The increased use of technology in the area of training is well documented. We have seen an escalating utilization of Web-based training, intelligent tutoring systems, and modeling and simulation in both the military and private sectors. These advances are primarily driven by improved computer technologies that can provide more sophisticated learning platforms. The use of individual trainee assessment, targeted objectives, and dynamic presentation of training stimuli have changed the way we view training. However, in the very near future, these advances may change the way we view other areas of I-O as well.

Recently the silver screen has been full of depictions of a future where computers have oppressed, enslaved, or exterminated the human race. *The Matrix* foretells of a future where humans are used as batteries in a post-apocalyptic world, while in the world of the *Terminator* humans are used as target practice. The basic premise in these films, and many others, is that mankind has developed artificial intelligence in computers to such a degree that the computers become sentient. Humans fearing what they have created, try to pull the plug. The computers fight back, and mankind is dispensed coldly and efficiently.

While finishing off my popcorn at a recent viewing of one of these films, it occurred to me that my parents probably wouldn’t have approved of my choice of profession as an I-O psychologist if they knew our field would be responsible for the destruction of the planet. Sure, we have had help from applied mathematicians, computer programmers, and especially from our cousins in the human factors field. Nevertheless, we have certainly played a large part in the integration of highly advanced, highly adaptable computer technology into the workplace, especially in the area of employee training.

Developing technology-assisted learning is not new. Learning machines were used as early as the 1950s. However, the recent advances in computing power have allowed us to develop training that is embedded, flexible, and interactive. Even simple office equipment, such as copying machines and personal computers, now come equipped with embedded training packages (How else would you know where the paper jam was and how to repair it?). While useful, these training technologies pale in comparison to the emerging state-of-the-art advances in the use of computing power and training.

Developing technology in the areas of Artificial Intelligence (AI) and Human Behavioral Representation (HBR) allows our training to involve the use of synthetic teammates. These new teammates incorporate intelligent tutoring technology to provide not only adaptive and interactive training
stimuli, but also immediate assessment and feedback. The notion of interacting with an artificial construct is no longer science fiction. The Navy currently employs these constructs in their Synthetic Cognition for Operational Team Training (SCOTT) system (Scolaro & Santarelli, 2002).

In the search for realistic training scenarios for their aircrews, the Navy has turned to the use of these synthetic teammates (nicknamed “synthers”) that can engage in taskwork, teamwork, and feedback delivery. The synther in the SCOTT system interacts with trainees through verbal communication networks that utilize standard terminology. The synther utilizes situational awareness to monitor tactical displays and verbal reports from human teammates. The synther generates expectations of possible team member behaviors and then matches actual behavior against these expectations. The synthetic team member then reacts and can explicitly coordinate with trainees using appropriate terminology in complete voice reports. Synthetic agents can replace missing team players in an intelligent, realistic fashion and assist live trainers in providing instructional assessment and feedback. Synthers “think” in a fashion that mimics human reasoning. Because of this complex cognitive architecture, they can perform predictably when faced with complex, novel environments.

While the training domains were initially very specific in nature, synthers have demonstrated a degree of flexibility and have been adapted for uses outside their original training domain. The process of synther development can be efficient once basic patterns of HBR and necessary software infrastructure have been completed (Weiland, Szczepkowski, Urban, Mitchell, Lyons, & Soles, 2002). The basic infrastructure of the system can be reused and modified so it can be applied in new training environments. These computer generated forces may currently exhibit overly predictable behaviors, but work in the areas of speech recognition, emotional modeling (Gratch & Marsella, 2003; Jones, Henninger, & Chown, 2002), and behavioral moderators (Ritter, Avraamides, & Councill, 2002) will aid in the development of synthers that are indistinguishable from human teammates.

Synthers are proving useful in providing instruction and practice to members of the military and will eventually be used outside of the training context. If we trust the technology to train our military and first responders, we will surely trust these synthers to complete other tasks in the business world. Any well-defined domain that requires situational awareness, information management, and feedback could potentially benefit from the use of AI employees. Synthers could be tremendously useful in manufacturing quality control by providing instant feedback and training to the employee when production quality deviates from set standards.

Perhaps a more advanced use of the new synther employee would be in a customer service or tech-support role. Problems encountered with products such as software are generally finite and narrowly defined. The synther tech-
support employee could comprehend your question and would have instant access to the database of correct responses (so it is likely to know more than the 17 year old who is reading from the manual for $8.50/hr.). Designed with the ability to interpret emotions, the synther would be able to read the wide-ranging moods of the customers and always respond in an empathetic, genuinely concerned fashion because it doesn’t get mad. Irate customers can’t get under its skin, it doesn’t have any.

The synther may soon be the best travel companion that the expatriate professional could ever have. When in Japan, the synther translator would be able to translate “Can you please hand me that report” in flawless Japanese because it wouldn’t just suggest a word-for-word translation, it would base the translation on the deeper level meaning and emotional content (which is often left out of a translation). In addition, the new synther employee would be able to assist with cultural assimilation. Before you could speak your newly acquired Japanese phrase, it might have told you to try to be a little quieter when you speak; we’re not in Kansas anymore. While the computational power necessary for a cultural synther isn’t quite portable, that kind of job duty is already being carried out in a training context. The U.S. Army is currently utilizing artificial intelligence and human behavioral representation to train soldiers to be more effective in cross-cultural situations.

With the advanced skill levels of a translator and cultural coach, the new synther would be a valuable teammate. Teammate? You mean this guy on my team is not a guy, he is a program? While the role of the synther is currently confined to the training environment, in the future synthers may be our new team members. The synther’s actions may contribute in a way that is consistent with the definition of a team; a group with specific individual roles that interact by way of exchanging information, sharing resources, and coordinating with and reacting to one another to achieve a common goal (Brannick, Salas, & Prince, 1997). The translator’s assistance in the previously mentioned situation, as well as endless other computer/human interactions would certainly meet that criterion.

The research opportunities in this area are numerous and fascinating. We’re not talking about the old virtual team research (netiquette and asynchronous work…yawn…); we are talking about virtual diversity! Our own research is currently examining some traditional areas of team functioning that may be impacted by the nature of the new, synthetic, team member, as well as unique team/machine phenomenon. One dynamic that our team is examining is the development of trust between team members and synthers. Humans build trust over time with the accumulation of idiosyncratic credits gained through consistent genuine interaction. But how will team trust be impacted by this new kind of machine interaction? What will be the nature of Machine-Member Exchange (MMX)?
The integration of synthers into our workforce is a likely extension of their use in a training environment and may change the nature of organizational life. While the notion seems far-fetched, many of our everyday work activities were science fiction 10 years ago (such as sending a document at the speed of light with the click of a button). Research in this area will be important to guide our human employees through another groundbreaking change in the nature of work. This research will not only aid in the productivity of organizations, but also in the satisfaction of employees and synthers. Because as the recent Hollywood movies have illustrated, when those synthers get mad there is hell to pay.

References


