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INDUSTRY 5.0: TOWARDS A MORE SUSTAINABLE HUMAN CENTRIC FACTORY OF THE FUTURE

Puviyarasu SA^{1*} and Christophe MERLO¹

¹ESTIA Institute of technology, University de Bordeaux, Technopole Izarbel, Bidart, France
* Corresponding author Email: puviyarasu.sa@estia.fr

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1. Introduction

Industry 5.0 is an emerging concept and forethoughtful industrial revolution. It is a strategic initiative from European Commission to industry for achieving economic and societal goals. It offers many innovative opportunities for industry to create prosperity, wisdom and foresight. The core pillar includes Human-centric, Sustainability and Resilience [Wang, X. et al,2023]. The human-centric pillar aims to consider human being integrated to advanced technology to bring more harmonious and fulfilling workplace. By leveraging this integration, it promises to create a well-balanced and collaborative industrial environment. As a result, it empowers industrial workers to achieve their well beings and fulfilment in their jobs. This paper explores this human-centric pillar and proposes a 4-dimensions model for I5.0 factory.

2. Methodology

First a large bibliographic work has been achieved to explore human aspects for I5.0. Second research gaps have been identified. Third an integrated model for enhancing human-centricity is proposed. State of the art allows to declare that human-centric approaches mostly focus on human-machine collaboration to improve the efficiency of production [Lu, Y. et al, 2022], such as human workers and universal robots that are boosting the productivity of manufacturing industry [EU, 2022].

However, the current exploration and shared understanding of the human-centric pillar in Industry 5.0 is still relatively scarce. Particularly, human elements, their typology and human-centric technology are yet to be explored.

As a result, there is a lack of systematic and authoritative literature. A systematic view on human centric aspects is necessary to outline the definitions, terminology, taxonomy, projected key technologies, and value driven impacts of human-centric aspects.

3. Results & Discussion

In Industry 5.0, the Human-centric concepts are placing the human at the heart of what the industry does. Figure.1 presents the different point of view for I5.0 human-centric approach. It outlines the human centric dimensions considering that a human worker is seen through its relationship within its digital and physical manufacturing environment by sensing, processing and actuating with it:

- 1) Terminology and definitions: Industry 5.0, manufacturing components, human being as a worker.
- 2) Taxonomy considering input/output modalities: human, machine and human-computer interaction modalities.
- 3) Human centric key technologies: augmented/virtual reality and other technologies for the worker or for his/her interaction with the digital and physical environment.
- 4) Human value ensuring the industrial worker to have proper work life balance: self-actualisation, accountability, privacy, welfare; autonomy and altruism; and their impacts on achieving professional goals, making decisions, demonstrating engagement and reliability, ensuring personal health and self well-being.

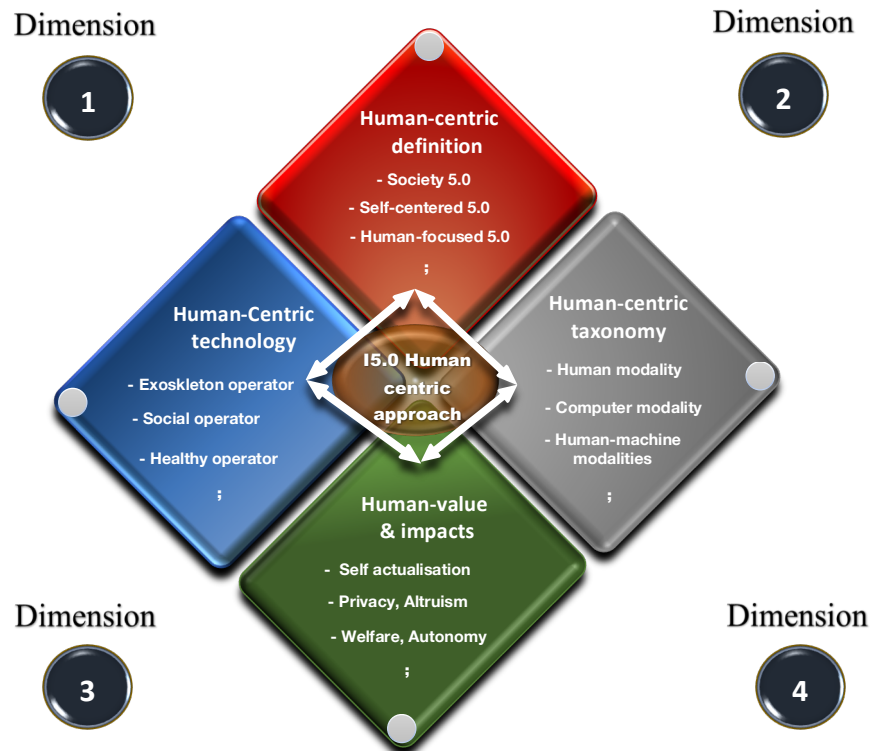


Figure 1. Proposed 4-dimension viewpoint model for I5.0-Human-centric approach.

3.5. Discussion

The 4 dimensions allow to define a global human-centric approach in order to achieve societal jobs and growth by respecting the boundaries of the planet!

Nevertheless, skill gap challenges must still be explored e.g. for recent robotics, artificial intelligence, and data analytics technologies. Applying this model requires strong investments in Education and Training, especially for social safety networks. Finally, companies should analyse much more the impacts of introducing new technologies not only on their processes but also on the human workers, in all their dimensions. This will generate more time and investments but on will bring more trust on Industry 5.0 capabilities.

4. Conclusion

The different point of view, and their fundamentals aspects have been presented. It summarizes the current and projected body of knowledge within the industry 5.0 context. It is expected to bring lively discussion together to strengths and build a comprehensive human-centric factory of the future.

References

- [1] Leng, J., Sha, W., Wang, B., Zheng, P., Zhuang, C., Liu, Q., ... & Wang, L. Industry 5.0: Prospect and retrospect. *Journal of Manufacturing Systems*, 65, 279-295, 2022.
- [2] Adel, A. Future of industry 5.0 in society: Human-centric solutions, challenges and prospective research areas. *Journal of Cloud Computing*, 1(1), 1-15, 2022.
- [3] Li, X., Nassehi, A., Wang, B., Hu, S. J., & Epureanu, B. I. Human-centric manufacturing for human-system coevolution in Industry 5.0, *CIRP Annals*, 72(1), 393-39, 2023
- [4] Rajumesh, S, Promoting sustainable and human-centric industry 5.0: a thematic analysis of emerging research topics and opportunities, *Journal of Business and Socio-economic Development*, 2023.
- [5] Mourtzis, D, The Metaverse in Industry 5.0: A Human-Centric Approach towards Personalized Value Creation, *Encyclopedia*, 3(3), 1105-1120, 2023.