
Guest editorial: The evolution of human-machine interaction, from Taylorism to human-centered approach

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In the past we have given a great deal of study to machines and little to workmen, but under Scientific Management the workman becomes the subject of far more careful and accurate study than was ever given to machines (Taylor, 1911).

The human-machine interactions have been investigated since the Taylorism period. Several scholars have accused Taylor of developing a negative human nature in the field of scientific management. Especially, behavioural economists like Simon (1976) and Sen (1990) and sociologists like Etzioni (1988) and Morgan (1997) who recognized such human nature as too egotistical and opportunistic and even more recently, as opposite to humanism (Bruce and Nyland, 2011) the Taylorism was identified as a form of machine dominance over human management nature (Del Giudice *et al.*, 2021a, 2021b) because workers were perceived as people with low levels of mental capacity.

Notwithstanding, we have found out that Taylor promoted a collaborative and positive human nature (Wagner-Tsukamoto, 2008). Taylor stressed out the relevance of undertaking a collaborative approach. He talks about “heartily cooperative managers” who were motivated by a premium wage system (Taylor, 1911). Taylor described how managers should be fair, collaborative and neutral. In this sense, we can see a new Taylor’s perspective on human relations which was closer to Mayo (2004) and Follett (1942; see also Gibson *et al.*, 2013). As stated by Muldoon (2020a, 2020b) Taylor and Mayo complement each other rather than to be considered competitors. Therefore, no power over employees but “power with” collaboration between managers and employees. Despite that, Wagner-Tsukamoto (2007) confutes such an approach because it does not consider managerial opportunism that was espoused by Taylor as well. However, it is interesting to notice that Taylor’s philosophy has been perpetuated over time (Warring, 1988).

This has encouraged new studies on employees’ engagement to understand the evolution from the dilemma of Taylorism human nature concept (moving towards a negative and a positive view) to the current management approach (Dagher *et al.*, 2015). For instance, Varje *et al.* (2013) accent on the “self” that explores the psychological side of workers. Such humanism has been blown up nowadays with the debate about human-machine interactions (Del Giudice *et al.*, 2021a, 2021b). The evolution and involvement of technologies has introduced the concept of “digital humanism” that leverages on the relationship between human and humanoids (Wagner, 2020). In turn, this has triggered a new dilemma: do humanoids disempower or empower humanity (Agar, 2019; Beane, 2019; Acemoglu and Restrepo, 2017). For instance, Stiegler (2020) affirms that such machines augment humans and so empower their skills. On the same note, Del Giudice *et al.* (2021a, 2021b) and Malik *et al.* (2020) stress the positive outcomes that can be generated by human-machine interactions such as innovative venture and employees’ engagement align with business turnover. Those machines free humans from routinary activities and encourage them to be more creative.



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New contributions to the special issue

The present special issue offers a variety of contributions that use quantitative and qualitative methodologies. The common perspectives of the following works rely on Taylorism management history and the digital transformation which moves from a traditional managerial approach to an innovative and collaborative one in the field of education, health and automotive among others.

Caputo *et al.* (2023) conceptually explore “human–technology dichotomy in shaping management history” which provides a multi-interpretative model to explain such dichotomy. This dichotomy consists of four phases:

- (1) the structural-based approach;
- (2) the collaborative and inclusive approach;
- (3) the technology-oriented approach; and
- (4) the human–technology contamination approach which is positioned considering human technologization and technology humanization.

The description of these phases allows us to understand and deeply investigate the evolution of human–technology dichotomy. It is also interesting to note that “time” is not the primary variable because two or more phases can occur in the same socio-economic scenario. Overall, the research also puts the attention to the collaborative managerial approach which was known as heartily cooperative (Taylor, 1911).

Duggal *et al.* (2023) present an article on “changing learning paradigms: an interplay of Digital Taylorism and technostress on perceived employability”, which discusses the Taylorism approach in the education field. The authors maintain that an implementation of digital Taylorism implementation (DTI) in massive open online courses can facilitate the learning journey and supply students with knowledge, capabilities and skills useful for the job market. However, the use of new technologies generates stress which has motivated the present study to understand how student perceptions of DTI and technostress impact their perceived employability. A quantitative methodology (id est partial least squares [PLS] structural equation modelling approach with SMART PLS 4.0. software) is used on a sample of 305 students from six universities, selected from university grants commission website. The research emphasizes the relevant role of humans in the education pattern which can reduce the level of technostress that is originated by technology difficulties and increase emotional relationships. It was noticed that although the need of using technologies in a learning programme is needed, it is highly requested to maintain the human relationship with the teacher to minimize isolation and maximize empathy.

The emotional pattern in the context of human–machine interactions is also examined considering millennials and Generation Z by Magni, Del Gaudio, Papa and Della Corte. The authors offer an article entitled digital humanism and artificial intelligence: the role of emotions beyond the human–machine interaction in Society 5.0. By artificial intelligence device use acceptance model, the research analyses the use of robots and artificial intelligence in human–machine interactions considering heuristic factors such as social influence, hedonic motivation and anthropomorphism. The key contributions of this work rely on the role of emotions in driving the use of technologies in the young generation. Yet, the research also emphasizes the relevance of adopting a healthy collaborative approach to enhance human–machine relationships. In turn, individuals are always needed to be more understood compared with machines (Taylor, 1911). This comes from the current Society 5.0 principles which centralized the role of human skills and capabilities (Del Giudice *et al.*, 2021a, 2021b; Konno and Schillaci, 2021; Cillo *et al.*, 2022). Artificial intelligence cannot replace individuals due to their lack of

emotional intelligence (Iaia *et al.*, 2023; de Oliveira and Rodrigues, 2021) and so it supports the relevance of “humans work with machines” (Taylor, 1911).

Zhang *et al.* (2023) discuss the role of blockchain in the current economy by adopting a historical perspective. The blockchain is one of the technologies that has brought a radical change in a business processes (Bracci *et al.*, 2022; Pham *et al.*, 2023; Al-Swidi *et al.*, 2023; Li *et al.*, 2023). The research investigates the elements that impact the use, the governance and the scale-up of this technology in the health care and energy industry. A comparative case study analysis is used to combine the theoretical discussion with the empirical analysis. In turn, it offers a real, practice-based perspective in the pre- and post-adoption stages of blockchain technology. The collaborative approach is also supported in this work which highlights “collaboration and consensus-building among multiple organisations involved in a blockchain consortium, which is a vital aspect of consortium blockchain governance”.

Iaia *et al.* (2023) presents research on an empirical case study in the automotive industry to explore human-machine interactions. The case study is structured on “Carrozzeria Fratelli Basile” which is rooted in the nexus of traditional Taylorism principles and the new perspective of digital Taylorism. The company adopts new technologies even though one of the founders emphasizes the important role of humans in managing and interacting with machines. In particular, he states:

The machine, therefore, does not enter into the merits of the technical aspect but as a support for the technicians, who manage to be more performing, so whoever is performing, among other things, can become a teacher and provide training, or we can find expertise of the highest skills on the market I send the underperforming ones to take the course to increase their technical competence. In this sense, I don't see the connection with the machine, this is something still strongly connected to the dexterity and ability of the trainer, the teacher, the internal resource that is next to this person and helps him to grow, as has always been the case since the dawn of time (Mattia Basile declared).

The combination of traditional and digital Taylorism principles enhances business performance which is steered towards innovation and creativity (Schumpeter, 2015).

Finally, the historical excursus of human-machine interactions is also studied through a systematic literature review and a bibliometric analysis by Jain *et al.* (2023). These methods is widely used to investigate a phenomenon or a theory on a historical perspective (Chaudhuri *et al.*, 2021; Dabić *et al.*, 2021; Ramos Cordeiro *et al.*, 2023; Farooq, 2023). The research offers new insights on human-machine relationships evaluating their impact in the past, present and future. The authors highlight four macro topics such as: “1. From Taylorism to advanced technologies; 2. Machine learning and innovation; 3. Industry 4.0, Society 5.0 and cyber-physical system; and 4. Psychology and emotions.” All topics share a common perspective based on the fact that individuals work with machines rather than “work like machines”. This supports the idea of Mayo (1953) who was the promoter of studies on human relations. The research also recognizes the significance of adopting a collaborating approach and supporting individuals by technologies. In turn, it follows the principles of Society 5.0 which considers modern needs where individuals are centralized in the current economy.

Conclusion

With this scenario, the present special issue offers an historical excursus that explores the evolution of human-machine interaction, from Taylorism to the human-centred approach. The scope is to investigate the historical root of such interaction and how it evolved over time. It helps understand human emotions, capabilities and instincts by the involvement of neural networks and machine learning. The implications of “mental attitude” (Nadworny, 1955) have been operating and changing from Taylorism to nowadays. By looking into the scientific

management history, it is possible to find a plethora of studies that offer a different point of view on human-machine interactions. Some of those also defined as “traditionalists” share a negative opinion and others who have a more positive idea that embraces the beneficial view of such interactions which brings up the understanding of the psychological side of human management. As far as we know there were no studies that explore historical roots and empirical scenarios of the relevance of human-machine interaction. Therefore, scholars were invited to trace the management history through the investigation of past and traditional works from Taylor to recent and modern studies so as to offer the evolutive perspective of such interactions. Their works are based on facts which can be behind some interpretations and rely on the relative context (Muldoon, 2021). Taking into consideration that “management is a combination of economics, psychology, and sociology [...]. I urge management history scholars to conduct citation analysis and check original texts and their hidden meanings to uncover a more accurate past” (Muldoon, 2020a, 2020b; p. 49). Scholars provide qualitative and quantitative articles even though previous works on the management history literature are based on theory-building approaches. We stress the fact that all interpretations are based on the positive view of human-machine interactions where machines have the role of empowering human skills and capabilities (Stiegler, 2020).

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