words were mine the thoughts were contributed by Council. I believe some of the various versions of the definition may exist in the archives in the form of correspondence between myself and members of Council and the Executive.

Without a doubt, the most important way in which the final formulation differed from the original proposal is the duality of the structure, addressing both the science and the practice of Ergonomics. This came about to address the conflicting views of two opposing communities who advocated passionately for what they perceived was the essence of the field as they knew it. While perhaps unorthodox, there was no reason to select one perspective over the other. Indeed, an inclusive definition seemed to both provide useful elaboration and provide comfort to both communities (academic and practitioner) that the definition represents what they actually do. Thus, the IEA definition outlines the nature and scope of the science of Ergonomics as well as the profession by which scientific theory, data and methods are applied to design to enhance overall system performance and human wellbeing. This duality is a unique contribution that came out of many hours of debate.

PF. *That wasn't there at first?*

IN. I don't believe the first version made specific reference to the profession. It did talk about design-orientation but it did not distinguish between the science and the practice.

PF. *As discipline objectives... [inaudible]*

IN. The duality of the definition that emerged from the participatory process we adopted was a very positive outcome and was met with wide acceptance. I was gratified with the results. As I mentioned it took three years of deliberation that culminated at the Council meeting just prior to the 2000 Congress in San Diego. I announced the definition in my Presidential address at the opening plenary, and it was highlighted in the Triennial Report that was given to each of the 3000 or so delegates.

I am heartened that at this Congress (Florence 2018) speakers were referring to the definition as agreed by Council and formally launched in 2000.

PF. *It is an asset.*

IN. I look at it and think, "wonderful, this is great". It has had some impact.

PF. *I am trying not to speak too much during this interview but, to me, it is a fundamental aspect of the definition, especially if I compare it to other unofficial definitions, which defined the discipline, full stop, may be in ways we disagree with, but only the discipline,*

not what the discipline allows one to do. It also means that time has passed so that the profession exists. At the time of the first definition, it was mostly scholars.

IN. That's right. I think that one of the things that came out of this process is a clear articulation of how Ergonomics differs from other scientific disciplines. It is distinguished by being highly applied. The science of Ergonomics does not generate all of the relevant knowledge on which we rely - we build on basic knowledge from allied sciences such as medicine, engineering and psychology, kinesiology, and we augment that with unique scientific theories, methods, and principles. What distinguishes us in many respects is the integration of applied science and methodology to solve practical problems in designs for human use. That is why the application of the science to design needed to be embedded in the definition. Without it, you have not really...

PF. *...covered the field.*

IN. Covered the field. I think that's what really emerged so clearly from our process: Ergonomics represents both a science and a practice. I actually wanted to go further to define branches of Ergonomics, but I don't think the Council was ready to go further. We did manage to include descriptions of three principal branches of Ergonomics - cognitive, physical and organizational - but they are less prominent in the documentation than the formal definition of the field.

PF. *Another step forward that was made in the definition consisted in setting ergonomics as a discipline in its own right. Again, in previous definitions, ergonomics was often presented as a melting pot of disciplines: ergonomists were there to borrow relevant methods and models to these disciplines in order to take care of practical issues. In the definition adopted in 2000, no mention is made of these father (or mother) disciplines. Ergonomics stands by itself.*

IN. The other thing I should point out is that the definition refers to Ergonomics and contains the term, Human Factors, in parenthesis. We did that intentionally to emphasize that they have become synonymous, because, these two terms, Ergonomics and Human Factors, came from different traditions, different regions of the world, and historically they dealt with different aspects of the field. Simplistically speaking, Ergonomics was associated primarily with the physical aspects of work and was traditionally European-centric. On the other hand, Human Factors reflected primarily cognitive aspects of work, for example aviation psychology that was traditionally centered in North America. But over time, they each expanded in scope and by 2000, at the time we defined the field, the two terms were effectively interchangeable. Moreover, most of the scientists recognized the importance of a broad understanding of both the physical and the cognitive aspects of the task for effective design. As a result, we deliberately did not want to distinguish between Ergonomics and Human Factors. We did display deference to the term Ergonomics because this term was used in the name of the organization, International Ergonomics Association. Nevertheless, we included the term Human Factors because it was regarded as synonymous with Ergonomics. Interestingly, today some people use the

combined term Human Factors and Ergonomics (HFE) while others continue to distinguish between the two. So, I guess we didn't fully resolve that issue.

Part of the problem is that the two terms have their specific limitations. For example, unlike terms such as anthropology and chemistry, the term "Human Factors" does not adequately reflect its rigorous scientific basis, and it comprises two words that are often fused together in the popular media to refer to matters that have nothing to do with Ergonomics. Ergonomics is a more scientific term, but it is widely associated with a narrow aspect of the field. Many within the cognitive, behavioral, user experience community don't associate with. So both terms are somewhat problematic, which may be why people started combining the terms to create Human Factors and Ergonomics (HFE). That is not an ideal solution because it seems superfluous to combine two terms that are synonymous?

I am afraid we will have to continue to explain to inquisitive audiences why it is that we call the field Ergonomics or Human Factors or Human Factors and Ergonomics.

PF. *I believe also there are differences within Ergonomics and within Human Factors, anyway. So there's discussion needed to make it inclusive. I am learning a lot hearing you. I thought there was a group of people working in-between, and that was not the case. So it is even more an achievement, because it is only a part of the Council meetings that could be devoted to this, so, in three-year time, it's only six to nine hours.*

You already addressed the issue of the first part of the definition, the definition of the discipline and the definition of Ergonomists/Human Factors specialists. But this is not the whole definition, the whole definition is longer than this, there's this part defining Physical Ergonomics, Cognitive Ergonomics, Organizational Ergonomics. But, before this, in-between, there's a small section, a paragraph which states "we're not going to deal with Transportation Ergonomics, or Healthcare Ergonomics, and so on, but we recognize that there are forms of practices, or forms of domains of specialization". So I suppose there was a discussion. The first part of the definition needed to be expanded a little bit, and it was decided to expand it in terms of domains of specialization, and not domains of application.

IN. Yes. I would have liked to define the principal branches of the field, but as I say there wasn't sufficient support to go beyond what we did and so we compromised on the description of three domains of specializations. I think there were some who wanted to define specific applications, but I did not think we wanted to get into this because applications come and go and they do not alter the essence of the field. For example, medicine does not change when you develop a new specialty, drugs or treatment; medicine is medicine, everybody understands what it is about, though the application might change. So, there wasn't much value in referring to aviation human factors, or factory, or nuclear power plants...

PF. ... or forestry

IN. Exactly, the list of applications can be very long and it would never be exhaustive, so it is hard to see the value in it. If you define the essence of the field well you should be able to adapt this definition to any application. For example, an application like aviation human factors is simply the application of human factors to aviation. The specific design issues under consideration in a given project depend on the specific aeronautical system and mission being designed. The application has no impact on the science except possibly to identify gaps in knowledge.

We defined three principal domains; the cognitive domain which is important because it influences how users perceive and react to information, the physical domain because it draws from the biological rather than psychological sciences, and the organizational domain because job design and management is critical to the performance of sociotechnical systems. I was happy to refer to these three domains though there are clearly others that could have been included. I regarded these three as a good starting point that could be expanded with time. Much like medicine, where new specializations like oncology and pediatrics emerged as the field evolved, branches within Ergonomics should evolve with increased specialization within the core science

PF. *You mentioned that there was initially some reluctance from some people, at the beginning, but, during the process, were there issues that were more difficult than others?*

IN. Frankly, there were healthy disagreements but none that I would characterize as difficult. I think the satisfying thing about the process is that, by the end, everybody was sold on the definition. No one stood back and said "I object, I want the record to note my objection. I realize that the IEA has taken this decision, fine, but I want the record to show that I oppose this". Nobody said that. Everybody was more or less on board with the definition. And that is precisely because everybody had a voice, everyone had the opportunity to input, and those people who were skeptical at the beginning were heard and their input was considered. The process was participatory and the decision democratic, and that's why it was successful in the end.

PF. *Yes, I remember myself pointing out that the word "work" was not in the definition. And there was some discussion about it. The words "jobs" and "tasks" were there, and some people seemed to think that they covered the idea.*

IN. You were involved because you were part of the Council...

PF. *...starting in Santorini², quite late actually.
I think we covered many points. Any regrets?*

². The 1999 Council meeting was held in Santorini, Greece.

IN. Well, no regrets... However, the end product is rather long for a definition. Some people would have preferred a shorter, more pithy definition - a clever quip, something like: "Ergonomics is about the fit of people and technology". But such a definition misses the essence of the field. While it may be long, all of the critical elements are covered and it's hard to make it shorter without thinking that you're missing an essential part of our DNA. So... it is what it is.

PF. *Well, I think you covered the points I had in mind, thank you.*

IN. You're more than welcome. I think it is worthwhile to look back on how the definition came to be and to review its validity/relevance some 20 years later. I am not suggesting there is any need to revise it in any way. But I do think it would be instructive to consider the underlying epistemology and consider the implications for our work and approach to the field. We should reflect on what the core model as defined means to us, what it means going forward, how we use it, how it affects what we do, what's in it that's important, what isn't... It's worth having a deeper discussion around the definition.

The idea for a session at IEA2021 devoted to this could be very interesting. For example, a long-held belief among ergonomists is that academicians and practitioners need to have an understanding of the full breadth of the field in order to be effective (e.g., the BCPE ergonomist formation model). While the principle of a holistic approach is widely accepted, few within our community can claim such breadth of knowledge. What are the limits of this model? For example, to what extent does a User Experience (UE) professional need to understand biomechanics to evaluate a graphics display, or does a kinesiologist need to understand cognition to design lifting tasks? No doubt, some would argue that indeed a holistic understanding is important. The use of a graphics display can be affected by biomechanical considerations and lifting tasks can be influenced by visual factors. Would it not be more reasonable to be promoting Ergonomics teams that comprise relevant specializations rather than relying on a single individual to embody the requisite knowledge? I come from a tradition that advocates for the latter, namely a foundation that spans the full range of competencies, at least at the generalist level. After all, ergonomists are designing for people and need to understand how cognitive, physical and organizational factors interact to influence performance and wellbeing. I am not sure that is a viable ideal. I am very fortunate to have had the academic training that combined engineering and psychology.

I don't know if you were at Neville's sessions, farewell to Neville Moray?

PF. *Oh yes I was there.*

IN. One of the things I mentioned at that session was the profound influence he had on my training. I had undergraduate degrees in engineering science and industrial engineering. When I did my post-graduate work in Human Factors with Neville, he sent me to take some graduate Psychology courses. And that changed my complete understanding of what Human Factors is about. The training in cognition and

neuroscience provided much better appreciation for issues that relate to holistic human activities as well as the principles of research methodology, which I think is vital to understanding individual difference and drawing valid inferences from descriptive data. So, I attribute much of my outlook on the field to the unique combination of engineering and psychology training that I have had. However, I realize that ergonomists come from many diverse backgrounds and that their perspectives differ from mine. Because Ergonomics lacks a formalized academic infrastructure (there are no faculties of Ergonomics, centres of scholarship devoted exclusively to Ergonomics, etc.), there is no standardized or internationally-recognized curriculum. While this is problematic we tried to capture the holistic nature of the field by outlining the three domains of specialization.

PF. *This part of the definition, from a French point of view, is uneasy, because we believe there is no way to think of physiology or psychology if we do not think of it in context, in an organizational context. Musculo-skeletal disorders are totally related to the organization.*

IN. Yes, I agree with you, but I don't know if it is a viable proposition to train all ergonomists in industrial psychology or sociotechnical systems theory. If you survey the 1700 or so delegates at this Congress you will likely find that few have had training in all three domains. In my case, for example, I readily admit that I lack competency in many areas of Ergonomics, but I do not think this necessarily makes me a bad ergonomist. I think I have enough of an overview to know where there may be gaps in my approach. I cannot tell you what the right mix or level of training should be.

PF. *Yes. That's also related to the discussion about Ergonomics vs Human Factors. Another thing, in France, they would say "Should we think in terms of Human factors or Human actors?" It is not simply playing with words. It is the same when we integrate people in the design not only as some sort of constraints but also as actors, as designers themselves. It is not so much the issue of physiology and psychology, it is more about the position given to the actual worker... We could carry on for a long time...*

IN. Yes, I appreciate that. This is the kind of intellectual discussion that people should be having on a regular basis. A deep dive into some of these issues can reveal how the field should evolve to meet emerging challenges. The IEA Congress is the appropriate venue for exploring such questions. Many of the delegates are new to the field and they may not be aware of the definition, why it exists, how it relates to what they do or understand other perspectives.

PF. *So thank you very much!*

IN. Merci beaucoup Monsieur! We should talk about setting up sessions³

³. At the 2021 IEA Congress!