



PARTICIPATORY ERGONOMICS AND SOCIAL TECHNOLOGY: THEORETICAL APPROACHES TOWARDS BETTER ERGONOMIC PRACTICE

Raissa Jordão de Carvalho ^{1*}

Sandra Francisca Bezerra Gemma ²

Abstract

This article proposes to make a theoretical approach between ergonomics, more specifically, participatory ergonomics and the concepts of social technology in order to reflect, contribute and expand the knowledge of ergonomists towards better ergonomic practice in organizations. Participatory ergonomics proposes the participation of workers in all stages of studies, analyzes and ergonomic interventions with the aim of improving working conditions. Social technology is also based on the collective participation of individuals to solve social problems. In this way, building ergonomics in a participatory way, from the perspective of social technology, as a process, is a way to increase workers' margin of action, contributing to their development, in addition to enabling comfort, safety, health and efficient performance at work.

Keywords: participatory ergonomics; social technology; transformation at work.

1. INTRODUCTION

Work, as a relationship between man and nature, allows the individual to produce essential elements for their life, through the transformation of the natural element and also to transform themselves. It is through work that man differentiates himself from other animals, constituting himself as a human gender and allowing the production of material goods essential for human reproduction (Gois, 2015). Sociologist Georges Friedmann reinforces that it is through work that man changes his own environment and can change himself (Freitas et al, 2020).

Defined as an activity, work concerns the subject's confrontation with reality, being the means by which he or she can enroll in a collective work and, at the same time, personalize himself. Therefore, any form of impediment to activity leads to an immobilization of the subject's internal dynamism, of his vital energy. Deprived of the object in which to invest the latter, the subject becomes emptied, withdraws, loses the experience of meaning. In the activity clinic, when this occurs, it is said that the subject has been deprived of their power to act (Clot, 1999 & Lhuillier, 2006 cited by Bendassolli, 2011). Sendo assim, o trabalho não pode ser thought

¹ FCA/UNICAMP Limeira - <http://lattes.cnpq.br/1671627068268839>. *Email: raissa.jordao80@gmail.com

² FCA/UNICAMP Limeira - <https://orcid.org/0000-0002-8567-157X>



only through the logic of capital. The work must enable the worker to deal with the difficulties of real professional activity, to recognize the factors that impede action or the execution of a job well done, to apply their intelligence to solve problems, thus providing ways of transforming the work. In other words, work must have meaning, it must have purpose, it must provide the power to act and it must be a means that contributes to the development of the individual.

From this point of view, ergonomics and social technology can make significant contributions to the construction of this development path.

2. METHODOLOGY

This article was produced based on the discussions and the concept of social technology covered in the discipline of Technological Change and Social Dynamics, in the Interdisciplinary Master's Degree in Applied Human and Social Sciences, at FCA (Faculty of Applied Sciences), at UNICAMP (University of Campinas State). A non-systematic literature review was also carried out, covering the themes of participatory ergonomics and social technology.

3. RESULTS AND DISCUSSION

3.1. Ergonomics and participatory ergonomics

Ergonomics, traditionally, is divided into two aspects: Anglo-Saxon (classic or American) and French (contemporary or Francophone). Anglo-Saxon ergonomics is the oldest and considers ergonomics as the use of science to improve human working conditions. The disciplines of anatomy and physiology, for example, allow the design of chairs, monitors and schedules better adapted to the human organism. In short, for this trend, ergonomics, is to take into account the general characteristics of man, for the best adaptation of machines and technical devices. French ergonomics is more recent and considers ergonomics as the specific study of human work to improve it (Dias, 2017).

For Lima (2020), ergonomics, in its most recent definition, appears as a technical discipline that aims to understand the “real work activity” with a view to its transformation.

Noro (1991) states that Participatory Ergonomics is a new technology for the dissemination of ergonomic information, highlighting that this dissemination is vital for the effective use of ergonomic knowledge throughout the organization, the entire institution and can also be extended to any educational institutions.

According to Brown (2005), workers are the experts; and, with adequate knowledge, skills, tools, resources and encouragement, they are in a better position to identify and analyze problems and to develop and implement solutions that are effective in reducing injury risks and improving productivity.



Therefore, a fundamental point in the process of practical application of ergonomics is the worker's participation in the construction of knowledge. From this point of view, worker participation cannot be seen only as a “source of information” so that real work activity can be learned, but rather as an actor, an agent of change who will contribute to the transformation of the work and the production of knowledge applied to work.

The need for people to be involved in the development of ergonomics is justified by Imada (1991) through three aspects:

- I. since ergonomics is an intuitive science, which in many cases simply organizes the knowledge that workers are already using, it can value workers' accumulated experience;
- II. it is more plausible that people support and adopt solutions for which they feel responsible; It is,
- III. Developing and implementing technology empowers workers to modify and correct future problems within the dynamics of their reality.

Still according to Filho & Lima (2015), the production of knowledge about work activity, originating from the ethnographic look – description of the world through the eyes of others –, allows us to understand the use of the body, thoughts, emotions in situations of work, the determinants that weigh on the actions of workers, the strategies used to meet the demands placed on them, that is, it allows for a new logic based on work activity, little widespread in companies and institutions and which can be used both for prevention and to improve system performance.

3.2. Social technologies

Social Technologies, despite being a recent phenomenon, have been used, in recent years, as a potential for social transformations.

Social Technology is technology that aims at social inclusion. It is the result of the action of a social actor on a work process that he controls and which, depending on the characteristics of the socioeconomic context, the social agreement, and the productive environment in which he operates, allows a modification in the product generated that can be appropriate according to your interests (Dagnino, 2014).

Also according to Dagnino (2010), Social Technology is a tool for building a more fair, egalitarian and environmentally sustainable society.

According to Fraga (2011), beyond the theoretical debate, the solutions that have emerged from the technological needs of popular groups can be called social technology. In this sense, it is not about devaluing the theoretical debate, but rather trying to connect it to a



line of technological resistance practices. The author cites examples of technological resistance in several aspects:

In this sense, technological resistance can be seen in the struggle of family farming from the perspective of choosing the way they want to plant, harvest and process food, placing agroecology as an alternative to the green revolution. It can also be seen in the struggle of indigenous people, quilombolas and riverside dwellers protecting their territories from large projects such as hydroelectric plants. It can be seen in the fight for housing combined with participation in the design of the architectural project and construction in self-managed joint efforts. It can be seen in the struggle of collectors and cooperatives sorting recyclable materials to organize work based on self-management, modifying existing technologies.

For Schwab & Freitas (2016), Social Technology presents as an essential condition the individualized construction for each case, that is, one cannot simply look for a ready-made solution and apply it to the problem situation, without due adaptation of the technology and consideration of the impact of this on local values. Social Technology must be understood as a technological solution for social transformation designed for each context. Social Technology, as a priority, must have open innovation, which can incorporate other knowledge.

3.3. Tecnologia e ergonomia

According to Machado (1994), the impact of technological innovations on the mode of production affects both exchange relations and production relations themselves. Such innovations change the forms of cooperation, directly influencing human activity, the raw materials used for work and the means and instruments used. In this sense, ergonomics has been working systematically to study the introduction of these new technologies, demonstrating the transformation of the content and nature of work, as well as the consequences of these changes on the health of subjects and the effectiveness of organizations.

When we think about technology in ergonomics, the first image that comes to mind is the automation of processes, elimination or optimization of human action in order to increase productivity and efficiency and prevent the emergence of work-related illnesses or ergonomic risks when carrying out activities. of work.

Technologies for using virtual reality to simulate work situations with the aim of predicting gestures, movements, postures and possible discomforts and risks related to physical aspects; Development of artifacts such as the exoskeleton in order to “facilitate” critical movements or those that require great efforts or even the most common automation of processes, completely eliminating human action are common examples of what is meant by technology in ergonomics for the solution problems arising from the execution of work activities.



Furthermore, they are examples of how technology is seen only as an artifact, how it can be ambiguous and how it cannot be considered a neutral science. Therefore, the questions we should ask when thinking about technology associated with ergonomics are: Who is this technology for? For what? For what purpose? Does it solve the “problem”? Does it generate a transformation? What does it enable workers? Independence? Emancipation? Empowerment?

In fact, what can be seen is that technology, when understood as an artifact, embodies the vision of a group, a social class, political and economic interests (in the case of organizations). In some situations, it strengthens individualism, competitiveness and standardization, which are elements that weaken social relations and forms of resistance in the workplace and in society in general.

Technology must contribute to the form of knowledge production and development of workers in a way that strengthens their identity, valuing and recognizing their acquired, tacit and real working knowledge.

As explained by Dias (2013), in the debate on the One Million Cisterns Program (P1MC - public policy that materializes coexistence with drought as a vision of the Semi-Arid problem) and some of the actions that emerged from its achievements, the processes of building a social technology are more important than direct products. The desired dynamics of empowerment and social inclusion are not generated a posteriori by the cisterns; they are, rather, the result of the construction process of these artifacts.

The author also reinforces that perhaps the most interesting aspect associated with this case, in particular, are the indirect results of the program. Evidently, guaranteeing access to water in the Semiarid region is of fundamental importance. However, no less important are the dynamics of social inclusion, empowerment, creation of cooperation bonds and the genesis of a local identity and a sense of belonging to the community, which begin and are strengthened in the construction of cisterns. Such dynamics are results of construction processes, and not products of the artifact itself.

Araújo (2016) analyzed work management from the perspective of activity in a coal mine struggling for self-management, through a company recovered by workers. The study highlighted important advances in which workers highlighted a relief from the pressure exerted by the hierarchy, resulting in greater freedom at work and, consequently, better health and safety conditions. Better conditions for transporting workers to the mines, significant improvements in facilities, with better lighting, higher galleries, masonry structures, among other improvements that guarantee greater comfort and safety are examples of significant



transformations from the point of view of health and safety, which are the result of workers' participation in company management.

4. CONCLUSION

Ao compararmos a ergonomia participativa com a tecnologia social, ambas tem como objetivo garantir a participação e inclusão do indivíduo no processo de construção da solução de um problema.

A participação dos indivíduos, seja no ambiente de trabalho ou no cotidiano social, na tomada de decisões e na construção dos processos de transformação, possibilita o exercício das habilidades do grupo envolvido, gerando sentimentos de responsabilidade, comprometimento e representatividade.

Inserir o trabalhador como ator do processo da intervenção ergonômica gera uma desconstrução de crenças ainda presente em muitas organizações, no qual a imagem do especialista/ergonomista ou ainda, de quem prescreve o trabalho é soberana e que trabalhadores são vistos como simples executores. Aliar o conhecimento do trabalhador ao conhecimento do especialista parece ser uma abordagem construtivista inteligente, ainda não percebida e valorizada por boa parte das organizações.

Ademais, a tecnologia social nos faz refletir de como a tecnologia em si pode ser pensada como um processo, um caminho possível para o desenvolvimento do trabalhador em seu ambiente de trabalho. Além do resultado final esperado, que é a transformação no trabalho e o alcance na melhoria das condições de trabalho, o percurso em si deve ser reconhecido pelas oportunidades que ele possibilita e pelo valor e benefícios gerados aos participantes: empoderamento, inclusão, pertencimento, reconhecimento, dignidade e cooperação. O percurso pode ser uma ponte que torna viável o desenvolvimento do trabalhador e o fortalecimento da sua identidade.

Construir a ergonomia de forma participativa, a partir da perspectiva da tecnologia social, como um processo, é aumentar a margem de ação dos trabalhadores para viabilizar o conforto, a segurança, a saúde e desempenho eficiente no trabalho (objetivos básicos da ergonomia). Acima de tudo, é possibilitar formas de se exercer a democracia no ambiente de trabalho e possibilitar, de fato, que a ergonomia exerça seu papel social que é a transformação do trabalho. A tecnologia não pode e não deve ser vista apenas como evolução da humanidade. A nossa evolução depende das escolhas que fazemos como indivíduos e como ser no mundo.

A tecnologia está aí, ela faz parte da sociedade, ela é o sistema, ela vai acontecer, independente de qualquer fato. Porém, ela não pode ser encarada e fortalecida como um sistema de dominação. Cabe a nós, seres humanos, inseridos na sociedade fazermos contribuições



efetivas para que ela não se atualize, se mantenha e se construa de forma a reforçar e perpetuar as desigualdades econômicas, raciais, de gênero, de sexo, de status e privilégios.

Afinal de contas, parafraseando Dejours (Barros & Lancman, 2016): When comparing participatory ergonomics with social technology, both aim to ensure the participation and inclusion of the individual in the process of building a solution to a problem.

The participation of individuals, whether in the workplace or in everyday social life, in decision-making and in the construction of transformation processes, enables the exercise of the skills of the group involved, generating feelings of responsibility, commitment and representation.

Inserting the worker as an actor in the ergonomic intervention process generates a deconstruction of beliefs still present in many organizations, in which the image of the specialist/ergonomist or even of those who prescribe the work is sovereign and that workers are seen as simple executors. Combining the worker's knowledge with the specialist's knowledge seems to be an intelligent constructivist approach, not yet perceived and valued by most organizations.

Furthermore, social technology makes us reflect on how technology itself can be thought of as a process, a possible path for the development of workers in their work environment. In addition to the expected final result, which is the transformation at work and the improvement of working conditions, the journey itself must be recognized for the opportunities it provides and for the value and benefits generated to the participants: empowerment, inclusion, belonging, recognition, dignity and cooperation. The route can be a bridge that makes the development of the worker and the strengthening of their identity viable.

Building ergonomics in a participatory way, from the perspective of social technology, as a process, is to increase workers' margin of action to enable comfort, safety, health and efficient performance at work (basic objectives of ergonomics). Above all, it is to enable ways to exercise democracy in the workplace and, in fact, enable ergonomics to play its social role, which is the transformation of work. Technology cannot and should not be seen only as the evolution of humanity. Our evolution depends on the choices we make as individuals and how to be in the world.

The technology is there, it is part of society, it is the system, it will happen, regardless of any fact. However, it cannot be seen and strengthened as a system of domination. It is up to us, human beings, inserted in society to make effective contributions so that it does not update, maintain and build itself in a way that reinforces and perpetuates economic, racial, gender, sex, status and privilege inequalities.



After all, paraphrasing Dejours (Barros & Lancman, 2016): *Working is not only producing, but also transforming yourself!*

5. REFERENCES

- Araújo, F. S. (2016). Gestão do trabalho na COOPERMINAS: mobilização de competências e coletivos de trabalho na atividade dos operadores de uma mina de carvão em luta pela autogestão (Tese de Doutorado). Universidade Federal Fluminense.
- Barros, J. O., & Lancman, S. (2016). A centralidade do trabalho para a construção da saúde. *Rev Ter Ocup Univ São Paulo*, 27(2), 228-35. Maio/ago - 2016. Disponível em: <<https://www.revistas.usp.br/rto/article/view/119227/116632>>. Acesso em: 05/12/2022
- Bendassolli, P. F. (2011). Mal estar no trabalho: do sofrimento ao poder de agir. *Revista Mal Estar e Subjetividade*, 11(1), 65-99.
- Brown, O. (2005). Participatory Ergonomics. In: Stanton, N., Hedge, A., Brookhuis, K., Sala, E., Hendrick, H. (Eds), *Handbook of human factors and ergonomics methods*. Boca Raton: CRC Press.
- Dagnino, R. (2010). *Tecnologia social: ferramenta para construir outra sociedade*. (2ª ed.). Campinas: Komedi.
- Dagnino, R. (2014). *Tecnologia Social: contribuições conceituais e metodológicas*. Campina Grande: EDUEPB.
- Dias, K. B. (2017). Ergonomia no Brasil: comparativo entre a anglo-saxônica e a francesa. *Revista Científica Semana Acadêmica*. Disponível em: <https://semanaacademica.org.br/artigo/ergonomia-no-brasil-comparativo-entre-anglo-saxonica-e-francesa>. Acessado em: 05/12/2022.
- Dias, R.B. (2013). Tecnologia social e desenvolvimento local: reflexões a partir da análise do Programa Um Milhão de Cisternas. *Revista Brasileira de Desenvolvimento Regional*, v. 1, n. 2, p. 173-189. <http://dx.doi.org/10.7867/2317-5443.2013v1n2p173-189>
- Filho, J. M. J., & Lima, F. P. A. (2015) Análise ergonômica do trabalho no Brasil: transferência tecnológica bem-sucedida? *Rev. bras. saúde ocup.* 40 (131). <https://doi.org/10.1590/0303-7657AP0113115>
- Fraga, L.S. (2011). Autogestão e tecnologia social: utopia e engajamento. In Benini, E. A., Faria, M. S., Novaes, H. T., Dagnino, R. (org), *Gestão Pública e Sociedade: fundamentos e políticas públicas da Economia Solidária*. Vol. 1 (1 ed., pp. 101-124). São Paulo: Outras Expressões.



- Freitas, F.F., Rossi, I. A. & Kian, N. (2020). Os fatores biopsicossociais de um trabalhador: Estudo de caso de um profissional tatuador. *Brazilian Journal of health Review*, 3 (4), 10895-10904. <https://doi.org/10.34119/bjhrv3n4-293>
- Gois, J.C.S. (2015). Os fundamentos do trabalho em Marx: considerações acerca do trabalho produtivo e do trabalho improdutivo. *Seminário Nacional de Serviço Social, Trabalho e Política Social*. Florianópolis.
- Imada, A. S. (1991). The rationale and tools of participatory ergonomics. In: Noro, K.; Imada A. S. (Org.), *Participatory ergonomics*. (1 ed., pp. 30-50). London: CRC Press.
- Lima, F. P. A. (2020). Ergonomia, ciência do trabalho, ponto de vista do trabalho: a ciência do trabalho numa perspectiva histórica. *Ação Ergonômica*, 1 (2), 35-45.
- Machado, L. R. S. (1994) Educação e os desafios das novas tecnologias. In: Ferreti, C. J. (Org). *Novas tecnologias, trabalho e educação: um debate multidisciplinar* (16ª ed., pp 169-188). São Paulo: Vozes.
- Noro, K. The rationale and tools of participatory ergonomics. In: Noro, K.; Imada, A. S. (Org), *Participatory Ergonomics* (1 ed, pp. 3-29). London. CRC Press.
- Schwab, D., & Freitas, C.C.G. (2016). Tecnologia social: implicações e desafios da implantação. *R. Technol. Soc.*, 12 (26), 42-60. <https://doi.org/10.3895/rts.v12n26.3794>