

Can technology create instant experts?

It is thought to take 10,000 hours of practice to create an expert. Can technology reduce this number?

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In the Academy Award winning film *The Matrix*, the hero (Neo) and heroine (Trinity) find themselves running for their lives, trying desperately to escape the swiftly closing net of machine agents bent on their imminent destruction. The exhausting chase seems set to culminate in an anti-climactic surrender on a nondescript rooftop. With no possible line of retreat, our protagonists are presented with only two, less than desirable options, capture or suicide. However, what kind of Hollywood movie would it be to leave our heroes with such dismal prospects?

Luckily for Neo and Trinity, there is a helicopter conveniently parked on top of this very building. But there is just one small hurdle between the couple and their flight to freedom: neither of them possesses the expertise to fly this complex aircraft. In Matrix world, however, this is really no barrier at all. As a result of their direct brain-computer interface, the necessary know-how can be downloaded in mere milliseconds. There is no need to complete the hundreds or even thousands of hours of deliberate practice that are supposedly required to obtain proficiency¹. Needless to say, the crucial download is successful and the duo escapes to once again battle the evil of the machines.

As the two fly away however, the question remains whether the instant acquisition of expertise through technology will ever be as possible in the real world as it is in fiction. Such a capacity could indeed signal the genesis of a drastically different world than the one in which we live today. Optimists could then envisage a world where technology ordains virtually everyone with superhero-like proficiency in almost all domains of human expertise². Conversely, pessimists are likely to adopt a far more dystopian perspective where malevolent individuals can readily access some of society's most undesirable skills. Here, we examine the potential for this rate and level of technologically-supported development of expertise. Our

present question concerns how technology can facilitate expertise and how, in their turn, experts can act then to influence the development of human machine symbiosis. In short, we examine how technology creates experts and how experts create the technology to create experts.

Expertise: in the brain or in the computer?

In many realms of work performance, we have seen the need for continuous human (largely psychomotor) response now often mostly or even completely replaced by machine action. Under the driving influence of this line of evolution, the requirements for expert response have themselves undergone fairly radical change. An example may help illustrate this here. In his important text, *Cognition in the wild*, Hutchins commented extensively upon the skills necessary to be an effective long-distance ocean navigator³. In certain native Polynesian societies, the capacity to traverse long distances across the open ocean was crucially dependent upon certain learned observational skills. Your social position and indeed the survival of the social group depended directly upon this level of learned expertise. Today, successful navigation is largely contingent upon the technological support of a sophisticated global positioning system (GPS). With a well-designed interface to access this information, successful performance no longer depends upon knowledge of winds, waves and stars; that is, until the technology fails. However, if the technology fails completely, many modern-day vessels themselves become simply un-navigable anyway. Thus in many modern day situations, the expertise engrained in certain procedural and factual knowledge can, to a fair degree, be stored in the computer support system. Crucial knowledge and thus one aspect of 'expertise' does not necessarily need to be resident in the head of the operator. But this configuration can itself well have problematic or even disastrous consequences. For example, concerns are often expressed about schoolchildren and their use of

electronic calculators. Such technical support allows the child to produce almost instant answers to maths questions but they do this potentially without any basic understanding of the process of arithmetic computation involved. Indeed, grocery store clerks in the US often make egregious errors if the register fails or even if the data are simply entered incorrectly. It is also common for many individuals today to have problems performing even basic mathematical additions when the computer is 'down'. The problem here is that the balance of some forms of expertise has shifted over toward the computer side and suddenly we have purportedly 'smart' machines being operated by sadly 'dumb' humans. The question is where should necessary expertise reside and how do we get the balance right?

Getting the balance right: the elaboration of expertise

Making instant experts then cannot be solely about transferring some level of coded procedural knowledge to a readily handy machine, be it either computer or brain. It requires that both the machine and its operator partake of the needed and thus shared understanding. Our contention is that technological systems should therefore support human expertise but never totally usurp it (except in the most dire of emergency conditions where human response is not possible). It brings us back to the question of what is expertise in the first place? If, for a moment, we exclude the area of sports performance, the vast majority of modern expertise is indeed expressed in association with technological support systems. The modern-day expert is often the individual who has great facility with the interface to a system and is one who thus understands the subtleties and nuances of the operations and can induce the ever-more complex system to behave in the manner they (and their immediate clients) desire. In safety-critical systems, much effort is devoted to standardisation so that expertise can be expressed by many users. This principle persists for socially interactive computer games as much as it does complex work systems and in military support capacities. Thus expertise remains goal-driven as it always has been but now the scaffolding of factual information upon which the procedural facility of the individual expert is built, can be easily supported by the exocentric storage of knowledge. The challenge is to make this knowledge readily retrievable and usable at

the appropriate juncture. The degree to which the individual is themselves required to store such information, as opposed to being able to access it in order to exhibit higher-level expertise, remains presently in a state of flux.

The foreseeable future

To answer our original question, can technology create instant experts, the answer at present seems to be 'no'. Technology can act to better support a growing level of expertise but some considerable effort must still go into the accumulation of required factual and procedural knowledge to get to a superior level of competence. However, it remains important to ask, what does the future of this relationship between expertise and technology look like? Does it hold doom and despair as machine capacity grows and eventually usurps all human user abilities and then overthrows and eradicates their one-time masters, as some of Hollywood's more dire predictions propose? No, because in general, we are optimists. One brighter potential future that film makers may have accurately predicted is the creation of a direct physical interface between the human mind and the electronic brain. The result of this linkage point is the contiguous and uninterrupted communication between the human mind and a computer system. Efforts to create just such an interface are already underway in the scientific community⁴. By utilising this forthright connection, there exists the potential that expertise could be developed almost instantaneously. Yet such a vision lies well into the future. What is frustrating is that the long, laborious process of skill accumulation toward expertise has not yet been diminished appreciably by technological innovation, nor has the general process of child education been significantly shortened by the computer revolution of the last and present century. While machine capacities grow rather in Lamarckian fashion, the slow and frustrating Darwinian-inspired advances in humans abilities pale in comparison. Sadly, the hybrid of the two seems anchored in the human limits at the present time. As mediators between humans and machines, ergonomists must seek to address this persisting impasse. If, as experts in human-machine systems, we could foster the greater development of a larger and more able cadre of human experts in all areas, some of the most challenging issues that face humankind such as population, global warming, energy depletion and failing water resources, might themselves be able to be better resolved. ❖

References

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