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Epistemological Foundation of Technology: A Rationist Perspective

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Abstract

Technology is a basic tool of development, which is so dynamic that man seems to be at a lost to the value of this creation. Technology is indeed human's creation, but it seems beyond the control of man. The implication of this is that technology seems to be controlling man that created it. The reason for this inability of man to control technology is largely due to the fact that, technology has been viewed and approached solely from the standpoint of the scientific. What this means is that technology is only established on the platform of science and this has denied it, its epistemological foundation. This paper therefore seeks to establish the epistemological foundation and significance of technology, and argues that it is only through the cognitive understanding of technology that its values and danger could be identified. This way, man will be in a better position to reflect on technology, and thereby control it.

Introduction

The technological age that we live in appears to be doomed. This is largely due to the weak foundation that the entire edifice of technology is erected. Technology as we have come to accept it is a product of science. This is because every definition of technology inherently contains this scientific element. Though

there is a tight relationship between science and technology, but its umbilical cord seems completely severed from epistemology, which is the womb that conceived, carried and delivered this "dynamic baby" that has altered and changed the course of society.

It is an established fact that every product of technology and technology itself is a product of human cognitive prowess and creativity. There would never have been technology and even science without human cognitive ability to create through the process of thinking. Indeed, this is the seed and origin of all human developmental efforts. However, the emergence of logical positivism created a problem of doubt as to the paternity of the baby-technology. This is because the logical positivists dared to reject the epistemological basis of all things and rather opted for a pattern of "verificationism", which compounded the epistemological frame-work of science versa vice technology.

This epistemological confusion has brought about the problem that science and everything that comes with it faces today. Modernity also, has added to this confusion and this has made it more difficult for science and technology to be understood wholly. It is therefore, on the basis of this that this paper is inspired to chart a route map towards recovering the epistemological basis of technology. The reason for this is to make it possible for technology to be grasped the way it should be. It is only when technology is properly viewed from its epistemological root, that man can take firm control of technology and therefore makes it a reflective activity, and thereby highlighting its philosophical significance.

Technology as Epistemology

It is a fact that technology is a product of human cognitive and creative talent. This manifests itself in the way students of today have formed their habits of mind by interacting with information that is digital and networked. This students display some level of maturity that suggest that they are older than their teachers, whose relationships with information are governed by earlier generations of technology. There is more. This is because the present day students possess skills and experiences that previous generations do not. This is further enhanced and made possible by very neurological structures and pathways they have developed as part of their learning, which are based on the technologies they use to create, store and disseminate information. Essentially, these pathways and the categories, taxonomies, and other tools they employed for thinking are distinct from those used by their teachers, who belong to the older generations.

This pattern has made new technology to change the way we think or reason. Schilling (2005:1) shares this view when he says that "new technology is changing the way we think". Though this contains some ambiguity, but it is very obvious that

this is the case. We can see the greater influence of Microsoft word's grammar checker on American English than any teacher, curriculum or even book can offer. However, the consideration of the relationship between technology and thinking will be explicitly in the context of education, where the mission involves helping students to think.

We can start our discourse with the role that patterns and categories play in learning and knowing. Though patterns and categories that are usually used cannot be said to be perfect ways of creating meaning, they indeed influence the way we think, remember, and anticipate information. This assertion can be illustrated with biology as the world is split into domains of kingdom, phylum, class, order, family, genus, and species, which as we can see in the final category, is a division based on ability to produce sexually. For this reason, there emerge such families like canidae and felidae, dogs and cats. So is it in our world or doing and other forms of assisted reproduction, we, instead, divide the world basically by means of locomotion, dogs and cats would both be in one group as the digitigrade. Following this therefore, we discover that the particular way we learn information, as well as when we learn, create specific neural pathways or patterns in our brains. Once these patterns and pathways become too familiar or set, we become less adept at seeing information which does not actually fit the pattern. Sometimes, we can even start adding phantom data to fill in the gaps.

It is on the basis of this that Schilling (2005:2) declares:

> All of our cognitive tools help us perceive our world and sort the flood of information that continually flows across our senses. We regularly filter and winnow this information in order to focus, group, and extract meaning. If our brain and senses did not do this, we would be overhelmed by our inability to differentiate foreground from background.

From this, it is clear that it is man's cognitive tools that really shaped the world and make it what it is. These cognitive tools are the means through which the world is designed. This is actually anchored on time and experience as they train our senses to interpret information. They equally lead to the development of a facility to fill in information not available to our senses. This is from the illusionist's stand point, since it is optical illusions that are perhaps the most widely known demonstration of this type of learned behaviour. Our mind fills in or adds information that we can perceive depth, relationships, and other data not actually present in an image or scene.

The minds also fill in such things as context and inform our understanding by, for instance, utilizing our familiarity with the tools of information creation and dissemination. Though patterns, and categories are necessary for us to sort through

the information to find meaning, once we have created our categories and patterns, they can be difficult to put aside. In these instances, one cannot see familiar information without the categories or meaning with which we have associated it.

Much has really be said and written about the importance of categories and patterns for thinking. The American National Research Council has reported on "research demonstrate that when a series of events are presented in a random sequence, people reorder them… the mind creates categories for processing information… the mind imposes structure on the information available from experience".

A problem is then created when we lose sight of the constructs we bring to our interaction with the data around us, but it is hard not to. What Nietzsche has said about metaphors holds equally true for our use of patterns to help formulate meaning. This can be seen in the Nietzschean Metaphors as Schilling put thus:

> What, then, is truth? A mobile army of metaphors, metonyms, and anthropomorphisms – in short, a sum of human relations which have been enhanced, transposed, and embellished poetically and rhetorically, and which after long use firm, canonical, and obligatory to a people: truths are illusions about which one has forgotten that this is what they are; metaphors which are worn out and without sensuous power; coins which have lost their pictures and now matter only as metal, no longer as coins (3-4).

From this, it obvious that the patterns and categories we use can constrict our ability to understand new things. Also, we tend to use known patterns to help us learn, or manage new information. Context and what we know affects the ways in which we establish meaning.

For several centuries, humans have used various technologies to assist manage data, whether it was Incan knots or Egyptian hieroglyphs. The introduction of new technologies, therefore, is an important part of the context in which we see meaning for new information. For this reason, although we have had stories about the flying horse and three-headed dogs in our culture, today any person that look at such pictures of a flying horse and three-headed dogs will mostly likely think of a product of image-editing software.

Education has the contradictory tasks of teaching us to work within patterns, but also to think beyond them. So, if we are not careful, disciplinary thinking can slip into rotate with established taxonomies. An educated person today knows how to access and use appropriate data as well as understand the abilities and limitations of each. It is very likely that the way in which they go about finding, assimilating, and

representing information, utilize specific areas of their brains. Photoshop and other such tools change the way we process visual data.

Epistemology, and epistemological inquiries have a long history, arching from superstition toward what Gurvitch (1976) refers to as the "social framework of knowledge". Technology has always been present as an essential component of how we think, of our thinking about our thinking, and of what we teach. When the technology changes, as it is now, its role becomes all the more evident.

As educators and philosophers, we can also discuss the ways in which learning changes the brain. And following Nietzsche, we can also reason that it is hard to change our patterns and categories of thought. Nevertheless, we must perceive our own technological – dependent construct in order to integrate the valuable information and skills we have developed over a lifetime with the new tools now used in creating and sharing knowledge.

Technological Rationality and Reason

The nature of rationality is one major divide of technology and the technological society. This has generated a great debate among philosophers of technology. Science, it must be noted is generally taken to be the prime model or paradigm of rationality in our society especially among the educated people. Technology which by extension is regarded as applied science is also seen as a part of this rationality of modern society.

Technocrats see themselves as advocates of the rule of reason, but unlike Plato, they understand reason, to mean technological/scientific reason. However, the analytical critics of technological pessimists do not rely on the grand thesis of such European figures like Heidegger and Ellul who functioned as pioneers in this field. This has it made possible for technocrats and most analytical philosophers of technology to advocate for kind of piecemeal evaluation of technology, which one project at a time (Pitt, 2000). Ironically, they tend to agree with the recent continental philosophy influenced by some American philosophers of technology like Ihede, Feinberg and Haraway. These philosophers are very skeptical of the claim that technology has an essence or general character that can be morally or culturally assessed as a whole. There appear to be an agreement in this between several analytical philosophers and post-modernists, who are indeed strange bed-fellows. Many analytical philosophers and almost all technocratic opponents of grand thesis and narrative of technological pessimism generally use risk/benefit analysis to do the evaluation. So, the question, which is basic here, is; whether the mathematical calculations of risk and benefit can incorporate, or do justice to, the moral and aesthetic values of the people who live with the technology.

Several students of the rise of modern society, starting with the early twentieth-century German Sociologist Max Weber, have portrayed the rise of modern, western society as the rise of rationality. Weber, as we know, talked about the "rationalization" of various areas of society, which include economics, and science that also extend to all other areas of society and culture. To Weber, rationalization means systematization and organization by means of rational principles.

However, Jacques Ellul's "technique" has many parallels to Weber's "rationalization". Indeed, Ellul in his book *The Technological Society*, which was published in 1954, did not mention this concept of Weber. It is a fact that Ellul is a prime advocate of the notion of technology as primarily a matter of rules rather than of hardware. Technological rules constitute his "technique". Ellul's "technical phenomenon" is the application of technique to all aspects of life and society, and corresponds to the complete triumph of Weber's process of rationalization.

So, in the twentieth-century theories of technocracy and post-industrial society the application of scientific rationality to various areas of social prediction and planning was seen as a progressive culmination of the rise of reason. The application of such techniques as operation analysis, cost/ benefit and risk/benefit analysis, rational choice theory, and the general application of economic models to apparently non-economic aspects of society, such as politics, and even mate choice, is seen as a positive step. Applied social science becomes "social engineering" of a sort for more complex and sophisticated as can be seen in Ozumba's "Ethics of Political Engineering".

Sharply in contrast to the technocrats and technological optimists, those who have been pessimistic about the dominance of technology in our society have often contrasted a higher or genuine rationality with technological rationality, or "instrumental rationality". Technological rationality is seen as a lower form of rationality that needs to be supplemented and tailored by "genuine philosophical, dialectical and higher rationality (Dusek 2006:54). This is identifiable with the German tradition that emerges from Immanuel Kant and George Fredrich Hegel. This contrast of dialectical and instrumental reason is taken up in the twentieth-century critical theory.

The traditional model for rationality in the West right from the Platonic era in ancient Greece has been mathematics. This is because, mathematics is generally considered to have the features of universality, necessity, rigor and certainty. Mathematics has universality with respect to individuals as well as cultures. Mathematical results are such that any one that follows the technique of calculation will arrive at the same result. There appear to be subjective individual variation in correct and answers to a well set problem.

In Africa, the model of rationality is not clearly established or defined but it seems to inclined towards the idealistic and mystical. What is meant here is that rationality in Africa possesses no mathematical content as far as the Africans are concerned. These are more in the realm of revealed knowledge that must have been handed down from one generation to the other through such means as folklores, oral tradition, among others. Rationality to the African is more of initiative and communally derived in terms of the value of human life. Though Egypt is said to remain the original place for the development of mathematics, this has not been generally imbibed by all Africans as an epistemological tool to acquire certainty in terms of the search for true knowledge.

From our analysis so far, it can be seen that we have a number of different kind of reason. The formalistic version identifies reason with deductive logic. Euclid's geometry was the model for both Plato and the seventeenth century rationalists. Some later identified reason with a formal inductive logic, which Carnap approaches, in it's a priori-structure, a deductive system. Others identify reason with instrumental or technological reasoning, the adaptation of means to an end.

It has been established that epistemology is the capstone of technology. This can be seen in the work of Pitt, when he looked at the negative and positive aspects of technology. He opines that it is human problems that drive all technology. In tackling these problems there is therefore the need for man to look inward and make use of his knowledge. This utilization of human knowledge towards the resolution of human problems makes reflective activity possible. It is while reflecting on the internal and external problems of man that bring about observation and experimentation. These are the anchor points of science, which eventually give rise to ideas that are classified as scientific.

It is the application of such scientific ideas in practical ways that describe what is known as technology. This of course, reveals both the philosophical and epistemological significance of technology. So, technology becomes the practical application of human scientific ideas, which are products of his reflective activities towards solving human problems.

What can be gleaned from this is that there cannot be technology without a reflective attitude aimed at satisfying a need. So, every technology is for a purpose. This purpose is knowledge –driven and emerges with a rationality that is peculiar to it. It is also this rationality that defines the value of such a technology. However, to make technology valuable and worthwhile, it is important that rationality be emphasized and made reflective towards the satisfaction of human needs and comfort. Ekanem (2005) shares this view when he proposed a philosophy of education known as "Essencism" towards the development of a technology that will be human centered. In this proposal, he advocates for an effective combination of the

physical and spiritual aspects of man so as to bring about a technology that will satisfy the essence of man on planet earth.

A cursory look at Ekanem's view will reveal both epistemological and philosophical significance of technology. This is because the origin, the use and value of technology are both epistemologically and philosophically rooted.

This can be seen in the methodology of technology, which is systematic. This system makes use of both theoretical and practical intelligence in the design and construction of every technology.

Conclusion

However, we come to define it technology certainly can be anticipated to involve questions of knowledge in several important ways. The technology of a society is a reflection of what at least some members of that society know how to do. Notably, the sorts of modern technology characteristically associated with the development of the philosophy of technology also embody theoretical knowledge gained from the sciences. All the questions that must be asked explicitly in the philosophy of science are therefore embedded in the philosophy of technology. These complex epistemological relationships can be seen in our position in describing technology as epistemology and the rationality of technology and reason.

The relationship between modern science and technology is basically reciprocal. Modern science could not be what it is today, without the precise instruments of observation, manipulation, and calculation that a refined modern technology provides. So, it is a basic truth to say that technology is a necessary condition for contemporary forms of science as it is to say that science is a necessary condition for a contemporary form of technology. Epistemologically therefore, a fundamental question may arise as to the extent to which scientific knowledge itself is an artifact of our instruments and techniques.

Historically, we see that long before there were sophisticated technologies of theoretical science, human beings were using tools and following craft traditions that embodied high degrees of practical knowledge. What is the relationship between practical and theoretical reason, and how do they both relate to technology? Is one or the other primary? How does act relate to thought? The answers to all these questions have been captured in the epistemological foundation of technology, with a rational taint.

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