Insights from T-Shaped Professional (T-SP) Model to support human-machine interaction

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Purpose – Human resources are the key to rapid socio-economic development and efficient service delivery (Onah, 2008). Without an adequate, skilled and well-motivated workforce operating within a sound human resource management programme, development is not possible (Griffin 1997). Every educational system at every level depends heavily on the human resources for execution of its programme. Although the introduction of innovative approaches in education programs inspired by the T-Shaped Model (Saviano et al., 2016; Barile et al., 2015), past studies did not investigate the importance to develop T-shaped skills and techniques for aligning human machine learning (Spohrer, J., Banavar, G 2015) and to design more intuitive machine interfaces. The aim of the paper, thus, is to better formalize the T-Shaped Professional (T-SP) model to support human-machine interaction in order to understand the characteristics that people must have to interact effectively with smart machines realizing the wise evolution of service systems (Barile *et al.*, 2019).

Design/Methodology/approach – Given our purpose, we propose a trans-disciplinary approach based on Service Science (SS) and Viable Systems Approach (VSA) as frameworks for rethinking the actual T-Shaped Professionals (T-SP) Model in which vertical expertise is combined with horizontal and cross-sectional knowledge (Spohrer & Maglio, 2010; Demirkan & Spohrer, 2015; Freund 2018; Moghaddam, Demirkan, and Spohrer 2018; Gardner & Maietta 2020) keeping into consideration the impact of the digital transformation on workforce's personal and intellectual habits that is now gradually underway.

Findings – People will need both emotional and social intelligence as well as increased technology-assisted rational intelligence to create a wise system. While rational intelligence and technical/hard skills will be useful to verify the reliability of a result produced by intelligent machines, the social and emotional intelligences (Goleman, D., 1995) will serve to verify the adaptability to the context of the solutions identified by the machines. In fact, they ensure the development of: i) *intrapersonal* (emotional) *skills*: understanding of one's own values, awareness of one's knowledge/awareness, flexibility, self-management; ii) *interpersonal skills* (social): relationships with others (including intelligent machines), understanding of other people's values/empathy, active listening/communication, cooperation; iii) *inter-generational skills* for thinking long-term about the implications of today's decisions to future generation, especially decisions that impact the resilience of future generations (ability to rapidly rebuild from scratch after catastrophes). Futhermore, in the era of digital workers (smartphone apps grown up), people and other service system entities investing in learning and upskilling is key.

Practical implications – In this study we focus on the skills that people must have to support human and machine interactions. This does not mean that people have to only develop technical skills to understand the complex algorithms of the machines, rather that they need to also develop creative abilities, relational and social skills, therefore, they need horizontal competencies to fill in for the machine's gaps so as to be able to operate for the benefit of the system. Furthermore, people will need to improve their analytical and critical senses and be able to understand the belief system in which the machine operates (its behavior, operational boundaries, and limitations) as well as its intentions (Degani et al., 2017). In this way, the human partner will be able to adapt the profound skills of a machine to the social environment in which it operates, ensuring intelligent decisions that benefit the current generation and wise decisions that benefit future generations (as judged by future generations). Policy makers will have to adopt an education policy aimed at preparing T-Shaped Professionals (T-SP) of the future; a collaborative policy to promote the virtuous and circular collaboration between humans and machines. At the same time, universities and researchers can play a key role by engaging with policy makers to design smarter and wiser human-centered service

systems; driving new knowledge creation and stimulating quality of life progress for everyone, including the weakest in society.

In addition, service system entities are responsible entities (such as people, families, businesses, universities, cities, regional governments). Being responsible means becoming more conscious and explicit about learning investments. All responsible entities are constantly learning (AKA "upskilling") by tacitly investing in exploration (doing things in new ways) and exploitation (doing things in habitual, entrenched, routine ways). The practice of service science is the process of building a Service Innovation Roadmap (SIR) for each entity (Spohrer 2021). A SIR summarizes a responsible entities' learning investments, or plan for "upskilling". A SIR is a practical thing – a kind of Business Model Canvas for learning investments that responsible service system entities make. Furthermore, we divide the types of investment into three parts (1) Run (individual habits, enterprise routine operations), (2) Transform (copy best strategies from other entities, largely by finding high performing individual role models and/or enterprise competitors and following in their strategic footsteps or path), (3) Innovate (invent your own new best strategy or best practice). The tool of service science is complexity economics; modeling entities and their changing strategies. Complexity economics models and runs simulations to see what possible futures might exist, when strategic interactions are driving change. Policy can then be invented to make some possible futures more likely than others. However, because entities change their strategies as they are interacting, predicting the future is not possible.

Originality/value – The paper, in spite of its limits, offers interesting reflections for debate on the need to propose a T-SP model optimized for the era of intelligent machines that should possess a proactive attitude, creativity, change management orientation, understanding of complex situations, and negotiation skills. As technology races ahead, the demand for workers with social emotional learning skills also increases, because these skills are not yet susceptible to computerization (Frey, C.B. and Osborne, 2017) and can exceed the limits of intelligent machines, also known as the rapidly growing digital workforce each person can access (Piciocchi et al., 2019).

Key words – Human-Machine Interaction, Service Science, Viable Systems Approach, T-Shaped Model.

Paper type – Conceptual paper