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# How to transform positively and constructively towards the Fourth Industrial Revolution: Empirical evidence from a German technology organisation operating in South Africa

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## ABSTRACT

This article explores the question of how organisations can transform constructively and positively towards the Fourth Industrial Revolution (4IR). It presents insights into the state of the art on 4IR, positive psychology movements PP1.0 and PP2.0 and particularly on German organisations in the 4IR within the South African context. The study uses a qualitative research approach and presents findings from a study conducted with 16 managers across top, middle and lower management levels in a German engineering organisation, based in South Africa, operating in Southern Africa. Findings, discussion, conclusions and recommendations provide insights into emerging themes on the 4IR from perspectives that take the context of discourses on the 4IR in developed and developing countries into account. Findings show the importance of five main themes when transforming into the 4IR: 1. Employee management; 2. Innovative technological and systemic change; 3. Work organisation; 4. Environment; and 5. Network and cooperation. Human communication and connectivity and a balanced human-machine interaction seem to build the core framework for constructive socio-technological change and a meaningful work environment. Thereby, a focus on the positive transformation requires working through the challenges and dark sides of the 4IR as well as a contextual and culture-specific approach to finally create a meaningful, healthy and optimal functioning work environment for the employees.

**KEYWORDS:** Positive psychology (PP1.0; PP2.0), Fourth Industrial Revolution (4IR), human communication, human connection, balanced human-machine interaction, technological advancement, developing country, Germany, South Africa

## 1. Introduction

Pioneers of positive psychology (PP1.0) have implemented their discourses some decades ago to originate a new perspective into the problem-orientated discourses of analytic and mainstream psychology. The main aim of this new movement was to measure human strengths, focus on human capacity and an increase regarding the view on constructs such as mental health, happiness, hope and well-being (Lopez, Pedrotti, & Snyder, 2018). The more recent positive psychology discourse (PP2.0) aims at advancing previous discourses. PP2.0 emphasises a new approach to life and meaning by working through the negative and the positive, by a subtle appreciation of the ambivalent nature of the good life (Mayer & May, 2019). PP2.0 is, above all, epitomised by an appreciation of the fundamentally dialectical nature of well-being. PP2.0 explores the "dark" side of life, while emphasising its role in our positive functioning and transformation as human beings (F. Carreno & Pérez-Escobar, 2019; Wong, 2016).

There is a considerable amount of academic literature that supports the use of PP1.0 and PP2.0 interventions to enhance well-being at work (Meyers et al., 2013). PP1.0 interventions typically use strength-based methods, which aim to identify and enhance what is being done well, rather than trying to identify and fix what is "wrong" in an individual, group or organisation (Schaufeli & Bakker, 2004). Intervention strategies that have been used in organisations include positive leadership coaching (Cameron, 2008), solution-focused training (Grant, Fried, & Juillerat, 2011) and appreciative inquiry, which involves asking positive questions in order to strengthen individual and group potential and create transformation. Avey, Avolio and Luthans (2011) conducted research on 15 PP1.0 interventions in organisations and concluded that most led to significant improvements in employee well-being (Cantore & Cooperrider, 2013). However, the vast majority of the interventions in the research were aimed at the level of the individual, identifying what employees can do to improve their own positive mental health, rather than what an organisation might do to influence employee mental health (The Canadian Mental Health Association, 2015). Also, case studies have shown that changes that encourage job sharing, part-time work, working from home arrangements and telework led to employees feeling a greater sense of alignment with the organisation's values and vision (Davenport, Allisey, Page, LaMontagne, & Reavley, 2016).

This article aims at shedding light onto PP1.0 and PP2.0 constructs in a German technology organisation, operating in South Africa, acting on driving the organisation into a successful Fourth Industrial Revolution (4IR) setting. The 4IR strives for improvement of

human condition and functioning from different philosophical, theoretical and methodological stances and is based on new technologies, value sets and aims (Shamim, Cang, Yu, & Li, 2016), focusing on the strengths, optimal functioning and positive concepts such as flow, health, hope, meaningfulness and happiness in the industry context (Alkatheeri, Ameen, Isaac, Nusari, Duraisamy, & Khalifa, 2020; Pal, 2019). Thereby, the authors focus particularly on responding the following research question: How can organisations transform constructively towards the 4IR?

## 2. The Fourth Industrial Revolution

The new catchphrases for the Fourth Industrial Revolution are "industry 4.0", "smart industry", "intelligent industry", "smart factory", or in general "smart manufacturing". In scholarly literature, these terms can be followed back over 40 years and Levin (2018) has emphasised that in this revolution not only do technologies converge, so too do interests and concepts. According to Schwab (2017), "the fourth industrial revolution is on a very basic level distinctive from the past transformations because it is characterised by a spectrum of innovations that are blending the physical, computerized and natural universes, affecting all disciplines, economies and industries". The World Economic Forum (WEF, 2017) observes that new businesses are creating fewer jobs, and those jobs require advanced abilities, new technologies, such as artificial intelligence (AI) and robotics intensified digitalisation and related threats which needs to lead to required and intense cybersecurity.

The 4IR is conveying the advancement of contemporary systems and commercial models and will be challenged by ambiguities, a change from tangible technologies towards adaptive social technologies, an area where faith, policy frameworks, learning by doing, and teamwork between diverse social players are vital success features (Berger, 2018; WEF, 2018a). These are also the spheres where emerging countries have the most challenges, with disparity, low trust between social players, federal government, trade meditation and astronomical expenditures of research, innovation and failure, and the attentiveness on material and data technologies with only sporadic allusion to the significance of development of innovative social technologies and government policies (WEF, 2018b) which, as a result, affects the development and implementation of future industrial strategies (Levin, 2018). Several authors emphasis that the 4IR is rapidly leading its way towards the Fifth Industrial Revolution (5IR) with its focus on nanotechnology (Rai & Rai, 2015) and the improvements of the 4IR with regard to green computing, advanced human-machine interaction and boundary-spanning cooperation (Pathak et al., 2019).

## 3. The South African context

South Africa needs to be geared for a rapidly changing environment, rearranging network coordination, education and private sector, increasing the low technological capability, inadequate and stagnating digital readiness and economically falling complexity. An important factor is the non-linear nature of these technologies and socio-political changes that accompany the further development of new ideas (WEF, 2018a). Kuhn (2012) argued that paradigm shifts cannot be predicted. The WEF (2018b) argues that for the 4IR certain factors are more important than others, such as overcoming fragmentation in the public sector, paying careful attention to the economic and innovation ecosystem, and strengthening the resilience of a range of public and private institutions. A more technology-intensive and digital future will require better education, better infrastructure and legal frameworks that protect data and monitor competitive and anti-competitive behaviour. Further analysis is required in terms of B-BBEE and affirmative action (AA), and the appropriate way to modernise or advance the industrial base of South Africa (Oosthuizen, Tonelli, & Mayer, 2019). The alignment with existing industrial policy, and the specific state interventions needed to create suitable social conditions (Levin, 2018).

## 4. German international organisations operating in South Africa

The German system of the 4IR is well-known as “industry 4.0”, which includes all shareholders in an online platform called “platform industry 4.0”, originally initiated by BITKOM, ZVEI and VDMA in 2013. Recognising that industry 4.0 needed to include community matters, the three organisations decided to hand over leadership to the central government departments (Bogner, Götz, Fleischmann, & Franke, 2015), including working groups on: 1) Software architectures, standards and norms, 2) Research and innovation, 3) Security of interacting systems, 4) Legal structures, and 5) Employment, education and training. The platform aims at standardisation of 4.0 processes internationally. Industry 4.0, according to the German Central Ministry for Economic Affairs and Energy (Cunningham, 2018), refers to the intelligent networking of machines and processes for business, flexible production, convertible and reconfigurable factories, customer-oriented solutions, optimised logistics, use of data and a resource-efficient circular economy.

The 4IR is associated by most organisations with digitalization, logistics, production and manufacturing areas (Bogner, Voelklein, Schroedel, & Franke, 2016). Commencing from the point of view that the 4IR is conceptualised as a systematic increase in the flexibility of

products and processes through automation, extensive networking and decentralised control mechanisms, as well as a data acquisition and integration through information and communication technologies, the importance of PP1.0 and PP2.0 should be scrutinised (Weisbecker, Burmester, & Schmidt, 2015). The study by Bogner et al. (2016) indicated that automation and digitalisation of the entire value chain as well as the concurrent deliberation of the success factors of the 4IR increase German organisations in South Africa success notably.

In German organisations in South Africa, a major disruptive breakthrough of completely new technologies and organisational models – the "smart factory" – is evolving in small steps. Pardi (2019) observed various forms of experimentation with new digital technologies in German companies, and Pardi, Krzywdzinski, and Lüthje (2019) highlight that more sophisticated machines replace traditional ones. In this context, it has been called for further debates on the 4IR (Butollo & Lüthje, 2017).

## 5. Positive psychology in the Fourth Industrial Revolution

The PP1.0 movement produced new conceptual frameworks and instruments to measure employee strengths in organisations and increased interest in topics such as optimism, hope, locus of control, creativity, self-esteem, emotional intelligence, empathy, humour and gratitude (Lopez & Snyder, 2003). At a meta-psychological level, it aims to redress the imbalance in psychological research and practice by calling attention to the positive aspects of employee functioning and experience, and integrating them with the understanding of the negative aspects of employee functioning and experience. At a pragmatic level, it is about understanding the origins, processes and mechanisms that lead to desirable outcomes (Linley, Joseph, Harrington, & Wood, 2006). PP2.0 is characterised by an altogether more nuanced approach to the concepts of positive and negative, and by a subtle appreciation of the ambivalent nature of the good life in organisations in the 4IR. More specifically, it is argued that PP2.0 is, above all, epitomised by an appreciation of the fundamentally dialectical nature of employee well-being in organisations in the 4IR (Lomas & Ivtzan, 2016).

PP2.0 also explores the "dark" side of organisational life while emphasising its role in the positive functioning and transformation of employees in the 4IR. This more nuanced approach to the notions of "positive" and "negative" can be described as the second wave of positive psychology (Wong, 2011). If the first wave is characterised by valorisation of the positive, the second wave recognises that well-being involves a subtle, dialectical interplay between positive and negative phenomena. Employee well-being can be defined as "a state of

successful performance across the organisational life path integrating physical, cognitive and social-emotional function" (Pollard & Davidson, 2001). It could be observed how ostensibly negative emotions, such as prudent anxiety, could sub-serve this greater organisational goal to implement new 4IR technologies and approaches (Lomas & Ivtzan, 2016).

Virtue, meaning, resilience and well-being, which are the four pillars of PP2.0, could strengthen the capacity of employees to cope with the challenges of the 4IR (Mayer, Vanderheiden, & Oosthuizen, 2019). Exploring concepts of PP1.0 such as meaning, resilience, employee development, mortality, change, suffering and spirituality engages with so-called negative matters from a PP1.0 angle, showing how the path of employee development can involve experiences which, while challenging, can lead to growth, insight, healing and transformation in the context of the 4IR (Ivtzan, Lomas, Hefferon, & Worth, 2016).

This article thus proposes PP2.0 (Ivtzan, Lomas, Hefferon, & Worth, 2015) as the potential paradigm for meaning-oriented interventions in organisations in the 4IR to have a strengths-based, integrated and interconnected meaningful focus and to explore the suffering and dark sides (Wong, 2011; 2016a, b), which will then open the ways towards happiness, resilience and meaning.

## 6. Research methodology

### *6.1 Research design and paradigm*

The study uses a post-modernist, qualitative research design (Creswell, 2013) within the hermeneutical-phenomenological research paradigm to explore and understand the subjective experiences and socio-cultural context of the employees and the interpretation of experiences through the researchers (Creswell, 2013; Hassan & Ghauri, 2014; Clark & Hogget, 2009)

### *6.2 Research context and organisational setting*

The study was conducted in a German world-leading, global operating technology organisation specialised in manufacturing. The organisation manufactures in particular pumps and industrial valves and focuses on the area of water and water waste management, provides state-of-the-art industrial applications, with regard to process engineering, special processes, chemical industries and marine applications, as well as heating and cooling systems. The company further supplies efficient applications for power stations, all-in solutions for building services, mining and dredging applications, automation and drive solutions, service in terms of consultancy, training, service and maintenance. In addition, the organisation manages spare

part logistics and reverse engineering, skill development and additive manufacturing testing. The annual service revenue of the organisation is in the range of 2 200 million euro. The organisation refers to the German Corporate Governance code and values a corporate culture, which includes professionalism and commitment, proactive planning, trust, honesty and responsibility, as well as appreciation. The company's core values include excellence, reliability and technology driven success and it is operating in over 100 countries worldwide.

### *6.3 Establishing researcher roles*

One of the researchers was working as a leadership consultant for the German headquarters. In the consulting sessions, the idea was born to conduct qualitative interviews with employees in the organisation to improve the understanding of the employees and their views regarding the transformation towards the 4IR. The research team consists of two researchers, one German female and one South African male researcher.

### *6.4 The sample*

Only one organisation participated in this study, namely the South African subsidy of the German engineering organisation. The employees working in the organisation were obtained through purposeful sampling strategies (Shaheen & Pradhan, 2019), which were based on the following criteria of inclusion, such as: managerial leadership role, position in the organisation and lengths within the organisation. Due to confidentiality reasons, biographical data will not be displayed fully. However, it can be mentioned that eight participants are English speaking, four are Afrikaans speaking, two are bilingual Afrikaans and English speaking and one is German speaking. The age range of participants is from 32 to 60 years of age. Participants worked in the organisation from two to 23 years. They work in top, middle or lower management positions in the fields of Production and Planning, Engineering, Finance, Technical, Projects, HR, Sales, Warehouse, Service and Operations. Out of the 16 participants 15 are male and one is female.

### *6.5 Data collection, analysis, reporting, quality assurance and ethics*

The researchers conducted 60-75-minute-interviews which were semi structured in nature and which contained twenty interview questions. One of the main questions explored during the interviews was the question referred to in this article: How can organisations transform constructively and positively towards the 4IR? Employees were informed about the ethical foundation of the study, the protection of the interviewees' rights, anonymity and

confidentiality (Myers, 2019). The analysis of data was conducted through five steps as described by Clarke and Hoggett (2009): (1) the data were subjected to an initial, preliminary and holistic assessment, (2) themes were generated, (3) data were coded, (4) the body of the text was broken down into meaningful pieces which were labelled, and (5) closer attention was paid to the subtleties and nuances of the meaning inherent in the data by the researchers (Clarke & Hoggett, 2009). Data were recorded as audio-recordings and transcribed verbatim. Field notes were taken during interviews. Data are stored electronically for a period of five years in password-encrypted data files.

Employees shared rich and detailed, rigorous subjective experiences which lead to rigor in the quality of the data, its analysis and interpretation (Johnson, Adkins & Chauvin, 2019). The researchers used different sources, methods and theoretical approaches to ensure credibility through triangulation (Creswell & Plano Clark, 2011). Confirmability and transferability of data (Creswell, 2013) were promoted through intersubjective validation processes and the use of established theories and methods which were established amongst the researchers (Yin, 2009), while rigor was promoted through thick descriptions and transparent processes. The study further provides an in-depth insight into the findings and topics, but does not provide generalisability (Creswell, 2013; Lincoln & Guba, 1985). The study was approved by the ethics committee at the Department of Industrial Psychology and People Management of the University of Johannesburg. The company provided consent to conduct the research and participants gave also written consent. All participants were informed about confidentiality and their rights as participants.

**Findings**

Participants responded to the question of how organisations can transform constructively and positively towards 4IR by highlighting five main themes: 1. Employee management; 2. Innovative technological and systemic change; 3. Work organisation; 4. Environment; and 5. Network and cooperation.[1] Firstly, managers highlight that a positive and constructive employee management are the most important to positively manage the change towards the 4IR (75)[2]. Thereby, for the entity of all managers, it is a core aspect to inform the employees about the situation and changes within the company and communicate with them about it, particularly about the changes that will come to the organisation (16). P9, a German, 56-year-old male manager, points out:

[1] Citations will only be given for a maximum of the the first three most referred to codes of each theme due to word count limitations.

[2] Numbers in brackets indicate frequency of statements (75) means 75 statements out of 16 interviews.

*We have to have an open culture, the people should communicate, should allow themselves to communicate. The people should have the possibility to share their ideas.*

Almost all participants highlight the importance of communication to combat fear. P8 says:

*I know that people have a fear of robots are going to take over our jobs and machines will be doing everything. And there's a big, big misperception around it all…. people must speak about it and get information. So that they know what is happening.*

P8, as a female, 35-year-old manager who has worked in the company for over five years, is strongly aware of the psychological impact of the changes in the organisation. She believes that communication supports combatting the fears and informing the employees. Further on, managers discuss that in future and to manage the transition into the 4IR well, managers and organisations need to balance human-machine interaction. The statement refers primarily to the perspective that machines and technology will not and should not take over in organisations, but rather that they need to be contained and controlled and programmed by humans in a way that they do not replace humans (and take over), but rather that human interaction and machine learning are balanced, that humans stay in a proactive mindset which controls machines and their impact on a conscious level. All statements refer to a mindset which uses machines and machine learning for the better but does not let the mind be controlled by technology and machine learning. P2, a 37-year old Indian English-speaking male, points out:

*I can see certain departments, especially in sales, customer consulting being more automated, but I think to certain people, especially on our side, you're going to need that human interaction. That human touch that sort of, I know, yes, you can go and see the history and you can go on your numbers. But when it comes to that gut feel, we need to be able to look at it, you know.*

This manager speaks, as many of the others as well, about a balanced interaction of humans and machines to avoid and eradicate mistakes. He further highlights that human intuition in this regard is important and an interplay of machines and humans is highly important. Additionally, managers emphasise that employees need to be encouraged to display a problem-solving attitude, which supports employees to be proactive, engaged and forward-thinking. Managers believe that with the 4IR, many challenges will have to be tackled not only by the managers and the top management themselves, but rather by each and everybody within the organisation. For them, it needs a forward-thinking, problem-solving employee-body which will support the organisation to transform constructively into the 4IR without losing staff members by a growing machine impact within the organisation, but rather by transforming roles and positions of employees which are needed within the 4IR.

Problem-solving is further needed to redefine employee impact, creativity and ideas for future planning and potentially occurring problems and barriers.

Also, P13, a white 42-year old male, Afrikaans-speaking participant who has been on the job for over 13 years, shares his view on problem-solving skills:

> *Unfortunately, we've become used to this habit of always battling with the internet and nobody's really complaining anymore because we so used to it. Which is wrong. It's wrong. My opinion is we need to get somebody from outside to come and evaluate what's happening here. I'll call it creative reporting…. somebody from outside must come with objective perspectives of where we are, evaluate what's happening and call it like it is. At least from there, you can start planning, you can start budgeting…but in not really identifying the problem, we just kind of stay behind… we need to solve the problems.*

This manager believes that it needs problem-solving skills from the outside of the organisation and creativity to move ahead based on a proper evaluation and planning. P7, a white, bilingual 33-year-old Afrikaans-English-speaking male engineer with six years of work experience in the organisation, emphasises:

> *We've gotten into a culture because of technology. Now we're moving into a fourth industrial revolution where it's accelerating the change, and being more disruptive. You're looking at a cultural society that's become complacent with instant gratification. So, problem-solving hasn't really developed. It's actually there's a lack of it, and as I said, people are lazy… going into an Industrial Revolution with a generation with that type of attitude is actually quite scary. I can't see that it's going to be a good idea. I would say we've actually lost the capability to problem-solve. That's a generation. Ja.*

This manager agrees that problem-solving within the organisation is a problem and that there is a need for cultural change within the organisation. However, all managers agree that problem-solving skills are highly important for future success and that the company culture and the attitude of the employees need to become more flexible and solution orientated. Other statements of managers refer to the importance of training employees and upskilling their knowledge and experience to prepare them for the coming changes, in a positive way which will provide them with the skills they will need in the changing workplaces (6). Other managers address that for a positive transformation, fears of employees (e.g. of being retrenched, of machines taking over, of robots, of an unsafe work future etc.) need to be contained by addressing them openly and working with them. Only by taking fears into consideration, opening up to them and dealing with them proactively, the organisation will manage the 4IR constructively. Other statements refer to the perspectives that employees ideas for solutions of challenges should be heard (5) since there is a huge creative potential within the organisation which stays often unheard and which is then taking into leisure time activities and entrepreneurship (5). Several managers refer to their own technological creations and ideas for which they aim at getting a patent. Further, employees need to

become well-prepared controllers to take care of the machines and systems (5); they further believe that a workforce is needed which consists of an "older generation" which holds a lot of useful engineering knowledge and a younger generation which has the technical knowhow (4). Finally, they believe that a constructive transition needs to ensure that employees can keep their jobs (4), that skilled labour needs to be employed (3), that employees need to increase their specialisation (3), are open for home office work (2), regulate the change by slowing it down and taking the speed out of it to manage it well (2), give employees more leisure time and less work hours to balance work-family life (1), provide assistance for employees to study besides working for the company (1), have employment equity (EE) representations which foster equal rights and treatment and managers who lead in a responsible way (1).

Table 1: Employee management

| **Frequency** | **Code** | **Participants** |
|---|---|---|
| **75** | **Employee management** | |
| 16 | Inform and communicate with employees | P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16 |
| 8 | Balance human-machine interactions | P1, P3, P4, P5, P7, P10, P14, P15 |
| 7 | Problem-solving | P5, P7, P8, P9, P13, P14, P16 |
| 6 | Train / upskilling employees | P5, P8, P9, P11, P13, P14 |
| 6 | Care for fears of employees | P1, P3, P4, P8, P11, P13 |
| 5 | Listen to employees' ideas | P3, P4, P7, P11, P12 |
| 5 | Employee good controllers to check machine systems | P1, P3, P12, P13, P14 |
| 4 | Balance experienced and young employees | P12, P13, P15, P16 |
| 4 | Keep jobs | P11, P12, P14, P15 |
| 3 | Employ skilled individuals | P, 9, P10, P12 |
| 3 | Promote employee specialisation | P2, P6, P16 |
| 2 | Open up for home office work | P7, P13 |
| 2 | Foster (slow) change | P13, P14 |
| 1 | Give employees more leisure time | P7 |
| 1 | Give study assistance | P11 |
| 1 | Have EE representatives | P11 |
| 1 | Lead responsibly | P13 |

The focus on employee management is followed by the focus on innovative technological and systemic change (67). In this category, 12 statements refer to the idea that the organisation needs to move into the "technological age". P1, an English-speaking, white, male participant who has worked in the organisation since over 10 years, aged 35 years, highlights the move into the technical age and its relation to automation:

> *It's moving more to a more technological age, in terms of everything being more automated. I think some people do confuse or get worried here when they see automation because they think that it's job losses and so forth, but it's not always the case…. One example is in our purchasing side. So we've automated the system so it*

*automatically orders stock for us to supply a notification short of this of leaders and supply the inflates the purchase order, confirmed on the system. (P1)*

The participant addresses the current move within the technological age and the automation and, at the same time, he highlights the challenges with the complexity of the 4IR and the changes in workplaces and society, as well as the fact that individuals might not fully comprehend what is happening. However, focusing on the automation processes themselves, they do hold keys to more effective, ordered, networked and notified workplaces and employees.

These statements are followed by the perspective that, to be constructive and successful, organisations have to create smart solutions. One male, a 43-year-old, Afrikaans-speaking manager with 13 years of background in the business (P10), highlights:

*Artificial intelligence is to automate things…. the drive is to empower some people, and for me, artificial intelligence is to create more efficiency with preventing errors … If I look at the products, I think there's still a lot of manual labour required to manufacture it. Which may or may not be optimised? I don't know. But what I can see currently is that it's very labour-intensive. And in order to reduce that, I think we're very far from getting automated.*

Another manager, aged 32 years, white and English-speaking and about two years in the organisation, is critical about the technological age (P11):

*Technology is taking over these days. The economy is down and stuff, and so much youth unemployment, and then they bring in things like that. So, when do we – say to youth go to universities, get their qualification, but where do they get their experience from if there's a robot coming to do everything? So how do we work? So, it's good and bad. I would say 50–50 with these smart solutions.*

Participants see positive and negative aspects of the technological age with its advantages and disadvantages and that is does create new opportunities, but, at the same time, it also creates new challenges towards the society which need to be addressed. Further, seven statements each highlight that the organisation needs to automate and that it needs to improve online processes, for example in logistics and tracking of articles or services. However, again, when looking at automation, several participants are worried about the impact for the employees. P2, a 37-year-old, Indian English-speaking male, points out:

*If you're looking at reducing labour, I think the impact on our continent is rather significant. People won't like it. They already don't like the banks moving over – their robot automation and all that. The automotive industry – automated – it has been like automated for a very long time… and we are also there…*

Some participants mention that the organisation should make more use of robots in the future (5), however only on the side of larger productions, that 3D-modelling will support the organisation to work creatively and smart (3), that the organisation should invest in technological equipment and use new equipment (4). A further three statements each

emphasise that the organisation should improve programming across all of its departments and sectors and start analysing big data to create smart solutions for their sector. Finally, two statements highlight that the organisation needs a stable internet connection, dress up to internet fraud that has happened to the organisation before, that individuals still need to use their intuition to manage the machines in the right way, and to use virtual realities. Finally, one participant each emphasises that participants should use social media marketing to keep and uplift the standing in the area of expertise, develop alternatives to google translate and to foster effective intercultural communication and even create a 4IR sub-company to drive 4IR processes.

Table 2: Innovative technological and systemic change

| Frequency | Code | Participants |
|---|---|---|
| **67** | **Overall theme: Innovative technological and systemic change** | |
| 12 | Move into technological age | P1, P2, P3, P4, P5, P6, P7, P9, P10, P12, P13, !6 |
| 11 | Create smart solutions | P1, P5, P7, P8, P9, P10, P12, P13, P14, P15, P16 |
| 7 | Automate | P1, P2, P3, P5, P7, P8, P9, P10 |
| 7 | Improve online processes (e.g. logistics, tracking) | P1, P4, P8, P10, P12, P13, P14 |
| 5 | Use robots | P1, P2, P5, P8, P12 |
| 4 | 3D modelling | P5, P7, P12, P14 |
| 4 | Buy / update new technological equipment | P8, P10, P12, P13 |
| 3 | Improve programming | P8, P9, P13 |
| 3 | Analyse big data | P9, P10, P12 |
| 2 | Need stable internet connection | P12, P13 |
| 2 | Dress up to internet fraud | P10, P15 |
| 2 | Use intuition with machines | P3, P7 |
| 2 | Use virtual realities | P13, P14 |
| 1 | Create user-friendly systems / apps /service | P13 |
| 1 | Use social media marketing | P10 |
| 1 | Develop alternatives to google translate | P10 |
| 1 | Create a 4IR sub-company to drive 4IR processes | P9 |

Further, 61 statements refer to the organisation of work. Often these statements are connected to technologisation, smart solutions and automatisation. A majority of participants believe that work speed needs to improve in the organisation to be competitive in future and eight statements relate to the idea that work speed and effectivity need to improve and innovative work ways need to be found.

P5, an Afrikaans-speaking male, white 34-year-old participant who has been with the company for 11 years, emphasises that speed is crucial in the process of the 4IR:

> *You need to know the basics before you can make an advanced system. So, if you personally don't know the basics, how can you run an advanced system?... people still need the skills to work from the basic. They need to understand the product they're making and how to do it. Because then you can integrate it into the automation, make it*

*faster. Because automation isn't really there to replace the person, it's more there to speed up the process. That's the way I see it.*

P5 does not see thee 4IR as a threat to human employees, but rather as a support to help them speed up processes through automatisation. Regarding effectivity and efficiency, P8, a Coloured, female manager, aged 35 and with five years' work experience in the company, says:

*A lot of things that can be changed: you can get more efficiency out of a pump if you run at different speeds, if you connect it to the data of the customer. And that can be done a [predictive] maintenance. So sometimes our pumps, they just run the pumps until they break. And that you can see that before, a few weeks before and then we can inform our customers it's not right but it's yellow already. So, if you look at it, you can run your system without any interruptions, otherwise, to shut down, something like that.*

Effective management of machines can be used to deal more effectively with the customer, to keep machines maintained and use it for predictive processes. These processes are defined as innovative pathways by the participants and several refer to the importance of driving innovation within the company to stay competitive. One manager (P16), a white, Afrikaans-speaking male and a long-term employee in the organisation, is very critical on how innovation can be driven in the organisation:

*Our IT needs to be updated big time. I know there's always upgrades and I know it's very difficult to stay in touch with technology and the latest of everything. But we sit two days without internet. And it's not. It's not Eskom related. It's our own fault. It's our own planning. That makes it very frustrating. I think in the last, we had a major hiccup in August, I would say September, and in the last six or eight weeks I think we've probably lost 40 to 50% of our productivity due to not having connectivity and being at work…under these circumstances it is not easy to speak of innovation…when the basics are not right.*

Additionally, participants highlight that the organisation should go paperless (7), improve planning functions (6), install practical applications (5), create adaptive workplaces (4), and change organisational culture towards a more open, coping and learning culture (4). Three statements emphasise that the company should gear up, that the organisation should work 24/7 with the support of the machines (2) and that it should develop an innovative learning culture (2). Finally, one statement each refers to the fact that the organisation should build its own training centre to develop staff, reduce theft through new processes and technological equipment, and work on a future mission and vision of the company.

Table 3: Work organisation

| **Frequency** | **Code** | **Participants** |
|---|---|---|
| **61** | **Work organisation** | |
| 9 | Improve work speed | P2, P5, P6, P8, P9, P10, P12, P15, P16 |
| 8 | Increase work effectivity | P5, P8, P9, P10, P12, P13, P14, P16 |

| | | | |
|---|---|---|---|
| 8 | | Create innovative ways of work | P1, P3, P5, P7, P9, P10, P13, P16 |
| 7 | | Go paperless | P1, P2, P8, P10, P11, P12, P14 |
| 6 | | Improve planning functions | P1, P4, P5, P8, P10, P12 |
| 5 | | Install practical applications | P7, P8, P9, P13, P14 |
| 4 | | Create adaptive workplaces | P7, P8, P10, P13 |
| 4 | | Change organisational culture (more open, coping culture, learning culture) | P8, P9, P10, P14 |
| 3 | | Company to gear up | P10, P13, P14 |
| 2 | | Work 24/7 | P5, P12 |
| 2 | | Create innovative learning culture | P8, P10 |
| 1 | | Have own training centre | P14 |
| 1 | | Reduce theft through new processes / technological equipment | P14 |
| 1 | | Work on the mission and vision of company | P9 |

Altogether, 16 statements refer to the importance to keep the environment in mind when transforming into the 4IR. Thereby, nine statements highlight that for transformational purposes, management must be aware that the organisation is based in an African country and that the challenges in Africa and in South Africa are different to the European challenges to transform into the 4IR. A 55-year-old bilingual English- and Afrikaans-speaking manager who has worked in the company for 18 years (P15), highlights:

> *Now the problem is: do we not see that we have a labour problem already, that we have an unemployment problem already? … I do believe that government should stop this AI, at least in South Africa until such time as you have more people working, because the more they going to proceed with this, the less people will have jobs. And don't tell me that you're going to need people to fix the robots. We don't have the skills. We don't have skills at the moment at all. The CNC lathe machine operator is already a problem. Okay. So where are you going to get someone to fix your robotics, please?*

Several managers highlight that, particularly for the South African context, 4IR processes are a problem, because of the fact that neither systems, nor processes or employee skills are in place to deal with 4IR technology. Further on, three statements mention that organisations need to evaluate the advantages and disadvantages of the 4IR for the environment and the broader society. Two statements refer to the fact that the organisation needs to care for the environment and the community and take responsibility for the changes in the environment and the world. Finally, two individuals emphasise that politics within South Africa need to change to really foster the 4IR in workplaces and let organisations deal constructively with the changes.

Table 4: Environment

| **Frequency** | **Code** | | **Participants** |
|---|---|---|---|
| **16** | **Environment** | | |
| 10 | | Take context into consideration | P2, P3, P6, P7, P11, P12, P13, P15, P16 |
| 3 | | Evaluate advantages and disadvantages | P5, P14, P15 |
| 2 | | Care for environment and community | P4, P9 |
| 2 | | Change politics | P5, P15 |

The least mentioned, but still important, category is network and cooperation (15). Five statements refer to the idea that the businesses need to improve the cooperation with universities and research and that business and academia should be more integrated to always be on the forefront of research in the business, particularly if businesses cannot effort their own research lab or centre. P2, a male English-speaking manager, emphasises:

> *Organisations and universities should work together to move forward into the right direction.*

Further on, businesses should work with external consultants to get innovative, creative and "out of the box" ideas to drive the organisation forward (5). P4, a white, male, English-speaking 47-year-old participant, mentions that external consultants are needed to provide new directions:

> *My approach is always if you got a fresh pair of eyes, you see something different. You need the internal one to be able to drive the company, but you need external eyes to be able to guide the company. So you need both.*

Further, three statements highlight that the organisation needs to improve its networks and cooperation to remain marketable. Finally, two individuals highlight that language frictions and barriers need to be overcome to cooperate well in 4IR and one person highlights that a new online platform is inevitable to manage the business well in future (Table 5).

Table 5: Network and cooperation

| **Frequency** | **Code** | **Participants** |
|---|---|---|
| **15** | **Network and cooperation** | |
| 5 | Improve business-university cooperation and research | P3, P5, P7, P9, P10 |
| 5 | Employee external consultants | P1, P4, P7, P13, P14 |
| 3 | Improve networks and cooperation | P5, P7, P8, P9 |
| 2 | Overcome language frictions and barriers | P10, P12 |
| 1 | Create a new online platform | P8 |

## Discussion

This chapter aimed at focusing on the subjective perspectives of managers on how to transform organisations constructively and positively in times of the 4IR. It thereby aimed at taking on a solution-orientated approach, not emphasising the challenges and difficulties in the first way, but rather focusing onto the positive aspects (P1.0) (Lopez, Pedrotti, & Snyder, 2018) and working towards a new approach to life and meaning by working through the negative and the positive (PP2.0) (Wong, 2016; Mayer & May, 2019). The findings provide most interesting insights since the managers were invited to anticipate positive and creative ways to transform the organisation (as in Cantore & Cooperrider, 2013), but often referred to

in the interviews to the negative, the challenging and problematic aspects, the "dark" side of the 4IR, as described as an important process by F. Carreno and Pérez-Escobar (2019) and Wong (2016).

Findings have emphasised that positive and constructive transformation is primarily associated with keeping the human connectivity, conducting positive and employee-orientated communication by providing information about the situation and the organisation's vision and mission. The data feed into work on positive organisational psychology of Davenport et al. (2016), showing the employees value, for example working from home, slow changes and increased leisure time; however, the findings in this study expand the previously conducted studies in developed countries (as Davenport et al., 2016). These findings show that for the positive transformation of the 4IR, challenges of developing countries (e.g. high unemployment rate, unskilled labour, lack of IT skills and controllers and specialisation) specific to developing countries need to be taken into account. Further, the embedding context, here, the South African society, also needs to be anticipated as influencing with its socio-cultural and political system (e.g. employment equity, study assistance, post-apartheid scenario etc.).

Generally, findings show the key factors needed for a positive and constructive transformation into 4IR, striving for the human condition and functioning from different philosophical, theoretical and methodological stances and is based on new technologies, value sets and aims, as in Shamim et al. (2016). Findings show clearly that the employee management and thereby the human factor at work is the most important aspect to drive the 4IR in a meaningful and positive way – it is not the technological and system change aspect, as often highlighted in 4IR documents in developed countries such as Germany or the US which do not necessarily take on a positive psychology perspective. Optimal functioning, as the findings show, depend on firstly a positive communication which provides employees with the idea of being informed and able to understand and manage the situation and contribute to it in a meaningful way. Secondly, findings show that optimal functioning is based on a successfully balanced human-machine interaction in which human connectivity and drive is viewed as the most important force – not as one could have expected the technological advantages (smart solution, automation improved online processes, use of robots, 3D modelling etc.) as such.

This perspective feeds into Levin (2018) who has highlighted the importance of concepts and interests beside technological conversion. Further, the technological and systemic change seems rather be seen in a split mindset which is anchored in between

excitement for innovation and fear for change and loss of control. As Schwab (2017) has pointed out, the 4IR is about technological innovations – as shown in the findings – but it is shown here that in the end it is even more about (re-)defining the meaning of the employee and employee communication and interaction with other employees, but also with machines. It is not necessarily about technological innovation as such (technological advantages, new realities, big data, new systems, new possibilities to overcome language barriers), but rather leads to questions how the work is organised in new and innovative ways (speed, effectivity, planning, organisational culture, learning cultures, lifelong learning and training, new skills, paperless office), but also about the question how to interact with the environment (societal context and embeddedness of the changes, nature, community, politics and adjustment of the 4IR based on an evaluation of advantages and disadvantages). Finally, a positive driven 4IR is also about networks and cooperation between different actors in the complex fields (university, businesses, consultants, intercultural interactions to cut down on language barriers and creating new virtual and online cooperation). The complexity as described by Schwab (2017) is reflected in the findings, although the findings show rather a focus on the human connectivity based on technology than the innovation of technology as such.

As highlighted before, the participants do not only focus on the positive drive into the 4IR, but also highlight challenges, as mentioned by the WEF (2017), such as cybersecurity needs, and upskilling or problems related to intensified AI, robotics, job loss and threats based on digitalisation. The findings further support Berger (2018) and the WEF (2018a, b) in so far that politics, cooperation, new ways of learning, social technologies and teamwork will be positive key aspects in the 4IR transformation. As presented by WEF (2018b), developing countries might experience most challenges in a low trust between social players, federal government, astronomical expenditures of research, innovation and failure. The findings also shed light on concerns that this scenario is part of the challenges of developing countries. However, it needs to be clearly stated that the focus of the findings is rather on the idea that the internal processes within the organisation are of primary concern for the participants of the study.

The factors which need to be taken into account in developing countries, such as South Africa (WEF, 2018b), are also partly emphasised in this study, such as strong networking (to counteract disintegration and fragmentation), innovation, ecological care and care of institutions within the immediate context of the organisation, change in educational setting, upskilling, increased (technological, online) infrastructure and policy alignments. Findings further support Cunningham's view (2018) that the 4IR from a German viewpoint refers to

the intelligent networking of machines and processes for business, flexible production, convertible and reconfigurable factories, customer-oriented solutions, optimised logistics, use of data and a resource-efficient circular economy. All of these aspects are also taken into account in this German-led organisation that was studied. Managers also highlight the processes mentioned by Bogner et al. (2016), such as digitalisation, flexibility of products and processes, automation, extensive networking and decentralised control mechanisms, as well as a data acquisition and integration through information and communication technologies. Managers in the organisation refer to all of these aspects as well; however, they integrate them far more with the idea of the importance of human-machine balanced interaction and workplaces, human connectivity, communication and interaction. The German perspective presented by Bogner et al. (2016) with the focus on automation and digitalisation in South Africa therefore seems to be far too limited and needs to be expanded by the human factor when striving for a positive, constructive and successful transition of German enterprises in South Africa.

Finally, in terms of the movements of PP1.0 and PP2.0, the findings show that the strengths of the 4IR will evolve, and then the fear of the unknown and the insecurities are transformed into optimism, hope, locus of control, creativity, self-esteem, emotional intelligence, empathy, humour and gratitude, as factors of PP1.0 mentioned by Lopez and Snyder (2003). Further, the study shows that employees are aware of the ambivalent nature of the 4IR for themselves, the organisation, the society and the environment; however, they do not seem to be too appreciative of this experienced ambivalence yet, as promoted in PP2.0 (Lomas & Ivtzan, 2016). Additionally, the managers do not focus outspokenly, explicitly and mindfully on the mental health and well-being as key factors in driving the 4IR forward. They, however, do refer to it implicitly by emphasising the importance of human communication, connectivity and interaction as the foundation for controlled technological advantage. With regard to the PP2.0, this interplay of positive and negative, of the subtle, dialectic nature of life and work (Wong, 2011) is implicitly referred to in the data; however, managers need to become even more aware of this. Lomas and Ivtzan (2016) have referred to the possible negative impact of anxiety for organisations, and it is supported in this study that fears of the employees one of the most important mentioned factors that need to be cared for by the organisation to transform positively and successfully into 4IR. The study further supports Ivtzan et al.'s (2016) perspective that a more mindful, aware and appreciative mindset of employees might contribute well to inner growth, insight, healing and transformation in 4IR processes by working through the PP2.0 pillars (Wong, 2011, 2016a, b)

of virtue, meaning, resilience and well-being, supporting the development of a human and strengths-based 4IR organisational culture.

**Limitations**

The study is limited to presenting the perspectives of 16 managers in one selected German engineering organisation. Its evaluations reveal subjective insights and experiences of individuals working in a highly specialised engineering field in post-apartheid South Africa. Therefore, the findings might provide a very selective and limited scope. The study does not aim to proclaiming potential generalisations, but rather contributes views of managers in the described field who are mainly South African male citizen from a specific cultural background and Afrikaans and English as their first languages. The findings therefore are limited within their theoretical and methodological scope and are presenting rather in-depth insights into subjective thoughts and experiences of the 4IR which can provide ideas for future research, organisational practice and consultancy from a positive psychology perspective.

**Conclusions**

The study responds to the question: How can organisations transform constructively towards the 4IR? To respond to this questions, empirical data were collected through qualitative interviews with managers of different managerial levels in a single German engineering company in South Africa. The findings show that five highly important themes, such as: 1. Employee management; 2. Innovative technological and systemic change; 3. Work organisation; 4. Environment; and 5. Network and cooperation, are discussed by the managers as drivers of the constructive and positive changes within the organisation towards the 4IR.

Taking the overall findings into consideration, managers have a split mindset about the 4IR and their value for humanity, the world, the society, the organisation and themselves. They do have many creative ideas how the organisation needs to transform to stay successful, creative and effective in future. However, at the same time, several employees are sceptical with regard to the environment and how the organisation will be able to transform to meet the challenges of the 4IR, specifically within the 4IR South African workplace.

Findings show in the mirror of previous research literature that technologisation is important; however, the study aims at setting a shift in focus on the 4IR within the German organisation in the South African context. Humans within the South African context will most probably function at their bests for the 4IR when they experience that the most important

factor in the 4IR is and remains the human factor, not the technology. The keys to success therefore lie in:

1. the human connectivity, the human interaction and the integration of various stakeholders within the organisational system and across organisations and organisational sectors;
2. the taking into account of the context of a developing economy on the one hand and the very specific post-apartheid South African situation on the other hand; and
3. the focus on the positive and constructive aspects of the 4IR after working through the main challenges and integrating the "dark" side through PP2.0 approaches.

The authors support the call of Butollo and Lüthje (2017) that the debate on the 4IR needs to proceed; however, it is argued here that this debate calls for the working through the dark and negative aspects with the aim of focusing on the optimal functioning, human connectivity, meaningful and balanced human-machine interaction while taking the systemic and integrating context of the cultural, political, societal, historical, economic and social systems into account.

**Recommendations for future research and organisational practice**

Findings lead to recommendations for future research and theory development: Further research is needed to explore the importance of PP1.0 and PP2.0 concepts of future-orientated 4IR organisations and their underlying concepts. Research should also address strategies to deal with ambiguities and ambivalences regarding change in positive and constructive ways. Another aspect that will need to get more attention in future will be ways how to deal with employees, how to prepare them for the 4IR and how to manage human-machine interaction in the optimal and post positive way. Future research also needs to evaluate which cognitive, affective and behavioural concepts can support positive and constructive management to transform organisations into the 4IR at its best. Best practice strategies should be theoretically researched before practical solutions can be found and implemented. Further, research should specialise more in 4IR transformations with regard to the context of the organisation and their cultural, social, economic and political aspects. Thereby the circumstances in developing and developed countries need to be differentiated.

On practical levels, it is recommended that management of organisations to transform optimally should focus on the constructive and positive sides of the 4IR while taking the dark sides into account and working through them. Awareness on all levels of the organisations

need to be created, adequate communication strategies need to be found and negative emotions need to be explored and transformed into positive emotions. Industrial and organisational consultants should focus on positive psychology perspectives and develop concepts which are holistic and systemic in nature, including all different elements of the organisation and its networks and cooperation partners. PP2.0 concepts in consultancy will support positive, constructive and value-based growth and developments in 4IR organisations which will help individuals and organisations to transform more smoothly into a balanced, context-specific 4IR.

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