

ENTREPRENEURIAL INTELLIGENCE: EXPANDING SCHWAB'S FOUR-TYPE INTELLIGENCE PROPOSITION TO MEANINGFULLY ADDRESS THE CHALLENGES OF THE FOURTH INDUSTRIAL REVOLUTION

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ABSTRACT

Humanity finds itself at the dawn of a revolution considered to be the Fourth Industrial Revolution (4IR). The introduction of new business models, the disruption of incumbents and the reshaping of production, consumption, transportation and delivery systems are all evidence of the profound changes taking place across all industries. The velocity, breadth, depth, and systems impact of the changes are unlike previously experienced in history. From the premise of the evident challenges and opportunities inherent to 4IR, Schwab (2016) propagates a 4-type intelligence proposition (contextual-, emotional-, inspired-, and physical intelligence) to be nurtured and applied so as to adapt, shape and harness the potential of disruption. Applying critical interpretive synthesis, this position paper argues the lack of a disposition type of intelligence in Schwab's proposition and proposes its expansion to include entrepreneurial intelligence, thereby increasing the potential of realisation of real impact and value creating solutions.

INTRODUCTION

In terms to managing resources in restricted times, and observing contemporary management through the lens of the profound changes taking place across all industries, evident by the advent of new business models, the disruption of established sectors and the reshaping of production, consumption, transportation and delivery systems (Schwab, 2016), numerous challenges become apparent on a macro-, mezzo, and micro level.

Lorenz, Rübmann, Strack, Lueth, and Bolle (2015:3) posit that a workforce transformation is on the horizon as manufacturing experiences a fourth wave of technological advancement: the rise of a new digital industrial technologies that are collectively known as Industry 4.0. Schwab (2016) observes that "in its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before," and that humankind finds itself at the beginning of a revolution he considers to be the Fourth Industrial Revolution (To be referred to as 4IR henceforth).

The reasons supporting the conviction that a fourth and distinct revolution is underway, and not merely a continuance of the third industrial revolution, is because of its velocity (4IR is evolving at an exponential rather than linear rate), breadth and depth (4IR is not only changing the "what" and the "how" of doing things but also "who" we are), and systems impact (4IR sees the advent of transformation of entire systems, across (and within) countries, companies, industries and society as a whole). Schwab (2016) furthers that although it is not clear how it will unfold, it is of necessity that the "response to it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academia and civil society."

Most technologies that will have a big impact on the world in five or ten years from now are already in limited use, while technologies that will reshape the world in less than fifteen years probably exist as laboratory prototypes (Bostrom, 2014:4). Consider the possibilities of mobile devices connecting billions of people driving unparalleled processing power, storage capabilities and access to knowledge. In addition, the overwhelming convergence of emergent technology such as, among others, artificial intelligence (AI), robotics, the internet of things (IoT), autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage and quantum computing. Although many are still in early stages of development, they are already introducing an inflection point as they build on and amplify each other in a synthesis of technologies across the physical, digital and biological worlds (Schwab, 2016).

In light of the evident challenges and opportunities inherent to 4IR, Schwab (2016) calls for the mobilisation of the collective wisdom of people's minds, hearts and souls to adapt, shape and harness the potential of disruption by nurturing and applying contextual-, emotional-, inspired-, and physical intelligence.

Lord, Dinh and Hoffman (2015:264) contest that the future offers many potentialities, which they define as "alternative states and possible outcomes that could occur but have not yet occurred because, to be actualised, they require the enactment of individual, social, and environmental events that are often serendipitous."

We are not captives to a dualistic choice between "accept technology and live with it" or "reject technology and live without it." Instead, 4IR is rather an opportunity to reflect on who we are and how we view the world. Instead of a reactive approach, we should be proactive and seek ways to harness the advancements in technology, and Schwab's 4-type intelligence proposition (contextual, emotional, inspired, and physical) could serve as significant individual and collective catalyst to facilitate self-examination and evaluation of the underlying social models that technologies embody and enable. This could potentially contribute to shaping 4IR in ways that will benefit all.

This position paper sets out to interrogate Schwab's 4-type intelligence proposition and to propose the addition of entrepreneurial intelligence.

PROBLEM INVESTIGATED

Technological advancement is increasingly transforming the way we work, live, communicate, travel and socialise, which, at the rate it is going, could fundamentally alter life, as we know it. So profound could it be that Kurzweill (2005:22) predicts a future period during which the pace of technological change will be so rapid, its impact so deep, that human life will be irreversibly transformed. Humankind finds itself in an age of unprecedented digital technological progress, which will continue to improve, bringing about not only beneficial transformations, but also profound challenges, likely to bring economic disruption. It is very plausible that as computers get more powerful, companies will have less need for some categories of employees (Brynjolfsson and McAfee, 2014:9-11), thereby accentuating the challenges of managing resources in restricted times. Increasingly, machine algorithms are applied in intellectual tasks that were once the exclusive domain of humans, and both ends of the occupational spectrum (high- and low-end) are likely to be impacted as software automation and machine learning advances (Ford, 2013:37-38).

This dramatic increase in development of technology and its impact on life in its broadest terms can thus not be negated. Albert Einstein said, "Those who have the privilege to know have the duty to act, and in that action are the seeds of new knowledge" (n.d.). It is subsequently argued that contemporary research and literature on technological advancement provides the "privilege to know." The "duty to act" is embodied in Schwab's (2016) call for the mobilisation of the collective wisdom of people's minds, hearts

and souls (public and private sectors, academia and civil society) to adapt, shape and harness the potential of disruption by nurturing and applying contextual-, emotional-, inspired-, and physical intelligence.

However, observed through the lens of 4IR, Schwab's 4-type intelligence proposition appears to lack 'disposition' (natural or acquired tendency, inclination, or habit), specifically in relation to the actual realisation (making real) of solutions. Disposition as a 'type' of intelligence implies one's habitual inclination, and in terms of 4IR could mean how one habitually recognises opportunities and acts to create value. This position paper therefore sets out to propose expanding Schwab's 4-type intelligence proposition to include entrepreneurial intelligence from a 'disposition' paradigm.

RESEARCH OBJECTIVES

Against the aforementioned backdrop and the pursuit of finding effective ways to managing resources in restricted times, the objectives of this paper are threefold: Firstly, to interrogate and critique Schwab's 4-type intelligence proposition; secondly to propose the addition of a disposition-type of intelligence to Schwab's proposition, with specific reference to entrepreneurial intelligence; and thirdly, to create greater awareness of 4IR amongst scholars and practitioners.

LITERATURE REVIEW

The rapid technological advancement that is increasingly transforming the way we work, live, and communicate, fundamentally altering our lives day by day appears to starkly contrast contemporary management practice (planning, organising, leading and control). Thus, managing resources (money, markets, machines, methods, material, man and information) in order to achieve organisational goals effectively and efficiently in the wake of technology's exponential advancement is of particular importance to scholars and practitioners. This section's aim is therefore to review the state of technological advancements, how it relates to management, and Schwab's propositions to shape a preferred future.

Bostrom (2014:255) states that we find ourselves in an era of strategic complexity, characterised by uncertainty. Albeit that many considerations have been determined, their details and interrelationships remain unclear and dubious, and there might be other factors we have not even considered yet. Brynjolfsson and McAfee (2014:9-11) refer to three broad conclusions, namely (1) finding ourselves in a time of profound digital technological progress, (2) the potential benefits to be brought about by digital technology, and (3) the potential thorny challenges brought about by digitisation; emphasising that it should not be surprising, as "even the most beneficial developments have unpleasant consequences that must be managed" (Brynjolfsson and McAfee (2014:11).

The World Economic Forum (2015:5) identified six software and services megatrends which are shaping society, namely (1) people and the internet, (2) computing, communications and storage everywhere, (3) the Internet of Things, (4) artificial intelligence (AI) and big data, (5) the sharing economy and distributed trust, and (6) the digitisation of matter.

In terms of the world of work, Lorenz *et al* (2015:5) lists the top ten effects of industry 4.0 on the workforce as being (1) big-data driven quality control, (2) robot-assisted production, (3) self-driving logistic vehicles, (4) production line simulation, (5) smart supply network, (6) predictive maintenance, (7) machines as a service, (8) self-organising production, (9) additive manufacturing of complex parts, and (10) augmented work, maintenance, and service.

Although there's never been a better time to be a worker with special skills or the right education Brynjolfsson and McAfee (2014:11) contest that the technological progress could leave many people behind, because computers, robots, and other digital technologies are acquiring ordinary skills and abilities at an extraordinary rate.

A more optimistic argument by Stewart, De and Cole (2015:1) highlight how technology has led to overall job creation in the past. The direct effects are that technology substitutes labour, raising productivity and lowering prices, and sectors which are the source of technological innovation expand rapidly, demanding increased labour. The indirect effects are that technology complements labour, leading to improved outcomes in sectors which subsequently expand and generate new demand for labour. In addition lower costs of production and prices enable consumers to shift spending to more discretionary goods and services, generating new demand for labour (Stewart *et al.*, 2015:1)

Although senior managers are far from obsolete, machine learning is progressing at a rapid pace, and executives need to become adept in creating innovative new organisational forms needed to manage in an age of machine intelligence; accentuating creative abilities, leadership skills, and strategic thinking (McAfee, Goldbloom, Brynjolfsson and Howard, 2014).

However, how should management position itself for a future of exponential automation across the various sectors of the economy? How should management practice evolve to navigate the anticipated disruptions to organisations and associated impact on the social fabric? Chui, Manyika, and Miremadi (2015) posit that the organisational and leadership implications are profound and that, from leaders to front line managers, will need to redefine jobs and processes to ensure organisational longevity.

It is, however, evident that predictions about the future development of technology, such as artificial intelligence, are as self-assured as they are diverse, and whether value can be extracted from the breadth and diversity of predictions is questioned (Armstrong, Sotala and ÓhÉigeartaigh, 2014:317). The research of Armstrong *et al.* (2014) highlights the problems with expert judgement, in theory and in practice, and that timeline predictions prove to be mostly unreliable, generally containing little useful information.

Nevertheless, the dramatic increase in development of technology and its impact on management practice in the future cannot be negated, but coupled to that, the way in which knowledge is being constructed in relation thereto also proves to be lacking scientific rigour and subsequent management practice implications.

Schwab's (2016) argues that the challenges of 4IR can only be meaningfully addressed if the collective wisdom of people's minds, hearts and souls are mobilised. To do so, Schwab (2016) contests the need to adapt, shape and harness the potential of disruption by nurturing and applying four different types of intelligence, namely (*ibid*):

- contextual (the mind) – how we understand and apply our knowledge;
- emotional (the heart) – how we process and integrate our thoughts and feelings and relate to ourselves and to one another;
- inspired (the soul) – how we use a sense of individual and shared purpose, trust, and other virtues to effect change and act towards the common good; and
- physical (the body) – how we cultivate and maintain our personal health and well-being and that of those around us to be in a position to apply the energy required for both individual and systems transformation.

But what is intelligence? Legg and Hutter (2007) compiled a collection of 71 definitions on intelligence (18 collective definitions, 35 psychologist definitions, and 18 AI researcher definitions). One of the earliest definition citations by Legg and Hutter (2007:20) is that of Binet and Simon (1905) that states “It seems to us that in intelligence there is a fundamental faculty, the alteration or the lack of which, is of the utmost importance for practical life. This faculty is judgement, otherwise called good sense, practical sense, initiative, the faculty of adapting one’s self to circumstances.”

Piaget (1963) in Legg and Hutter (2007:22) states that “intelligence is assimilation to the extent that it incorporates all the given data of experience within its framework. There can be no doubt either, that mental life is also accommodation to the environment. Assimilation can never be pure because by incorporating new elements into its earlier schemata the intelligence constantly modifies the latter in order to adjust them to new elements.”

For purposes of this study Gottfredson (1997) definition in Legg and Hutter’s (2007:19) is adopted, i.e. “Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience.”

The next four sections explore Schwab’s four types of intelligence, followed by a discussion on entrepreneurial intelligence with the intent to provide understanding and operationalisation of the various intelligence types.

Contextual intelligence (CI)

From a perspective of a contextual sub-theory of intelligence, Sternberg (1985:45) views intelligence as “mental activity directed toward purposive adaptation to, and selection and shaping of, real-world environments relevant to one’s life.” The situation in which purposeful action is taken is thus emphasised, Brown, Gould and Foster (2005:51) posit that contextual intelligence (CI) has to do with practical know-how that transcends what is formally described or taught directly, requiring understanding of the context in which one functions; not only knowing what to do, but also knowing how to get it done.

Similarly, Kutz (2008:23) defines contextual intelligence as “the ability to quickly and intuitively recognise and diagnose the dynamic contextual variables inherent in an event or circumstance and results in intentional adjustment of behaviour in order to exert appropriate influence in that context.” Context has to do with the nature of relations and interdependencies among and between agents (e.g., people, ideas, values, experiences, cultures, etc.), political alliances, organisations, religious alignment, social contexts, and private context. Therefore, contextual intelligence refers to the awareness of these interactions between agents that fundamentally inform behaviour in a social complex environment (Kutz and Bamford-Wade, 2013:67)

Tarun (2014:60), arguing that insufficient attention has been paid to context in the field of management, further adds that contextual intelligence is “the ability to understand the limits of our knowledge and to adapt that knowledge to an environment different from the one in which it was developed.” Schwab (2016) furthers that “sense of context is defined as the ability and willingness to anticipate emerging trends and connect the dots. These have been common characteristics of effective leadership across generations and, in the fourth industrial revolution, they are a prerequisite for adaptation and survival.”

Consequently, it is imperative that management practitioners understand the value of diverse networks across traditional boundaries, and develop their capacity and readiness to engage with all stakeholders related to the matter at hand. To acquire a holistic view of the situation, management practitioners have to

pursue a multi-stakeholder orientation that transcends the increasingly counterproductive boundaries between sectors and professions. In addition, the capability to reframe mental and conceptual models and organisational philosophies is essential. Management practitioners failing in this will find it challenging to adjust to the disruptions of 4IR (Schwab, 2016).

Emotional intelligence (EI)

Goleman (2004:82) argues that one common trait most effective leaders share, is a high degree of emotional intelligence. In fact, he regards it as the sine qua non of leadership; without it, even the best training in the world, an incisive, analytical mind, and an endless supply of smart ideas, still won't make a great leader. Salovey and Mayer (1990:189) define emotional intelligence as "the subset of social intelligence that involves the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions."

According to Goleman (2004:88) emotional intelligence consists of five components, namely, (1) Self-Awareness (ability to recognise and understand your moods, emotions, and drives, as well as their effect on others), (2) Self-Regulation (ability to control or redirect disruptive impulses and moods; the propensity to suspend judgment - to think before acting), (3) Motivation (passion to work for reasons that go beyond money or status; a propensity to pursue goals with energy and persistence), (4) Empathy (ability to understand the emotional makeup of other people; skill in treating people according to their emotional reactions), and (5) Social Skill (proficiency in managing relationships and building networks; an ability to find common ground and build rapport).

With reference to manager and leadership qualities, Lazovic (2012:798) argues that a high degree of emotional intelligence manifests in developing positive relations and achieving emotional commitment from employees, which strengthens organisational culture, improves its resilience and increases its flexibility. Developing a culture of trust grows synergy among employees which in turn stimulates creativity; essential for developing novel solutions and shaping innovative responses to the increasingly complex demands of contemporary society – as characterised by 4IR.

At the heart of emotional intelligence is the adaptation of creating conscious and intelligent actions regarding one's own emotional responses as well as managing other people's reactions to a particular situation. Of importance, however, is the ability to first understand one's own emotional state and subsequent recognition of its impact on one's behaviour (Lazovic, 2012:799). Schwab (2016) contests that self-awareness, self-regulation, motivation, empathy and social skills are critical skills to succeed in the era of 4IR. The level of emotional intelligence and the capacity to cultivate it continuously evidently differentiates the outstanding decision-makers from the average ones, and organisations rich in leaders with high emotional intelligence will be more creative and better equipped for agility and resilience in this age of persistent and acute change, able to cope with disruption.

Inspired intelligence (II)

Derived from the Latin word 'spirare' (to breathe), Schwab (2016) coined the term 'inspired intelligence' which refers to the continuous search for meaning and purpose. Schwab (2016) furthers that it emphasises nurturing the "creative impulse and lifting humanity to a new collective and moral consciousness based on a shared sense of destiny."

Aligned with this view, previous research illuminates articulating a vision as an essential leadership act (Gupta, Macmillan and Surie, 2004:246; Stopper, 2005:6). Sumner, Bock and Giamartino (2006:44)

emphasise the importance of envisioning the future by imagining exciting and worthy possibilities. Being forward-looking – envisioning exciting possibilities and enlisting others in a shared view of the future – is the attribute that most distinguishes leaders from non-leaders (Kouzes and Posner, 2009:20). It also influences follower trust because leaders show followers an attractive vision of the future to persuade them to believe in their own prospects (Chen, Hwang and Liu, 2009:129). Sumner *et al.* (2006:44) further posit that organisations are not successful through the actions of a single person; it requires a team effort, trust and strong relationships, competence and confidence, collaboration and individual accountability.

Horwath and Whipple (2014:2) also accentuates the ability to energise people, foster engagement and creating trust; inspiring the team and extending it all the way to the front line. The science of leadership has provided strong support for the notion that inspired intelligence infuses a vision for the future that speaks to shared concerns of the collective (Molenberghs, Prochilo, Steffens, Zacher and Haslam, 2015:2). Leaders thus need to portray a collective-oriented vision for the future by engaging with a higher order collective identity between them and their followers (Molenberghs *et al.*, 2015:3). Schwab (2016) posits that sharing is key, and leaders need to shift the focus from the self to a universal sense of common purpose. Unless a sense of shared purpose is developed collectively, addressing the challenges and reaping the full benefits of 4IR will not be possible.

Physical intelligence (PI)

According to Postle (1989) physical Intelligence is concerned with fitness and health, enjoyment of physical activities, pride in manual skills and dexterity, sensible and balanced diet, love of the outdoors, and good at household tasks. Schwab (2016) contests that physical intelligence involves “supporting and nourishing personal health and well-being.” This, Schwab (2016) argues, is critical due to the accelerated pace of change, increased complexity and increased number of stakeholders involved in decision-making processes. The need to keep fit and remain calm under pressure therefore becomes all the more important.

Covey (2004:41) asserts that “scientific laboratory studies are producing increasing evidence of the close relationship between body (physical), mind (thinking) and heart (feeling)[emotions].” In a study on the effects of physical activity on cognitive functioning in middle age, Singh-Manoux, Hillsdon, Brunner, and Marmot (2005:2255) also found that physical activity has a beneficial impact on cognitive functioning.

Schiller (2013:47) emphasises the importance of physical intelligence, stating that it does, however, not only refer to a high level of fitness, either muscular strength/endurance or anaerobic threshold and nutrition. Instead, Schiller (2013:47) argues, the intent of deepening physical intelligence is to enhance self-mastery, which Majer, Jason, and Olson (2004:59) describes as “a perception that reflects one’s personal mastery or control over life outcomes.”

This view is supported by scientific research, with epigenetics, a field of study in biology, shows undeniably the vital importance of sleep, nutrition and exercise in our lives, and understanding ways of keeping one’s physical body in harmony with one’s mind, one’s emotions, and the world at-large is imperative (Schwab, 2016).

Entrepreneurial intelligence (EntI)

Schwab’s four-type intelligence proposition presents a valuable framework to advance understanding and development of knowledge; processing and integrating thoughts and feelings of oneself and to others; creating individual and shared purpose and trust to effect change towards the common good; and cultivating and maintaining personal health and well-being of oneself and others. As observed earlier, this study

proposes a fifth type of intelligence: entrepreneurial (the disposition) – how we think, reason and act in relation to value creating opportunities in our local, national and global environment.

The proposition is based on Timmons and Spinelli's (2009:101) definition of entrepreneurship as "a way of thinking, reasoning, and acting that is opportunity obsessed, holistic in approach, and leadership balanced for the purpose of value creation and capture."

The reason for drawing on Timmons and Spinelli's definition is that amidst the current state of the literature characterised by a proliferation of theories and definitions that often conflict and overlap (Parker, 2003:45), and the plurality of the field's ontology, epistemology, and research methods (van Burg and Romme, 2014:370), Timmons and Spinelli's higher-order description in a sense encapsulates entrepreneurship as fundamentally a human creative act that results in value creation. As Cuervo, Ribeiro and Roig (2007:4) posit that entrepreneurship is a central element for economic progress as it manifests its fundamental importance in different ways: a) by identifying, assessing and exploiting business opportunities; b) by creating new companies and/or renewing existing ones by making them more dynamic; and c) by driving the economy forward – through innovation, competence, job creation and by generally improving the wellbeing of society.

Wiklund, Davidson, Audretsch and Karlson (2011:4) proposes that the phenomenon of "emergence of new economic activity" lies at the heart of entrepreneurship, which resonates with Timmons and Spinelli's (2009:101) view that entrepreneurship results in the creation, improvement, realisation, and renewal of value for all stakeholders. Key to the process is the recognition of opportunities (thinking and reasoning), followed by the will and initiative to seize these opportunities (act).

Entrepreneurial intelligence is thus proposed as *the ability to recognise opportunity through synthesis of the whole and creatively combining resources that result in the creation or renewal of value that makes economic and/or social meaning.*

As described by Timmons and Spinelli (2009:101), entrepreneurship, among others, implies a willingness to take personal and financial risks in a calculated manner in order to constantly shift the likelihood of success, balancing the risk with the potential reward.

The significance to 4IR is that entrepreneurship transcends the classic start-up notion to include companies and organisations of all types, in all stages; thus including organisations that are old and new; small and large; fast and slow growing; in the private, not-for-profit, and public sectors; in all geographic points; and in all stages of a nation's development, regardless of politics (Timmons and Spinelli's, 2009:101). It is further significant because it supports Douglas' (2003:62) proposition of a meta-model of the entrepreneurship phenomenon in that it considers the complexities of the domain of business enterprise and management as a whole – as it ranges from the macro-level socio-economic-political to the micro-level activities of the owner-manager-entrepreneur.

4IR transcends industry, societal, political, geographical, cultural and disciplinary boundaries. Hence the call by Schwab (2016) for adapting, shaping and harnessing the potential of disruption by nurturing and applying contextual-, emotional-, inspired-, and physical intelligence... *and in addition*, what this paper proposes, entrepreneurial intelligence.

Schwab (2016) furthers that although we do not know how the transformations driven by 4IR will unfold, its complexity and interconnectedness across sectors imply that all stakeholders of global society – governments, business, academia, and civil society – must collaborate to better comprehend the emerging trends. Shared comprehension is essential to shape a collective future that reflects common aims and values.

Drawing on Timmons and Spinelli's (2009:101), entrepreneurial intelligent leaders can inject imagination, motivation, commitment, passion, tenacity, integrity, teamwork, and vision into 4IR, and despite facing dilemmas, ambiguity and contradictions, identify opportunities, influence solutions and create value.

RESEARCH METHODOLOGY

The nature of the research problem (unprecedented digital technological progress bringing about beneficial transformations, but also profound challenges, likely to bring economic disruption), the diverse elements thereof (e.g. AI, biotechnology, nanotechnology, 3D-printing, decision-making automation, robotics, IoT), its interconnectedness and multi-dimensionality (the way we work, live, communicate, travel and socialise) led to the application of critical interpretive synthesis (CIS) (Dixon-Woods, Bonas, Booth, Jones, Miller, Sutton, Shaw, Smith and Young, 2006:38).

The literature on 4IR-related topics and themes is large, diverse, and complex, including both qualitative and quantitative empirical work; editorial commentaries and theoretical work; case studies; evaluative, descriptive, sociological, psychological, management, and economics papers. Subsequently, a conventional systematic review methodology was deemed ill-suited to the challenges that conducting such a review would pose, and CIS was decided upon.

Dixon-Woods, Kirk, Agarwal, Annandale, Arthur, Harvey, Hsu, Katbamna, Olsen, Smith, Riley and Sutton (2005:6) posit that CIS starts with an ambiguous and tentatively defined phenomenon; conducts extensive albeit not complete searching; strategically samples from the literature; conducts appraisal and critique of the included literature and, through a process similar to primary qualitative research, aims to produce a theoretical output in the form of a synthesised argument. Otherwise explained by Bales and Sare (2014:144) as (1) formulating the review question, (2) searching the literature, (3) sampling, (4) determination of quality, (5) data extraction, and (6) interpretive synthesis. According to Dixon-Woods *et al.* (2006:39) CIS explicitly sanctions the integration of qualitative and quantitative evidence through an interpretive process.

A distinguishing feature of CIS is its recognition of the authorial voice in that it does not lay claim to a set of techniques that allows a 'reproducible' synthesis. Instead, the interpretive work required to produce an account of disparate forms of evidence is acknowledged, and it appreciates that alternative accounts of the same evidence might be possible using different authorial voices. However, all accounts should be grounded in the evidence, verifiable and probable, and that reflexivity will be a principal requirement. (Dixon-Woods *et al.*, 2006:39).

In terms of formulating the review question in this study, the approach was highly iterative, modifying the question in response to search results and findings from retrieved literature. Searching the literature, generated extensive potentially relevant items, proving to be unmanageable, and subsequently only potentially relevant literature was identified to provide a sampling frame. For purposes of the synthesis, purposive sampling was initially applied to select literature that were clearly concerned with aspects of 4IR, partly informed by the scoping running up to the study. Sampling therefore involved a constant dialectic process conducted concurrently with concept generation.

As far as determination of quality is concerned, literature that appeared relevant was prioritised, rather than particular study types or literature that met specific methodological standards; hence the application of a low threshold was utilised to maximise the inclusion and contribution of a wide variety of literature at the conceptual level. Data extraction concerned systematically identifying themes pertinent with management practice within the 4IR context and the very recent findings of Schwab following the World Economic Forum meeting in Davos, Switzerland where 4IR was the featuring topic. In conducting the interpretive synthesis, a detailed inspection of the literature was the point of departure, gradually identifying recurring themes and developing a critique. Themes were then generated to help develop an argument, comparing

the argument developed against the literature, and attempting to specify the reasoning and the relationship with Schwab's proposition.

RESULTS

Using Schwab's 4-type intelligence proposition to meaningfully address the challenges of 4IR largely relates to 'being', i.e. human existence as it relates to mind, heart, soul and body. In the context of 4IR it thus proposes nurturing and applying the four different types of intelligence to shape 4IR to ensure that it is empowering and human-centred, rather than divisive and dehumanising.

An important observation is that Schwab's proposition has no reference to 'coping mechanisms' *per se*, as coping relates more to a 'survival' orientation (World Health Organisation, 1999) in times of challenge rather than 'managing.' According to the WHO (1999) if one knows how, and has the resources to manage, one does not need to cope. To cope implies very little control on the situation at hand. Schwab's 4-type intelligence proposition is thus proactive – knowing and managing – in pursuit of the co-existence of technology and society. Schwab (2016:4) emphasises that technology is not an exogenous force over which we have no control; in fact, we have the opportunity to shape the 4IR in a manner that improves the state of the world.

From that premise, Schwab's proposition can be regarded as significant, and holds promise in terms of developing and enhancing our individual and collective 'intelligence' (abilities) to shape a preferred future. Firstly, in terms of the 'mind' dimension, contextual intelligence has to do with knowledge and awareness of relations and interdependencies between all the elements of the societal ecosystem which informs one's decision-making and behaviour. Secondly, the 'heart' dimension, emotional intelligence, has to do with recognising and understanding one's own emotions and its effect on others, controlling disruptive impulses and moods, pursuing goals with energy and persistence, treating people according to their emotional reactions, and, managing relationships and building networks to find common ground. Thirdly, the 'soul' dimension, inspired intelligence, refers to energising people, fostering engagement and creating trust to infuse a vision for the future that embraces the shared dreams and concerns of the collective. Lastly, the 'physical' dimension, physical intelligence, has to do with keeping one's physical body in harmony with one's mind, one's emotions, and the world at-large; cultivating and maintaining one's and others' personal health and well-being.

However, what appears lacking in Schwab's proposition is 'disposition,' the nexus of attitudes, intentions, values, and beliefs, and one of the distinguishing features of one's character or personality (Facione, 2000:63). In the context of 4IR, it could be argued that an entrepreneurial disposition would further enhance one's contextual-, emotional-, inspired-, and physical intelligence to attain real solutions. Herewith termed 'entrepreneurial intelligence', it implies the ability to recognise opportunity through synthesis of the whole and creatively combining resources that result in the creation or renewal of value that makes economic and/or social meaning.

CONCLUSIONS

It is evident that the 4IR megatrends which are shaping society promises not only beneficial transformations, but also profound challenges, likely to bring economic disruption. Subsequently, the organisational and management practice implications are profound, and leaders will need to redefine their management orientation to ensure organisational longevity.

Following Schwab's pioneering work and resultant proposition that the challenges of 4IR can only be meaningfully addressed if the collective wisdom of people's minds, hearts and souls are mobilised by nurturing and applying contextual-, emotional-, inspired- and physical intelligence, an important benchmark has been set. Management practitioners need to develop their capacity and readiness to engage with all stakeholders in the context of their respective organisations. They have to acquire an integrated holistic view, by pursuing a multi-stakeholder orientation that transcends the increasingly counterproductive boundaries between sectors and professions.

In order to be creative and better equipped for agility and resilience in this age of persistent and acute change, able to manage the disruptions and resources in restricted times, management practitioners require high levels of emotional intelligence and the capacity to cultivate it. Leaders therefore need to shift the focus from the self to a universal sense of common purpose in order to address the challenges and securing the benefits of 4IR. In addition, leaders need to embrace the importance of sleep, nutrition and exercise, and understand ways of keeping their physical bodies in harmony with their mind, emotions, and the world at-large.

That being said, it is argued that Schwab's 4-type intelligence proposition fails to address 'disposition' (natural or acquired tendency, inclination, or habit), specifically in relation to the actual realisation (making real) of solutions. Hence the postulate of an additional, fifth type of intelligence, namely entrepreneurial intelligence, i.e. the ability to recognise opportunity through synthesis of the whole and creatively combining resources that result in the creation or renewal of value that makes economic and/or social meaning. How management practitioners think, reason and act in relation to value creating opportunities in the local, national and global environment could extensively influence the probability of organisational longevity. In terms of 4IR, a management practitioner's habitual inclination could imply how the habitual recognition of opportunities and subsequent actions to create value.

Subsequently, in support of translating the acknowledged benefit of individual and collective contextual-, emotional-, inspired-, and physical intelligence to real solutions, entrepreneurial intelligence is proposed as the requisite "active agent." It is therefore argued that by expanding Schwab's 4-type intelligence proposition to also include entrepreneurial intelligence could increase the probability of fundamental, lasting impact.

This position paper set out to interrogate and critique Schwab's 4-type intelligence proposition. Schwab's contribution is deemed valuable in pursuance of how management should practice evolve to navigate the anticipated disruptions to organisations and the associated impact on the social fabric, and it serves as a reliable framework in helping management practitioners position themselves at the advent of 4IR. In applying CIS to Schwab's contribution, the theme of entrepreneurial intelligence emerged from where the argument for its addition was developed, comparing the argument against Schwab's contribution, and attempting to specify the reasoning and the addition to Schwab's proposition. In this endeavour, greater awareness of 4IR and management practice implications amongst scholars and practitioners have been created, setting an important benchmark from where further research can be undertaken.

MANAGERIAL IMPLICATIONS AND RECOMMENDATIONS

Consider the technology shifts fundamentally altering society: Implantable Technologies, Our Digital Presence, Vision as the New Interface, Wearable Internet, Ubiquitous Computing, A Supercomputer in Your Pocket, Storage for All, The Internet of and for Things, The Connected Home, Smart Cities, Big Data for Decisions, Driverless Cars, Artificial Intelligence and Decision-Making, AI and White-Collar Jobs, Robotics and Services, Bitcoin and the Blockchain, The Sharing Economy, Governments and the Blockchain, 3D Printing and Manufacturing, 3D Printing and Human Health, 3D Printing and Consumer

Products, Designer Beings, and Neurotechnologies (Schwab, 2016). These components of 4IR have created an inflection point that are also redefining management practice.

The volatility, uncertainty, complexity and ambiguity spawned by these 4IR shifts demand management practitioners to reinvent themselves, and the 5-type intelligence framework (Schwab's 4-type intelligence proposition plus the entrepreneurial intelligence proposition) could serve as the ideal path for reinventing oneself and realigning oneself to meaningfully address the challenges and exploit the benefits.

The following practical recommendations are subsequently proposed:

- At the individual level management practitioners should assess themselves in relation to contextual-, emotional-, inspired-, physical-, and entrepreneurial intelligence so as to determine their readiness and identify shortcomings.
- At the team and organisational level management practitioners should initiate developmental initiatives in relation to contextual-, emotional-, inspired-, physical-, and entrepreneurial intelligence so as to empower employees and followers to meaningfully contribute to addressing the challenges and exploiting the opportunities.
- At the organisational level management practitioners should give 4IR prominence in their organisations' strategic dialogue.

Reflection on, and development of the 5-type intelligence constructs individually and collectively could create a firm foundation from where to influence an unconstrained future with many possible beneficial outcomes.

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