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# Teaching theology in the Fourth Industrial Revolution

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Post-school education (PSE) in South Africa mostly takes place within an industrial-age factory environment as has been done for the past 50 years or longer. This is the case despite the fact that the world is on the brink of, or already part of, the Fourth Industrial Revolution (4IR), called by some an 'emerging new world order'. Educating students today like we did it half a century ago has now become education to a 'quickly vanishing world'. Although one may argue that the *content* of Theology will not be much affected by the 4IR, it is proposed that the *way* in which that content is communicated and educated should change drastically. Doing this will prepare our students to become relevant preachers or theologians in the current (post-)postmodern society. The proposed model in this article is called an outside-in model – contrasted to the current inside-out model of education – in which our students should be taught to develop a sense of deep learning, to effectively learn and work in and with groups, to use their mobile devices (cell phones and tablets) and social media within the environment of education and to discuss new ways of gathering God's people.

The question that each educator should ask themselves nowadays is: Am I really preparing my students for the future that *they* are facing?

**Contribution:** A new way of teaching Theology in the 4IR is imperative for our students. This article suggests how it could be done. Although this entails willpower and persuading the mostly 'old' lecturers in Theology to engage with real technology, it is all about the student, because many of these students will become the lecturers of tomorrow. Our faculties or departments of Theology are therefore urged to fit themselves into the new mould and to train our future theologians in a 4IR way.

**Keywords:** Fourth Industrial Revolution; Education 4; Deep learning; Scalable learning; Entrepreneurial learner; Theology; Groups; Internet of things; Artificial intelligence; Big data.

## Introduction – Facing the Fourth Industrial Revolution[1]

Currently, the world is in a transitional (cf. Veldsman 2019) stage between the Third Industrial Revolution (3IR) and the 4IR, gradually facing (attempting to face) the 4IR with all its challenges.[2] Klaus Schwab (2016:1) puts this very strongly when he states, '[w]e are at the beginning of a revolution that is fundamentally changing the way we live, work, and relate to one another'. The 4IR is, considering its 'scale, scope and complexity', something totally different compared to the other IRs (Schwab 2016:1). Tefo Mohapi (2017) argues that the 4IR is in the process of blending digital technologies like artificial intelligence (AI), the Internet of things (IoT) and big data into our existence. This makes it very difficult to distinguish between the digital and the physical world. However, this very phenomenon will advance the quality of our lives and assist us in making better decisions.[3]

Bo Xing and Tshilidzi Marwala add that the 4IR is powered by AI[4] and cyber-physical systems[5] (Xing & Marwala 2017:10, 11; cf. Marwala 2007), stating that this will change the 'workplace

1.For two groundbreaking works on the 4IR, read Schwab (2016) and Brynjolfsson and McAfee (2014).

2.Schwab (2016:7), however, asserts that the 4IR already started at the turn of the 21st century (!).

3.Sawyer (2008:3); cf. the standard works of Bereiter (2002), Hargreaves (2003) and Sawyer (2006) on this subject.

4.AI is a 'fusion of technologies that is blurring the lines between the physical, digital and biological domains' (Butler-Adam 2018:1). Although being discussed and elaborated on by businesses and industries – in fact the entire economy – its implications are in fact still to be speculated about (Butler-Adam 2018:1; cf. also Smith et al. 2006:4). At this stage, AI is not on the level that the inventors would want it to be. At playing games like chess, AI is excellent, but when non-repetitive physical tasks are required, it is not yet competent enough (Butler-Adam 2018:1).

5.A cyber-physical system consists of computer-based algorithms that control and monitor a mechanism.

**Note:** Special Collection entitled Christianity as Change Agent in the 4th Industrial Revolution World, sub-edited by Erna Oliver (UNISA).

from task-based characteristics to human-centred characteristics' (Xing & Marwala 2017:10). The skills needed for the 4IR are people management, negotiation, emotional intelligence, critical thinking, cognitive flexibility, judgement, knowledge production and management (Xing & Marwala 2017:10–11).

Whenever a new IR is identified, the technology of the time takes quite a while – 'a significant lag time' (Penprase 2018:210) – to adapt itself to the new environment or situation and to fully fulfil the needs for the new revolution. At this moment in time – in the face of the 4IR – we are apparently in this 'lag' period (Mohapi 2017), with people or institutions predicting what will happen, although it is still not happening. The World Economic Forum acts as a good example, already suggesting in 2017 that the 4IR will have a big influence on education as well as gender and work (WEF 2017), but that influence is still not really visible. This lag period is directly dependent on both the period in which people will be trained to adapt and the time and experimentation phase it will take to widely disseminate the technology to everybody, including education (Penprase 2018:210; cf. Atkeson & Kehoe 2007:64–88). It therefore means that education is also in this lag period, prompting educators to get themselves ready to live up to the expectations of *what we expect* the 4IR would demand from us. The reason is that institutions of higher education are probably playing 'the most critical role' to timeously provide key people to organisations in particular and the society in general (Veldsman 2019; Cf. Soskil 2018:11).

## The first three industrial revolutions: Down memory lane

Every IR was disruptive in the sense that it was linked to many immediate job losses. However, in the long run it created other jobs that were more productive and more rewarding, jobs that substantially improved the living standards of many people (Brown-Martin 2017:2; cf. Acemoglu 2016). It thus created opportunities for many 'new' jobs – jobs that were unknown or unheard of during the previous IR.

Before the 18th century, there were no official IRs. It is therefore in fact a novelty, compared to other revolutions like the first Communication Revolution that took place in approximately 40 000 BCE (Warschauer & Matuchniak 2010:179ff) or the first Christian Revolution that started with Jesus of Nazareth.

The term 'Industrial Revolution' was coined by Arnold Toynbee in his book, *Lectures on the Industrial Revolution*, written in 1884, approximately a century after the 1IR commenced, and just after the commencement of the 2IR. In 1784, the 1IR was caused by Newton when he articulated his motion laws. From that time onwards, people understood motion better and quantified it in a better way (Xing & Marwala 2017:11). Mechanical production, railroads and steam power, harnessing water and steam power towards more systematic and efficient forms of manufacturing, became the order of the day (Penprase 2018:208; Schwab 2016:6–7). This made it possible for James Watts to invent the steam engine (Intelitek 2018).

The 2IR was catalysed in approximately 1870 (maybe better defined as between 1860 and 1900) by Faraday and Maxwell. They unified the forces of magnetism and electricity, which generated electricity and the electric motor (Xing & Marwala 2017:11), where electrical power created mass production (Schwab 2016:7). Added to this, workers started to move away from 'end-to-end knowledge about a product' and had a role assigned to each worker in a production line, having only a limited although sufficient expertise (Intelitek 2018).

The transistor, which was invented by William Shockley (mainly), John Bardeen and Walter Brattain and successfully demonstrated in 1947 (San José State University n.d.), led to the ushering in of the 3IR and the electronic age from 1969 onwards. This was accompanied by automated production, electronics and information technology, producing computers and the Internet (Xing & Marwala 2017:11). This started the 'computer and digital revolution' (Schwab 2016:7) and was actually the official commencement of the electronic age.

According to John Seely Brown (2013:13–14), the time between the 18th and the 20th century can be called the age of the *S-curve*, characterised by a relative stability in both social and cultural development. The last 50–70 years of this era marked its pinnacle, in which skills lasted a lifetime and 'career paths were clear' (Brown 2013:14). The 21st century introduced a new era, called by Brown (2013:14) the *Big Shift*, distanced from stability, 'driven by exponential advances in computation'. During the S-curve there were many technical skills on which people could depend, but all these skills are now becoming irrelevant or even redundant (Brown 2013:14).

## Response of education to the first three industrial revolutions

Before the 1IR, the education system can be classified as predominantly a classical education (Penprase 2018:208), where 'every step familiarizes the mind with the structure of language, and the meaning of words and phrases' (Yale University 1828:36). Subsequent to the 1IR, new diverse degrees and general education programmes were created, opening the way to a variety of courses presented to students. Charles Eliot, who was at that stage the president of Harvard University, referred to it as the 'New Education' (Eliot 1869; cf. Penprase 2018:208), whilst the model for postgraduate research posed by German universities became the trend of the world (Penprase 2018:209).

Between 1860 and 1900, the 2IR resulted in what is called by many scholars, the 'new economy' (cf. Atkeson & Kehoe

2007:64–88). This led to a surge in discoveries being made during these years. In this era, higher education was made accessible to the industrial classes (Penprase 2018:209), ending up in the education and training of technicians and engineers (Penprase 2018:209). This development led to the founding of many universities and colleges, especially in the United States of America (USA), focusing especially on 'technicians and engineers trained in the "practical avocations of life" [Geiger 2017:x] such as agriculture and the mechanic arts' (Penprase 2018:209).

The 3IR did not really change the way in which students were taught. Educators just made use – mostly to a limited extent – of the advances of the newly invented technology. This is still applicable for our current situation, where the same criteria as in the 2IR are applied to learning outcomes and educators, where students are still treated as if they are 'part of a production line' (Intelitek 2018). According to Penprase (2018:211), the effects of the 3IR are only now to be seen in our societies, in politics and economics, as well as in education, as more students get access to institutions of higher education, whilst academic research becomes a global phenomenon because of online technologies (Penprase 2018:213). The access to new information on the Internet has become immediate and mostly free, which has opened the door for more collaboration between students and created an environment for more and better or deeper learning. It has also led to the founding of institutions focusing more on global and interdisciplinary curricula (cf. Penprase 2018:213–214). In a sense, this has paved the way for the 4IR.

## The Fourth Industrial Revolution: Man and/versus machine

Interestingly, almost a century passed between the 1IR and 2IR as well as the 2IR and 3IR, but the time span between the 3IR and 4IR was less than half a century – if the 4IR has already commenced. Furthermore, every IR was catalysed by the discovery of a 'game changer', yet the changing factor opening the way to the 4IR has not been discovered or named yet. At this stage the 4IR itself is being discussed by many as being a catalyst (!). The #BricsSummit 2018[6] is a good example, with the theme, 'Fourth Industrial Revolution: A Catalyst or Impediment to Growth, Inclusive Development and Transformation' (BusinessReport 2018).

The 4IR is characterised by the digital revolution, AI, big data and robotics. Osman Seedat (2019) argues that the 4IR has added a world filled with 'cyber-physical systems' in which digital, physical and biological realms are merged in a profound way, and where AI is regarded to be the *primary catalyst* of the entire process of transformation. However, AI is not a new phenomenon, as the term was coined in 1956 by John McCarthy (cf. Smith et al. 2006:4).[7]

On the contrary, AI is not yet a full reality, which means that if AI is the catalyst for the 4IR, then we will probably have to wait another half century. According to Smith et al. (2006:24), the challenge with AI is to teach a computer to think and to reason, which means that we must already know exactly how to do it. Until then, our communication with computers will be on a limited basis.

Many people have the conviction that when AI 'takes over', human capital will become irrelevant and redundant. However, humans will stay relevant for a myriad of purposes like 'finalizing key decision making, problem solving, and process monitoring' (Xing, Marwala & Marwala 2018:174). The indispensability of humans lies in the implementation tasks needed for new technologies as well as certain maintenance duties needed to be performed before the new technologies can run smoothly. Then there are also instances in which the technology fails to work, like in power outages (sometimes taking place in South Africa), when humans must take over, or when a specific device or computer breaks down.

During the first three IRs, machines took over the mechanical work that many people did, and so the people adapted by performing cognitive tasks. Some people fear that AI will also take over these human functions (Xing et al. 2018:175). The fear factor will always be there, with the familiar 'what if' questions: What if robots do the work far better than people, thereby destroying many jobs done by humans? What if the AI robots take over the entire industry (cf. Brown-Martin 2017:4)? The fact is that many current mechanical jobs could be taken over by robots, as is already the case in the car manufacturing industry. However, a lot of new jobs will emerge because of the 4IR and AI creating the possibility for it. Graham Brown-Martin (2017:6) postulates that many jobs being created could be short-term contracts, with the implication that many people will sometimes have jobs, but not continually, thereby creating a 'bad society'.[8] Here, governments have to act with determination to create an environment in which entrepreneurs can flourish and where the new ventures will create new jobs. People should not try to slow down the upcoming workforce of robots and robotics, 'but to speed up our institutions so that entrepreneurs, managers, and workers alike can thrive' (Brown-Martin 2017:4; cf. also Schwab 2016:67–70).

Then there will always be categories of work that AI will not be able to accomplish, like in the field of Theology – being a preacher. As many current jobs will disappear in the (near) future, whilst other jobs, maybe not presently being thought of, will be created, the question is, how will this affect Theology? How will it affect the existence and work of preachers? Will there still be churches (or church buildings for that matter), or will these totally disappear or be replaced – and with what?

6. Brazil, Russia, India, China and South Africa.

7. The article by Smith et al. (2006) gives a well-designed history of AI that is worth reading.

8. Daniel Pink forecasted this in 2001 in his book *Free Agent Nation – The Future of Working for Yourself* (Pink 2001).

In 2017, Mark Cuban, a sports billionaire in the USA, predicted that there will be exponentially more newly created jobs in the next 5–10 years than in the last 30 years, and that the world will more intensely need expertise in languages, specifically English, as well as philosophy (Jaschik 2017). Added to that, workers should make the most of the positives emerging from this, by starting to focus on 'volunteering, entrepreneurship, family, civic engagement, and creative endeavours' (Brown-Martin 2017:5). Brown-Martin (2017:19) adds that the occupations and future professions occupied by people and professionals will be those that are impossible for machines to do, jobs that 'will rely on creative expression, social interaction, physical dexterity, empathy, ingenuity and collaboration'.

The fact of the matter is that humans will always take centre stage, at least during the 4IR (Veldsman 2019):

> In the centre of the [*4IR is*] an extending, increasingly diverse range of activist stakeholders with shifting interests, demands and expectations, whose voices are amplified by social media, enabling them to rapidly mobilise around issues, nationally and globally. (n.p.)

The situation in the 4IR will therefore be 'man AND machine'.

## The need for basic education to adapt

In light of what has been said up to this point, it becomes clear that people need to adapt in order to be prepared for the 4IR. That adaptation should start during basic education – in school. In 2008, Keith Sawyer referred to school education (and this is still true of the current education system in South Africa) as follows (Sawyer 2008):

- Knowledge has just become the gathering of *facts* and *procedures* related to solving problems.
- Education's goal is to make students familiar with these facts and procedures. People are considered to be educated when they possess a large collection of these facts and procedures.
- Educators have the knowledge of these facts and procedures, and their main task is to transmit it to their students.
- The easier facts and procedures must first be taught to the students, after which they should progressively learn the more difficult work. The definitions of the two terms 'simplicity' and 'complexity', as well as the way in which the material is presented, are determined by the educator, or alternatively by the textbook author(s) or with the help of other experts. The way in which students actually learn takes lower priority.[9]
- The success of their education is measured by assessing the students to inquire how many facts and procedures they have mastered and made their own. (p. 2)

9. Brown-Martin (2017:7) concurs that the current schools were designed on a non-scientific basis ('commonsense assumptions') that was never tested scientifically.

This kind of education is referred to as *the standard model*, applicable for and by analogy of the early 20th-century industrial-age factory (Sawyer 2008:2; cf. Callahan 1962). In the standard model, the part played by educational researchers is to assist educators to 'more effectively transmit facts and procedures to students. [However, they are] not teaching the deep knowledge [and deeper conceptual understanding] that underlies knowledge work' (Sawyer 2008:3) and that is needed by our students.[10]

This standard model does not really prepare a prospective student for post-school education (PSE) in the 4IR, and therefore basic education will have to adapt. Preparation for PSE should deliver a student who is clued up with the latest technology, digital skills and ways of learning (cf. Mohapi 2017). Added to computer literacy is also software programming education that is needed to empower our prospective students to better achieve their career goals in life (Mohapi 2017). At this moment this is still a pipe dream in South Africa (cf. Veldsman 2019).

## Who are the students we are (will be) working with?

In order to prepare ourselves in PSE for the 4IR, we must seriously take note of the characteristics of the students we are working with, as they will take centre stage in the new learning process (discussed later).

There are many millennial students (Generation Y – born between 1980 and approximately 1995) enrolled for PSE. They are joined by Generation Z students – those born from the middle of the 1990s to 2005. This generation is followed by Generation Alpha – youngsters who will start their PSE career during the early 2020s. We should start preparing ourselves for the Alphas. However, we should also ask ourselves if we are currently really on par with Generation Z or even the millennials? The African Gen Z Report of 2018 (Hawkes 2018:3) refers to Generation Z in a global overview of this generation, stating that this generation has most probably never posted a letter or perused a newspaper. Chances are also slim that they have used a file referencing system or encyclopaedia inside a library or searched for content in an alphabetical list. Did they ever have a phone book in their hands to search for a number, or go to a video shop to rent a movie? They have most probably never bought a CD or even a DVD, or had a cell phone with a numeric keypad. Hussin (2018:93) elaborates more on Generation Z, arguing that they are fully engaged and committed to learning. They love to get challenges and to engage in group discussions in a 'highly interactive learning environment'. Learning does not have any boundaries for them; they love to learn wherever they are and whatever the

10. As Elisa Guerra (2018:31) puts it bluntly, schools are currently still struggling to understand the level of digitisation that was introduced by the 3IR. Post-school education is currently on the same trajectory. According to Veldsman (2019), these academic institutions are still functioning on the level of a Middle-Age university: '[A] pursuit of the holy grail of siloed, disciplinary specialisation aimed at knowledge for the sake of knowledge'.

time of day, because they have all the information they need on their devices. For them, a physical classroom situation does not have priority.

However, in Africa, millions of the adolescents belonging to the aforementioned generations have not yet experienced the privilege of having reliable electricity or adequate sanitation, not to mention a good education or an electronic device in their hands with the most recent technology on it (Hawkes 2018:4). Because of high data costs resulting in low Internet penetration (during 2017, around 40% in Africa), these generations are, to a great extent, excluded from the international digital world (cf. Hawkes 2018:4). This reduces the difference between millennials and Generation Z in Africa greatly. These two groups are called 'Afrillennials', with their own culture and traditions, like always being indebted to their families and communities. Added to that, they are very committed to transformation and are keen on cultural diversity (Hawkes 2018:4). Notwithstanding these bleak facts, there is a light at the end of the tunnel, as many Afrillennials have globally already shown massive innovation, especially young entrepreneurs (cf. Hawkes 2018:4). Oswald Jumira (Gilbert 2018), the Group Head of Innovation Partnerships for Liquid Telecom, describes Generation Z as 'impatient and dynamic', adapting very easily to change. They are keener to teach themselves, in whatever way, than to be taught by an educator.

In South Africa, Generation Z is also called the Born Free generation (Hawkes 2018:5). Compared to the previous generations, this generation has more equal opportunities, and they are often more educated than anyone else in their families or households. The societies in which they grew up were considered to be full of uncertainty and change. This had an effect on their ways of doing things, as well as their attitudes and priorities. Their major characteristics are, according to Rachel Thompson, 'fluidity and disruption' (Thompson 2017). Everything is fluid for them, which gives them the space to invent things for themselves, to create their own rules as well as the world in which they want to live. They also have strong personalities and a drive to be successful and to cocreate (Hawkes 2018:5; cf. Thompson 2017). They like to challenge the *status quo* and want to be heard (Hawkes 2018:5). They therefore need an environment where space is given to them to execute their autonomy and to innovate (Thompson 2017). Generation Z has lost faith in PSE, as they are overwhelmed by information on the Internet and social media, with Instagram topping the list, followed by Snapchat, Facebook and Twitter (cf. Hawkes 2018:4), complemented by instant info and quick solutions. However, their attention span is lower than their predecessors.

These characteristics of the students will have to be thoroughly addressed within the South African educational context, if we want to succeed in educating this generation in the new era.

## The Fourth Industrial Revolution and Education 4

In order to implement PSE in this new revolution, one has to take note of Education 4. As it is a fact that people differ from each other on almost every level of their existence, including their learning processes, students should not all be treated in the same way with the expectation that all of them will react similarly. Each student has their own way of learning, absorbs information differently and has their own points of interest (cf. Intelitek 2018). The 4IR has therefore posed the need for Education 4 to be implemented. Thus, Education 4 is a response to the requirements of the 4IR in order to align humans and technology to develop new possibilities (Hussin 2018:92). According to Anealka Hussin (2018; cf. also Doucet 2018:58), Education 4 consists of nine 'trends':

1. Learning takes place anytime and anywhere.
2. Learning is personalised to every individual student.
3. Students decide in which way they want to learn, using the learning tools and techniques of their choice.
4. Learning is more project-based, requiring students to complete short-term projects. They can do it individually or in groups.
5. Hands-on learning[11] is very important for students to acquire field experience through projects and other practical work.
6. Students do data interpretation and compile reports on given sets of data acquired from their field work.
7. Each student is assessed differently, mostly by submitting portfolios in whatever way.
8. Students who have successfully completed a specific subject on a certain level are requested to form part of the composition of the curriculum of that subject for the new year.
9. Students are studying independently (adapting their 'natural' human procrastination to the new circumstances), using the educator only as a mentor, guide or facilitator when needed (pp. 92–93).

These trends will be implemented in this article, as it becomes clear that the major learning responsibilities are not in the hands of the educators anymore, but with the students. This is why the eighth trend is so important; but more than that, this is why the educator must exactly know who the students are that they are working with (as already discussed).

## Post-school education within the Fourth Industrial Revolution

Brown-Martin (2017:8) frankly states that the formal education of the 21st century is lacking the capacity and capability to meet the challenges of the 4IR. Brown (2013:14) agrees, stating that although we are experiencing the influx of the 4IR, our education systems are still intended to serve the S-curve society. During the last two or three centuries, including the present year(s), the main concern of education

11. As early as the 4th century BCE, Aristotle (*Nicomachean Ethics* 2.1) said, '[w]hat we have to learn to do we learn by doing' (Thomson & Tredennick 1976:91).

mostly was and is to transfer 'expert-generated knowledge' to students (Brown 2013:14).

The core mission of higher education – to educate students and deliver highly competent professionals to the corporate world (Papert 1980; Veldsman 2019) – will never change, notwithstanding the era (IR) in which it is presented. During the 3IR (and before that), the focus was more on the educator. This is called 'instructionism' (cf. Papert 1980), where the 'educational practices … are teacher-focused, skill-based, product-oriented, non-interactive, and highly prescribed' (Johnson 2005:2; cf. Brown-Martin 2017:8; Sawyer 2008:2). With the dawn of the 4IR, it has shifted (or should shift) to student-centred teaching and learning – a practice that has already been *discussed* for quite a while (as far back as 1964!) but is still not really implemented widely, specifically not in South Africa (cf. Brown, Collins & Duguid 1989:32–42; Dewey 2013:33–40; Piaget 1964:176–186; Vygotsky 1978). The principal task is to equip students with the most recent and best information and knowledge, in order to develop societies that are able to deliver service (Xing & Marwala 2017:10). According to Valerie Hannon (2017:42–54), the purpose of education in schools – and also in PSE – is all about a way to learn how to thrive in a world that is constantly transforming. To achieve this, PSE systems should become innovative and look for ways to employ 'all' the knowledge on the Internet by utilising devices like smartphones and tablets, accompanied by social media, in service of education. What is needed is a 'disruptive new technology' (Xing & Marwala 2017:15) to be used on and with these devices. Notwithstanding the high production of affordable cell phones and other mobile devices and the good connectivity to Internet broadband readily at hand, it looks as if this 'disruptive new technology' has not yet been identified by most educators because of a myriad of (comfort zone) reasons (Xing & Marwala 2017:15).[12]

The 4IR is depicted as an age in which the industrial economy is rapidly changing into a knowledge economy (Sawyer 2008:2), where knowledge and information are produced and distributed (Drucker 1993:182). Lifelong learning is one of the essential characteristics of the 4IR environment (Xing et al. 2018:178) because of the rapid changes taking place in almost every profession. Bryan Penprase explicates this fact: In future, no university or college – including students and faculty – will ever conclude their education. Instead, lifelong learning will take place where 'students' constantly engage with their peers and educators, as well as 'outside experts', in order to keep in line with the requirements of the time (Penprase 2018:224). This requires that the educator be allowed both 'time-to-adoption' (getting used to technology) and 'time-to-adaption' (involving elements related to humans) (Xing et al. 2018:178).

12.One such technology that has already been implemented abroad with many success narratives is gaming (specifically serious gaming and gamification) – something that the higher education institutions in South Africa have not grasped as yet. Brown (2013:18) suggests that, apart from being a *Homo sapiens* (a human knower) and a *Homo faber* (a human maker), a student is also a *Homo ludens* (a human player). For more information on gamification, read Oliver (2017), and for applying a serious game to Theology, read Oliver (2019).

What should PSE then look like nowadays? In light of Education 4 (discussed above) and as a background to the main discussion on a new proposed model for educating Theology (being discussed below), the ADAPTIVE proposal of Xing et al. (2018) – with additions by the author of this article – is given:

- **A:** *Accessibility*: Educators must make it possible for students to study anytime and anywhere, being able to access their study material on their portable devices, in this way becoming cyber citizens (Xing et al. 2018:181), and only occasionally attending formal (virtual) classes.
- **D:** *Digital literacy*: The most current technology can only be implemented to its full extent if the educator is fully equipped to understand and use it. Superficial knowledge is insufficient for the educator to fully enter cyberspace. Almost every feature of contemporary teaching and learning should be involved in new technologies (Xing et al. 2018:182). It is therefore inevitable for the educator to be fully knowledgeable of all the new technologies and to transfer that knowledge to the students so that they can utilise it maximally. A specific application (app), containing all the necessary information for the students, being regularly updated by the educator, would be of great use.
- **A:** *Acceleration*: Quicker learning and training are imperative in today's 'hypercompetitive environment' (Xing et al. 2018:183; cf. Brown 2013:1–21), creating alternative educational approaches. These approaches, when positively applied, will create a more learner-friendly environment, drawing more students to a specific subject. Yearlong or semester (partly open [discussed later]) curricula, being presented in online study guides, should be supplemented by short learning programmes (SLPs), also presented online, discussing parts of the old curriculum in an innovative way. The educator, previously a sage who enlightened their audience (Xing et al. 2018:184), should change into a guide, a mentor, a facilitator. The focus must shift from the educator to student-centredness.
- **P:** *Pan-regionalisation*: This refers to decolonising the curricula and a harmonising in African higher education between all the countries (regions) in Africa. This is an enormous task and can only be successfully accomplished if people from different races and countries work together on the topics.
- **T:** *Transformation*: A change in the academic culture of an institution is very important in order to adapt to the 4IR. The old ways of thinking should be replaced by new and innovative ways of operating the technology at hand. This will only start to happen if the educator takes a firm stance in this regard.
- **I:** *Inclusiveness*: The goal of the new technologies is to bring people together on every possible platform (see the discussion on groups) and to bring human and machine closer to each other. Educators will have to collaborate more with each other, on the national and international levels, for the sake of the students (cf. Veldsman 2019).
- **V:** *Vision*(*ary*): Educators need a new vision to reconsider their teaching and learning environment in order to

establish a better and more innovative learning experience for the students.
- **E:** *Engagement*: Engagement with different stakeholders should add to a better environment for the students, as the stakeholders partake in, contribute to and assist with the development of new technologies (p. 179ff).

The South African higher education system, starting with the educator, should become the critical driver of the 4IR to benefit from its advantages and results in a positive way.

### How can our educators prepare themselves for the Fourth Industrial Revolution?

Richard Henry Dana, Jr., who lived in the 19th century, uttered this enormous truth: 'He who dares to teach must never cease to learn' (Goodreads 2019). Theo Veldsman (2019) from the University of Johannesburg 'translates' these words into the 21st century, here focused on the educator: 'If individuals … do not learn and re-invent themselves faster than the rate of change, they will not have a future, because they have become obsolete'. Added to the previous heading, which refers much to the task of the educator, it becomes clear that if an educator really wants to be prepared for the 4IR, they must first know their students and the environment within which their students live and operate (discussed above). This brings the educator closer to the core purpose and mechanics of higher education for their 21st-century students.

The 4IR focuses much on adaptability as well as 'self-directed learning and thinking' (Penprase 2018:220). This is complemented by the development of critical reasoning on the side of the student. By reading a piece of content, the student must make up their mind on quite a few things: (1) 'Can I believe this?' (2) 'Do I need to remember this?' and (3) 'How does this fit into and contribute to my framework of knowledge?' This is in line with the fact that the world is moving away from stable contexts to fluid contexts in order to reshape students' conceptual lenses on a constant basis (Brown 2013:20), constantly rethinking the way in which they see things. In order to educate students significantly and effectively, educators need to 'talk their language'. The implication is that the educators should present their learning material in the best possible way and with the best possible means or equipment available, in line with the era in which they *currently* live. Educators should therefore utilise more adaptable learning programmes, supplying their students with a better learning experience, inculcating an attitude of lifelong learning to the students. To reach this goal, educators will have to 'radically improve [their] educational services' to the students (Xing & Marwala 2017:12). They can start by presenting a course and specific assessments on the students' portable devices and not with study guides and tutorial letters distributed in the classroom – go paperless (Timmers 2018:109). Students should be guided to authentic learning, which is, among others, 'project-based, challenge-driven and competency-involved' learning (Xing et al. 2018:195). The pedagogical shift should take place from parrot learning (memorising as much as possible) to active learning: In active learning the students are not passive passengers in the study process anymore by just absorbing the given knowledge, but become active participants or contributors in the student-centred approach.

## A proposed model for educating theology

Being part of the higher education system, our Theology departments are mostly designed around an inside-out ('we-know-best'; Veldsman 2019) 'educator first' model. However, what is proposed here is an outside-in ('high performance, high engagement, high responsibility organisation'; Veldsman 2019) model that is student-centred. According to Annette Franz (2015), the difference between these two models is that, with inside-out thinking, one focuses on processes, systems and tools, as well as the products being designed and employed, which are based on both internal thinking and intuition. The educators make decisions based on what they think are best for their business – academia and faculty – and not what is best for their customers – their students. Unfortunately this is what they *think* is best for their customers. With the outside-in model, the educator looks at the business from the perspective of the customer, and then designs processes, systems, tools and products to help them decide what is best for their customers – the students – and what they need (Franz 2015). In Theology, this is beyond imperative, with two groups of 'customers' to satisfy: our first customers are our students, who will become our representatives in specific congregations/parishes (from here on only 'congregation[s]'), whilst our second and most important customers are the members of our congregations themselves. When designing and developing a curriculum, the educator will therefore have to think 'customer'-centred – having the students and congregations in mind – all within the setting of the 4IR. Only with a well-developed plan can the desired outcomes be reached: Conducting higher education in this way will warrant that graduated students enter a world that they can help to shape, having acquired the necessary wisdom and skills. These students will build a future society in which everybody would like to live (Penprase 2018:220).

In this way our Theology students should be equipped for the future and for becoming lifelong learners. To achieve this goal, the educator should be well informed about current educational theories and teaching practices and also get the services of a colleague or colleagues in the departments of Education and Information Technology to assist in the process. The reason for this is that the current students need the correct intellectual capital to face the challenges of the 4IR. Interdisciplinarity, therefore, becomes more and more important.

The Big Shift has moved the whole world into a state of constant flow, where knowledge is not fixed anymore – as purported by our standard pedagogies – but tacit 'because there is no time for it to be distilled, encoded and

communicated before the next shift happens' (Brown 2013:14). The focus should therefore move to scalable learning. Scalable learning is a 'notion of total embodied cognition and deep participation in a constant flow of knowledge' (Brown 2013:14; cf. Weinberger 2012:151). Because since the last part of the previous century knowledge has moved onto networks, topics have become boundless, and people are very reluctant to agree on anything (Brown 2013:15). These networks should unify all the resources that the students are utilising – be it inside or outside a university. The networks should also find themselves in blogs, on Facebook, Instagram, Twitter, specific forums and so on. With scalable learning, students do not learn on their own anymore, but as active participants of a group,[13] in order to learn much faster than ever before (Rustici 2018). By means of groups, students become part of a 'systematic process of discovering, digesting and disseminating new knowledge' (Rustici 2018). This forms part of the academagogical approach being discussed below.

The implication of the Cartesian way of education ('I think, therefore I am')[14] was that knowledge is transferred from textbooks or authorities to the learner or student. In the past, this gave knowledge a long 'shelf life' (Brown 2013:15), whilst this is not the case anymore. This is also *contra* deep learning, which takes place by means of interaction and participation (Brown 2013:15). Brown (2013:15) therefore adjusts Descartes' dictum to a more social view: 'We participate, therefore we are'. In this view, study groups take very high preference. The Cartesian way of teaching explicit knowledge must make way for the acquisition of tacit knowledge; the epistemology of individual learning must make way for social participation (cf. Brown 2013:15–16). Students should not be taught dispositions, but they should be taught to develop their own dispositions (Brown 2013:18). Here, the Internet and social media come in very handy, with applications like Google Hangouts, Twitter, Instagram, Facebook, YouTube and so on. By just linking to these sites, even without any active participation, a student can pick up much information and knowledge that they would never otherwise have had. This demands that the student become what Brown (2013:18) calls an *entrepreneurial learner*. As an entrepreneurial learner the student is in a constant process of 'seeking, probing and uncovering' knowledge (Brown 2013:18) by using social network technologies. '[R]eciprocity and the building of social capital' (Brown 2013:18) is therefore of utmost importance, as '[i]nnovation thrives at the crossroads where ideas, perspectives and information from different fields, places and people collide in the chaos of creativity' (Brown 2013:19).

13.Read more about the power of groups (Sawyer 2007). This form of group work is unlike the group work being done in schools today, where only one learner in the group does the work, and the rest just get the marks. In the groups mentioned by Brown, each member is an individual with a personal task and commitment, constantly adding value to the group (cf. Brown 2013:15ff). Penprase (2018:225) adds that the 4IR will put a very high premium on both the intellectual capital and capacity of collective thought. Timmers (2018:117) calls it 'collaborative learning'.

14.The Cartesian way of thinking and learning that was adopted in education is, '*Cogito, ergo sum*' (from the original French, *je pense*, *donc je suis*, 'I think, therefore I am' – or actually, 'I am thinking, therefore I exist') (Descartes 2006:lv).

When a student studies Theology, it is of great importance to also take subjects that will enable them to understand the technology presented by the 4IR (as discussed above). A multi-, inter- and transdisciplinary approach (MIT) will therefore have to be applied because a successful member of society, including a pastor and theologian, should have a good knowledge of 'numeracy, literacy and an understanding of how the world operates'. They also need a digital literacy – a good understanding of the basics of AI (Butler-Adam 2018:1) and knowledge (Williamson 2017):

> [*A*]bout privacy and data protection, how news circulates, understanding cyberattacks, bots and hacking, how algorithms and automation are changing the future of work, and that there are programmers, business plans, political agendas and interest groups behind this. (n.p.)

This will help them to put into effect the new technology, manage it and work with it, and also with one another and with their congregations (Butler-Adam 2018:1). The curricula should also contain elements of how to make ethical and moral decisions – something that will 'always' be beyond the competence of AI (Schwab 2016:98–99).

The teaching practices being applied in curriculum development should not be one size fits all, but rather a more open approach utilising academagogy (or omnigogy). Academagogy, based in social constructivism, is 'a "meshed" model of pedagogy,[15] andragogy, and heutagogy and allows for flexibility in teaching by using a variety of methods' (McAuliffe & Winter 2014:167). Bruce Mackh (2015:124) agrees, defining academagogy (omnigogy) as the fluid and flexible actions of instructional systems. He also adds digigogy, which is distance or online learning, and which will more and more become a reality, as fully residential institutions of higher education will probably go out of fashion.

Academagogy considers the variety of characteristics being displayed by students and applies specific models of teaching that will work for each of them (cf. Winter et al. 2009:993). This is largely based on social constructivism, which focuses on group learning (cf. Rustici 2018 above) that is shaped by its own context, by conversations between groups and by collaboration (McAuliffe & Winter 2014:167) where each individual of the group adds to the knowledge construction and economy of the group. Karen Swan (2005:5) agrees that learning is constituted as a social activity and that meaning can only really be constructed with the aid of communication; moreover, collaborative activities are essential, as well as interactions with other peer groups. Groups functioning this way are able to respond and deliver the facts much faster and in a more intelligent way, and keep doing it on a 'continuous, sustainable basis' in any place and at any time (Veldsman 2019).

15.Pedagogy can be 'defined as teacher-directed instruction, transforming into student-centred instruction', while andragogy is 'teacher-facilitated instruction, which has transformed into learner-centred instruction', and heutagogy is 'self-directed learning' (Mackh 2015:124).

With academagogy in mind, the educator should have a very balanced mix of education presented inside and outside the classroom. The term 'classroom' can refer to the old concept of a gathering place at the university, or it can be a virtual classroom where everybody is connected with the educator and each other through their devices. Some basic information needs to be given in a direct way to the students by the educator at the beginning of the year, and this can be done in a few formal classes, where the students can make this information their own. However, how will the educator present the classes in an innovative way? Instead of just presenting the knowledge in person and writing the basic ideas on the blackboard in the traditional classroom, the educator can provide the students with podcasts or YouTube videos containing all the basic information. This could also be supplemented by a serious game and various other presentations or small chunks of information on social media like Twitter. Inside the (virtual) classroom, the educator and students can be connected via SMART Board, a digital whiteboard (Buthelezi 2017) on which the educator can do the same as on the old blackboard. On SMART Board, however, the students are allowed to add comments from their own devices, which can be saved as a file when the 'board' is full. This can be augmented with e-chat rooms as well as online teaching, mentoring and tutoring right through the span of each course (Veldsman 2019).

The curriculum should be a partly open one.[16] Firstly, the basic information should be mastered by means of, for example, quizzes in the class environment or projects done by individuals and groups (this is the closed part, where the educator decides the content). Then the time has come to stop formal education and prescribed content and supply the students with pointers emanating from the basic information. They should then do further research on the pointers that they have chosen, combined with practical work, where they will have to visit congregations (as individuals and groups) to practise the information obtained from their own research.[17] It is in this (research and practical) part of the curriculum that deep learning really takes place, resulting in deep knowledge.[18] Sawyer (2008:3) elaborates that students are learning deeper knowledge whilst being engaged in activities similar to the activities that professionals experience in their everyday work. Here, the educator must make sure that the activities – both on the research and practical levels – are really interesting for the students, as Brown-Martin (2017:11) concurs that students do not mind doing difficult activities, as long as these activities are interesting and in line with their passions. Individuals and groups must report back and do presentations on what they have discovered for themselves about the theme of a specific subject. In this way the students will become expert learners who have *learned how to learn* (Brown-Martin 2017:11). Mackh (2015:124) states that engaged learning allows students to study and do research 'on a more emotional or visceral level' than listening to lectures, reading textbook and doing research papers. Activities like these stimulate different parts of one's brain than the activities of listening and reading, therefore engaging the student on a deeper level.

Although the content of Theology may not be much affected by the 4IR, as most of the 'facts' will stay the same, the educators will have to focus in their specific subjects on the congregation, specifically on how the faith community will accept the communication of God's word within the 4IR. New ways of conveying the good news will have to be invented, discussed and practised in order to find an acceptable way for both preachers and especially the church members. This is imperative, specifically in this era when religion is also on the brink of the next revolution, called the 'big emergence' by Phyllis Tickle (2008, 2012).

Table 1 can be regarded as a summary of the proposed model.

## Conclusion

Xing and Marwala (2017) have the following expectations of the coming education environment:

> [*As*] the business of higher education remains unchanged since the times of Aristotle, today students still assemble at a scheduled time and venue to listen to the wisdom of scholars. Given the fourth industrial revolution, a new form of a university is emerging that does teaching, research and service in a different manner. This university is interdisciplinary, has virtual classrooms and laboratories, virtual libraries and virtual teachers. It does, however, not degrade educational experience but augments it. (p. 15)

These words call upon the Theology educators in South Africa to leave their comfort zones, where they did not 'waste' too much effort on education, as they focused more on writing books and articles and attending conferences abroad – therefore in fact being researchers and not educators. For educators in Theology, both the 4IR (as well as Education 4) and the 'big emergence' are wake-up calls to leave these old ways behind.

The model proposed here, containing elements of the 4IR combined with modern educational tools, should motivate educators in Theology to stand up and consider education from the viewpoint of their 'customers' – the students and their church members. It should push

16.A fully open curriculum constitutes a programme that is designed to enable students to compile their own curriculum/programme under the watchful eyes of their educator. This gives students the opportunity to do a course in a way that is far more interesting to them and that will connect more to their background and interest than the normal curriculum would allow them to (Wake Forest University n.d.). However, South Africa is not yet on that level of student performance. This is why a partly open curriculum is proposed.

17.This is a sort of constructivist approach, defined by Genevieve Johnson (2005:2) as follows: 'Constructivism refers to educational practices that are student-focused, meaning-based, process-oriented, interactive, and responsive to student interest'.

18.It is also in this part of the curriculum that educators can do their research and write articles or books.

**TABLE1:** Proposed Model for Educating Theology.

| Structure of proposed model | | |
|---|---|---|
| **Overarching: 4IR; Education 4** | | |
| **Educator** | **Students** | **Focus** |
| **Introduction to course** | | |
| • A few formal classes in the (virtual) classroom.<br>• Basics and pointers in a concise online study guide. | • Make the basics their own in whatever way suitable for them.<br>• Decide on what parts of the curriculum they want to explore further. | • Student-centredness<br>• Outside-in approach<br>• Interdisciplinary<br>• Academagogy<br>• (Partly) open curriculum |
| **The main course** | | |
| • Readily available to students in person and on (social) media.<br>• Time to do own research. | • Choose the pointers they want to do research on.<br>• Choose their own groups, based on the pointers they have chosen.<br>• Do extended research on their pointers.<br>• Visit congregations for practical work – as individuals and as groups.<br>• Enrich each other in groups on a continuous basis. | • Critical thinking<br>• Critical reasoning<br>• Deep knowledge<br>• Scalable learning<br>• Engaged learning<br>• Authentic learning<br>• Project-based, challenge-driven and competency-involved learning<br>• Entrepreneurial learners |
| **Transformative (continuous) assessment** | | |
| • Open channel between educator and student(s).<br>• Constant feedforward and feedback. | • Feedback on the week's work, done in whatever form.<br>• Final portfolio. | • Lifelong learning<br>• Fluidity and disruption |

educators to become part of the 4IR and of academagogy and to make a vital contribution to shape a new generation of well-rounded[19] theologians/preachers, who will be far better equipped to proclaim and preach the word of God to our church members and also to become lifelong learners.

In 1970, Alvin Toffler made this bold and famous statement: 'The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn' (Toffler 1970:414). Veldsman (2019) puts it even stronger when he argues that facing the 4IR has raised the *necessity* for students to engage in unceasing deep relearning, complemented by learning and unlearning. Being applied to the educator of today, the last remark goes to the educator: Consider whether you are really preparing your students for the future that *they* face? If not, you have work to do …

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## Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.


19.A well-rounded student is someone who is not only equipped with the know-how and specialist capabilities to do a job, but also has the right mindset, special personal characteristics and values, supplemented by the right values and guided by a highly moral conscience (cf. Veldsman 2019).


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