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# Public Opinion in the Age of Automation: South Africa and the Fourth Industrial Revolution

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**Abstract**

The fourth industrial revolution, a socio-technical ideal of a positive and desirable future, was institutionalised in national settings across the world. It's potential impact on South Africa has been repeatedly questioned. Without a doubt, technology in the current era affects every element of human life to a depth and breadth unimaginable to man. Using data from the South African Social Attitudes Values (SASAS), this research explored the variables impacting public perceptions towards the fourth industrial revolution. The paper employed a quantitative methodology (regression-based analysis) and found that attitudes are shaped by diverse demographic variables: age, gender, race, and employment status. The main premise was the opposition citizens expressed towards human labour being replaced by robotic services. This article argues that the urgent need for modern technology must be balanced with a careful consideration of societal goals and values before advancing new innovations. To mitigate potential negative outcomes, it is crucial for the South African government and relevant authorities to consider the concerns and objections raised by citizens.

***Keywords:*** *Fourth Industrial Revolution (4IR), public opinion, automation, techno-skeptic, techno-pessimism*

## 1. Introduction

Technological advancements and industrialisations have been crucial components of economic development worldwide. The fourth industrial revolution (4IR) and those industrial revolutions that have occurred throughout history have a key feature in common: they triggered a change in economic systems and social structures (Serumaga-Zake & Van der Poll, 2021). New technologies are quickly spreading throughout society and changing how our cities, economies, and political systems operate. Despite what its appellation might imply, the 4IR's effects will be felt throughout a much wider spectrum of society (Vicente & Dias-Trindade, 2021). Despite triggers caused by technological advancements, the world instead has been mesmerised with the hype of potential benefits that the fourth industrial revolution may bring. This has lead many to not consider if these potential benefits are tailormade for all economies and social contexts.

There is no denying that we live in a technological age; thus, it is interesting to consider how we may use technology to satisfy our needs in the present (Chukwujekwu & Ewelu, 2020). Everybody is familiar with and uses technology; it is present everywhere. The processes and products of technology, whether in mass production, engineering or medicine, do not demonstrate a lack of attention (Chukwujekwu & Ewelu, 2020). However, most of these technological advances do not originate in African societies and contexts; therefore, it is imperative to question the role of these advances without blindly embracing them.

Since there is no consensus or consistent approach to technical growth in modern Western industrial culture (Chukwujekwu & Ewelu, 2020), determining how to develop resources, whether to exploit species of animals or develop new technologies and how to govern them, is a contentious issue in modern society (Chukwujekwu & Ewelu, 2020). As a result, the technology crisis we are currently experiencing can be linked to outdated technological theories that govern how mankind uses technology. Governments have been prompted to get ready to take advantage of the fourth industrial revolution since it has been promoted to the world as being just around the corner for many societies. This strategy is problematic because it is based on the incorrect assumption that all technology will be beneficial to everyone and needs to be pursued at all costs.

As a rallying cry and rhetorical tool for those striving to build economic and commercial futures in the hopes of an economic upheaval brought on by "extreme automation and extreme connectivity," the 4IR is not the product of thorough historical research (Sutherland, 2020). Manufacturers and the World Economic Forum (WEF) have been actively pressing governments to amend their policies to boost the adoption of 4IR technologies and to lessen their negative socio-economic repercussions. These neoliberal initiatives could have negative employment effects, low pay, and increased inequality (Sutherland, 2020).

Given the predicted socio-economic effects the 4IR presents, it is expected that citizens may feel that technological development presents serious threats to their livelihoods. Although it is documented that some governments have made efforts to put in mitigating strategies to respond to some of the predicted changes, it is also important to review areas in which citizens show scepticism (Manyika et al., 2017). Most policymakers who enjoy focusing their narrative on success stories about technology tend to ignore those who critically analyse the side-effects of technological progress (Nam, 2019). Currently, South Africa is seeking strategies to harness the 4IR and is neglecting analysing its side effects. "Likewise, laws, customs, and citizen attitudes have not changed to meet the challenges posed by technology advancements" (Nam, 2019, p. 40). Policies that address these changes and further consider the desires of people who are potentially or immediately in danger of technological unemployment should be established (Nam, 2019). On this premise, this study stems from an unpublished thesis by the author and seeks to address the following questions: What influences citizens attitudes towards the fourth industrial revolution? How concerned are South African citizens about job replacement by robotic automation? How confident are South African citizens that the government will mitigate their concerns? How comfortable are South African citizens about robotic services?

In answering these questions, I used data from the South African Social Attitudes Survey (SASAS) from the Human Sciences Research Council (HSRC, 2018). The paper consists of six sections, including the introduction. The second section looks at literature on attitudes toward industrial revolutions, which is based on the first research question. The third section looks at reviews of policy options that respond to automation-driven unemployment, which addresses the third research question. The fourth section looks at the research methods and variables used to analyse public opinion data. The next section looks at the results

of the analysis and looks at policy implications. Last of all the paper offers concluding remarks.

## 2. Attitudes toward industrial revolutions and technological developments

Technological changes and new developments are known for the significant changes they bring in areas such as workplaces, social interactions, and the future of humans. For instance, in research conducted in preparation for the 4IR, Hahm (2018) examined the attitudes and performance of workers. Self-efficacy, expectations, and change acceptance were revealed to be important factors for workers as they prepared for the 4IR. Examining employee attitudes toward many factors was necessary (Hahm, 2018). These factors, which were connected to the development of new opportunities, have a significant impact on performance and how it will evolve in the 4IR period. This study demonstrated how particular attitudes enhance performance-related 4IR aspects, and adoption of these attitudes will, in turn, result in a more successful 4IR era adaptation (Hahm, 2018).

Public opinion has influenced policy results in the U.S., particularly those relating to immigration, free trade, international wars, and climate change mitigation (Caughey & Warshaw, 2018). It is anticipated that the public's influence on Artificial Intelligence (AI) policy will grow over time, just as it has in these other policy areas. Therefore, it is crucial to have a deeper awareness of what the public believes about AI and AI governance. Such comprehension is crucial for formulating wise policies and spotting chances to teach the public on the nature, advantages, and hazards of AI (Mertala, Fagerlund & Carledon, 2022). The American public's perception of AI governance was examined in a study by Zhang and Dafoe (2020) using an innovative, large-scale survey (N = 2000). Most Americans (82%) think that robots and/or AI should be properly controlled. Additionally, Americans believe that it is crucial for tech businesses and governments to carefully manage each of the 13 AI governance concerns identified in the poll. This number is close to survey results from respondents living in European Union countries.

Research on public opinion about scientific and technical (S&T) advancements in South Africa dates to the 1970s. It was motivated by the notion that innovation in S&T is crucial to national success and that innovation needs a receptive public (Besley, 2013). However, scientists' main concern in starting research projects was that rising public cynicism in Western countries would result in changes to support for scientific

initiatives. As a result, public opinion polls are now routine in many countries. The underlying proposition of this field of study is that interest in and knowledge of science both have an impact on attitudes about science (Raza, Singh & Shukla, 2009). The results of these ideas then affect things like voter support for government spending. Preliminary research indicates that South Africa stands out from other countries due to its distinctive public attitudes toward science and technology (Besley, 2013). South Africans generally display a spectrum of attitudes toward science and technology in the study (S&T). Scientific literacy is positively connected with the public's attitude toward science according to surveys conducted in many countries (Sturgis and Allum, 2004). A meta-analysis found a tenuous but positive correlation: people are more likely to support public funding of science if they have a positive opinion of it (Allum, Sturgis, Tabourazi & Brunton-Smith, 2008). Additionally, socio-demographic factors seem to have an impact on positive attitudes toward science, technology, engineering, and math (S&T) and higher literacy levels, with the most important ones being gender, age, and education levels (Munoz, Moreno & Luján, 2012).

Long debated has been the connection between attitudes toward science and technology and knowledge of science (Besley, 2013; Catto, Jones, Kaden & Elsdon-Baker, 2019). The deficit hypothesis, which contends that if people were simply more knowledgeable about science, their attitudes would change and scepticism would dissolve, has long been a tenet of research (Bauer, Allum & Miller, 2007). Western countries have therefore developed several educational initiatives. Some have questioned both the general nomenclature and the effectiveness of such initiatives (Bauer et al., 2007). Studies conducted in Europe have revealed that, in contrast to post-industrial nations, industrially developing nations have a lesser association between scientific literacy and social attitudes towards science and technology (S&T) (Munoz et al., 2012). According to the argument, knowledge is only accessible to select elites in industrialised countries (where socio-economic disparity is considerable), and greater knowledge encourages a more optimistic outlook. Guenther and Weingart (2016) also looked at the factors that influence people's opinions of science and technology. Since people's comprehension of the 4IR affects how they feel about science and technology, one of the study's objectives is to ascertain how knowledgeable South Africans are about it.

Recent studies attempting to ascertain public opinion on the 4IR have tended to concentrate on the adoption of technology across a range

of industries, such as how educators and academics feel about innovative teaching techniques (see, for example, Govender, 2012; Maisiri, 2020; Oke & Fernandes, 2020). Other studies also investigated how respondents thought 4IR technologies affected workplaces (see, for example, Mhaka, 2020; Mille, 2019). Most studies on the fourth industrial revolution, however, concentrate on its outcomes rather than the thoughts, opinions, and impressions of the general populace. Since they employ qualitative approaches, other recent studies on the fourth industrial revolution and public opinion in the South African context are often not generalisable (Morathi, 2020). Some quantitative studies are district-specific and cannot be generalized since they are not national representative (Lekhanya, 2019). This research attempts to address the gap in the use of quantitative public opinion data to assess opinions toward the fourth industrial revolution in South Africa because few studies use a nationwide representative sample in South Africa.

The fourth industrial revolution (4IR) represents a significant shift, integrating physical, digital, and biological technologies and redefining sectors globally. This convergence—seen in AI, big data, IoT, and blockchain—has both profound potential and inherent risks as technological development is led by powerful corporations and governments often with vested interests (Ndzendze, Singh & Timm, 2024). Major players like IBM, Google, Huawei and OpenAI wield considerable influence, often shaping 4IR advancements to serve the interests of dominant groups, potentially at the expense of marginalised communities, particularly in the Global South. The involvement of African labour in the development of popular technologies, which is often undercompensated and unrecognised, exemplifies this inequality (Kwanya, Kibe & Nyagowa, 2023). Historically, technological innovation has aligned with power structures and sometimes perpetuated inequality. Therefore, as the 4IR transforms societal structures, it presents not only a technological shift but a complex socio-economic challenge, necessitating critical engagement from humanities and social sciences to examine power dynamics and foster equitable, human-centred futures (Mthombeni & Mtapuri, 2024).

## 3. **Policies on automation and its contribution towards unemployment**

The role of the government and policymakers is crucial in dealing with unemployment that is a direct result of automation (Nam, 2019).

Essentially, policymakers can support people's ability to retrain and acquire new skills, which will boost their competitiveness in the labour market of the future (Nam, 2019).

Tax-based measures are thought to be effective treatments for this issue, including earned income tax credits, negative income taxes, and robot taxes (Nam, 2019). Furthermore, due to the enormous expense, offering job guarantees is viewed as a last option in situations of acute unemployment. Governments are working on steps to broaden the social safety of workers in addition to these progressive tactics, in which programs are directed to provide basic shelter, food and healthcare to those low-income families (Nam, 2019). In this regard, there are four principles that stand out that are efforts made to ensure the transition to automation does not bring socio-economic disorder. The first principle we find is the universal basic income, which is now being tested in four advanced economies, namely: Australia, Canada, Finland and New Zealand. This is done on a limited scale to serve as an unconditional financial safety net (Nam, 2019). No matter their employment situation or income, every person receives a regular pay cheque from their government. This shows that governments can increase social safety networks while maintaining their budgets (Nam, 2019).

The second principle, ensuring human worker quotas, would help regulate the appropriate scope and size of robotisation by limiting robot quotas to dangerous jobs (Nam, 2019). The legislation establishing labour quotas is expected to preserve their rights. Any industry may be required to maintain a human quota, and the value of the "made by people" label could be increased (Nam, 2019). Thirdly, governments may establish a list of duties that should only be performed by people in accordance with the quota plan, and they may increase the pay of those who complete those jobs (Nam, 2019). This tactic is designed for professions that require emotional ties with people, such as childcare, nursing, and psychological counselling (Nam, 2019). Finally, a government may consider having an initiative that pays displaced people to do some work. The government might then act in response to the rising demand for social programs to assist workers in meeting their basic needs.

China and other Asian economies' stifling impact, together with their distinctly different institutional and economic systems, have hindered developing countries' ability to replicate the triumphs of the Asian tiger economies (Sutherland, 2020). There is currently minimal domestic demand for manufactured goods, and many countries are actively competing for any industrial space that is available by paying extremely

low wages, which further decreases domestic demand and increases reliance on exports to international markets (Sutherland, 2020). To mobilise and sustain the rise of consumer and intersectoral demand, there is a decreasing amount of room for export-led industrialisation and a growing reliance on domestic development strategies (Sutherland, 2020).

The objectives of the South African industrial strategy have aimed to foster economic growth, in part by luring foreign direct investment, while also maintaining and creating jobs. Nevertheless, the 4IR runs the risk of eliminating jobs through automation, mass customisation, and robotisation while perhaps bringing production closer to consumers and using more recycled materials (Sutherland, 2020; Harvey, 2019). Understanding the underlying technologies and the business techniques employed by those attempting to use them to disrupt international markets are prerequisites for their acceptance (Sutherland, 2020). Due to the mixed emotions and trust surrounding the 4IR, it is imperative to seek out critical engagement and comprehension of the operational procedures. However, some alternatives are obvious, such as raising research and development spending, increasing the number of students majoring in STEM (science, technology, engineering, and mathematics), mandating school system reforms, and settling disputes over the amount of student fees (Booysen, 2016).

## 4. Data and methods

In-depth survey data from the 2018 South African Social Attitudes Survey (SASAS), conducted by the Human Sciences Research Council (HSRC), was used in this study (N = 2736, South African adults). This data was re-analysed to respond to the research questions of the study. The University of KwaZulu-Natal granted ethical permission for the use of the data in my research for the thesis on which this article is based. The protocol reference number is HSSREC/00002210/2020.

The study's outcome variable is a composite index of attitudes toward technological change, or the 4IR. To reflect how these technologies affect respondents' social and economic lives as well as their overall quality of life, it is based on questions that asked respondents to rate how comfortable or uncomfortable they felt in various scenarios involving 4IR technologies, such as the use of robots (such as robotic surgery, drone delivery, and self-driving cars) (HSRC, 2018).

To indicate social privilege and disadvantage, additional socio-economic indicators such as gender, age, population group, social class, and expertise were included as separate socio-demographic variables. A more detailed record of the respondent's highest educational degree was used to produce the category variable known as "educational achievement." The set of variables used in the study includes matriculation or its equivalent, "primary or no formal education" (the reference group), "incomplete secondary education," and further education. Using a dichotomous variable, we gauged internet accessibility. "Subjective class is assessed using an 11-point top-to-bottom self-placement scale. The employment status variable used in the study is a straightforward classification of whether the respondent is actively employed in the labour market. It is combined with a British Social Attitudes Survey measure of perceived personal job danger" ("very/quite worried vs. not very/not at all worried") (HSRC, 2018).

"Employed but not worried about 4IR threat," "Employed and worried about 4IR threat," and "not in the labour market" were the resulting categories. This was made to keep track of one's self-reported vulnerability to automation in the workplace. Self-rated competency is assessed based on whether respondents feel they are competent enough to use computer and Internet technologies for their daily lives. The options are "totally disagree" (5) and " totally disagree" (1) on a five-point scale. Based on responses to the query of "How confident are you that the South African government can ensure that new technologies do not contribute to job losses?" respondents had to rate their responses from "not at all confident" (1) to "extremely confident" (4).

**Sampling methodology and representativeness**

The South African Social Attitudes Survey (SASAS) (HSRC, 2018) employed a complex, multi-stage probabilistic sampling design targeting adults (16 years and older) across the nation. The sampling frame was drawn from the latest national census, organised into Small Area Layers (SALs) as primary sampling units with institutions (e.g., hospitals, military camps) excluded to focus on private households. The sampling procedure included three stages: (1) SALs were selected based on provincial demographics and urban/rural distribution with probability proportional to the number of residential units, ensuring comprehensive national coverage; (2) within each selected SAL, a pre-set number of dwelling units were chosen at random; and (3) in each selected dwelling,

one adult was randomly surveyed. Additionally, explicit stratification variables—province, geographic type, and predominant population group—were applied to ensure representation across key demographics. Weighting adjustments addressed any non-response imbalances, aligning the sample closely with national demographic distributions.

## 5. Results

Associations between socio-demographics and attitude towards the fourth industrial revolution were tested using one-way analysis. Table 1 summarises the findings. The ANOVA result reveals that there was a statistically significant gender difference. (p 0.001). According to the mean value calculated, female respondents had a more favourable opinion of the 4IR than male respondents. The ANOVA value shows that there was a statistically significant difference between the age groups (p 0.001). The oldest respondents (93 and over) have higher negative opinions toward the 4IR, according to the mean value (1.5185) measured, than the younger respondents (16–30) which had a mean value of 1.3750. The second age group of respondents (31-61) had a mean value of 1.3935, which is also lower than the older respondents, suggesting that younger age groups tend to have more optimistic attitudes.

The ANOVA result shows that there was a statistically significant difference in terms of race (p 0.001). Compared to other races, coloured respondents appear to have more favourable sentiments regarding the 4IR, according to the mean value of 1.3540. Compared to other races, white people exhibited more negative opinions toward the 4IR with the highest mean value of 1.7460. Africans also typically see the 4IR more favourably, with a mean of 1.4231. The ANOVA result shows that there was a statistically significant difference in job status (P = 0.036). The average figure found indicates that, compared to those who are employed, those who are unemployed (1.4336) have higher favourable sentiments toward the 4IR (1.4853).

The ANOVA value shows that there was a statistically significant difference in education level (p 0.001). The average result indicates that individuals with basic school education (1.2682) have more favourable opinions regarding the 4IR, whereas those with postgraduate degrees had a negative attitude (1.9643). This intriguing finding is challenging to explain, and additional South African research on the connection between educational attainment and views about the 4IR is required. The ANOVA value shows that there was a statistically significant difference

in household income (p 0.001). According to the median value, respondents with a household average monthly income of R5001–R10,000 (m = 1.3418) are more likely to have favourable sentiments toward the 4IR. Those who earned R50 000 and more (m = 1.8158) had more negative attitudes towards the 4IR.

***Table 1:*** *Demographic composition of the sample*

| Micro-level indicators | Number | Mean | Standard deviation | P value |
|---|---|---|---|---|
| Gender | | | | |
| Female | 1449 | 1.4082 | .56312 | 0.000 |
| Male | 1222 | 1.4973 | .59640 | |
| Age group | | | | |
| 16-30 | 813 | 1.3750 | .53033 | 0.000 |
| 31-61 | 1389 | 1.3935 | .56596 | |
| 62-92 | 467 | 1.4271 | .56713 | |
| 93 and above | 2 | 1.5185 | .60450 | |
| Race | | | | |
| Black African | 1694 | 1.4231 | .56727 | 0.000 |
| Coloured | 404 | 1.3540 | .55667 | |
| Indian/Asian | 319 | 1.4647 | .56716 | |
| White | 252 | 1.7460 | .62044 | |
| Other | 2 | 2.6250 | .53033 | |
| Employment status | | | | |
| Employed | 780 | 1.4853 | .60242 | 0.036 |
| Unemployed | 1878 | 1.4336 | .56991 | |
| Level of education | | | | |
| No schooling | 124 | 1.3105 | .47109 | 0.000 |
| Primary school | 398 | 1.2682 | .47990 | |
| Matric | 1775 | 1.4637 | .57543 | |
| Certificate | 97 | 1.6624 | .67704 | |
| Diploma | 120 | 1.5188 | .64834 | |
| Degree | 119 | 1.6239 | .66533 | |
| Postgraduate | 14 | 1.9643 | .81369 | |
| Household income | | | | |
| No income | 137 | 1.4142 | .57076 | 0.000 |
| 1-5000 | 1074 | 1.3541 | .54519 | |
| 5001-10000 | 237 | 1.3418 | .51438 | |
| 10001-20000 | 193 | 1.5117 | .62150 | |
| 20001-50000 | 122 | 1.6209 | .62756 | |
| 50+ | 19 | 1.8158 | .78547 | |
| Refused to answer | 880 | 1.5514 | .59205 | |

## 5.1 Descriptive statistics and graphical analysis of bivariate relationships

In this study, bivariate analyses were conducted to explore the relationships between key demographic variables and public attitudes towards robotic services, which is a core component of the Fourth Industrial Revolution (4IR). Specifically, the analysis aimed to determine whether age, confidence in government intervention, and perceptions of

school preparedness influence comfort levels with automation and robotic technologies. The Chi-square test was employed to assess the association between these variables and attitudes, while the odds ratio was calculated to quantify the strength of these associations.

Tests were carried out to test the odds of younger people accepting robots more than older people. This involved the analysis of the two variables of age and attitude for the purpose of determining the empirical relationship between them. The Chi-square test indicated that younger people (45.7%) were more comfortable with robotic services when compared to older people (37.9%).

***Table 2:*** *Bivariate analyses assessing the association between age and attitudes towards robotic services*

| | | | Attitude | | Total |
|---|---|---|---|---|---|
| | | | Uncomfortable | Comfortable | |
| Age | Young | Count | 740 | 623 | 1363 |
| | | % within age | 54.3% | 45.7% | 100.0% |
| | Old | Count | 812 | 496 | 1308 |
| | | % within age | 62.1% | 37.9% | 100.0% |
| Total | | Count | 1552 | 1119 | 2671 |
| | | % of total | 58.1% | 41.9% | 100.0% |

The odds ratio in Table 2.1 shows that younger people were significantly more comfortable with robotic services when compared to the older people (UOR: 0.726; 95% CI: 0.622–0.847; p<0.001).

***Table 2.1:*** *The odds ratio showing the perceived influence of age on 4IR acceptance*

| Variables | Unadjusted OR | (95 % CI) | p-value |
|---|---|---|---|
| Age<br>≤ 40 years vs > 40 years | 0.726 | 0.622 – 0.847 | 0.001 |

## 5.2 How confident are South Africa citizens that the government will mitigate their concerns?

The respondents were asked how confident they were that the South African government will be able to stop job losses brought on by new technologies. The information in Figure 1 indicates that more than half

of the respondents (58%) lacked confidence/trust in the government's capacity to halt employment losses brought on by new technologies. This demonstrates that a sizable majority of respondents were not being persuaded that state policy measures were adequate to handle any negative labour effects that automation would have in the years to come (Roberts et al., 2022). The less economically privileged have a propensity to be more sceptical of the state's ability in this area than economically privileged South Africans. According to all indications, South Africa is unfortunate to be in a state of low technical readiness. The South African government should create new approaches to policy to embrace the 4IR and harness its promise while minimising negative effects.

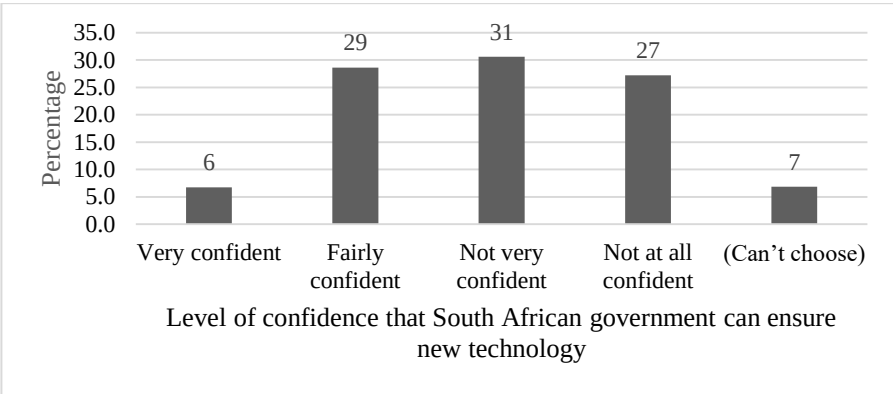



Figure 1: Confidence in South African government

Further bivariate analyses were carried out to test the odds of those who were confident in the South African government's intervention against those who were not confident to accept robotic services. The Chi-square test indicated that those who were confident in the South African government's intervention (51.4%) were more comfortable with robotic services when compared to those who were not confident (36.7%).

***Table 3.*** *Bivariate analyses assessing the association between confidence in South African government intervention and attitudes towards robotic services*

| | | | Attitude | | Total |
|---|---|---|---|---|---|
| | | | Uncomfortable | Comfortable | |
| Level of confidence in South African Government intervention | Confident | Count | 459 | 485 | 944 |
| | | % within confident | 48.6% | 51.4% | 100.0% |
| | Not confident | Count | 1093 | 633 | 1726 |
| | | % within confident | 63.3% | 36.7% | 100.0% |

| | | | | |
|---|---|---|---|---|
| Total | Count | 1552 | 1118 | 2670 |
| | % of total | 58.1% | 41.9% | 100.0% |

The odds ratio in Table 3.1 shows that people who were confident in the South African government's intervention were significantly more comfortable with robotic services compared to those who were not confident in such intervention (UOR: 0.548; 95% CI: 0.467–0.644; p<0.001).

***Table 3.1:*** *Perceived influence of confidence in South African government intervention and attitudes towards robotic services*

| Variables | Unadjusted OR | 95% CI | p-value |
|---|---|---|---|
| Level of confidence<br>Confident vs not confident | 0.548 | 0.467 – 0.644 | 0.001 |

The Chi-square test indicated that those who believed that schools had not prepared young people to work with technology (61.2%) were more uncomfortable with service automation compared to those who believed that schools had provided adequate preparation (54.8%).

***Table 4:*** *Bivariate analyses assessing the association between belief in lack of school preparation and attitudes toward services automation*

| | | | Attitude | | Total |
|---|---|---|---|---|---|
| | | | Uncomfortable | Comfortable | |
| School preparation | Agreement | Count | 849 | 538 | 1387 |
| | | % within school | 61.2% | 38.8% | 100.0% |
| | Disagreement | Count | 703 | 580 | 1283 |
| | | % within school | 54.8% | 45.2% | 100.0% |
| Total | | Count | 1552 | 1118 | 2670 |
| | | % of total | 58.1% | 41.9% | 100.0% |

The odds ratio in Table 4.1 shows that respondents who agreed that schools had not prepared young people to work with technology were significantly more uncomfortable with automation technologies compared to those in disagreement with this (UOR: 1.302; 95% CI: 1.116–1.519; P = 0.001).

***Table 4.1:*** *Perceived effect of the lack of school preparation and hostility towards service automation technologies*

| Variables | Unadjusted OR | 95 % CI | p-value |
|---|---|---|---|
| Lack of school preparation Agreement vs disagreement | 1.302 | 1.116 – 1.519 | P<0.001 |

The bivariate analysis provides key insights into South African attitudes towards the 4IR, confirming and extending existing research on technology acceptance. Younger individuals are generally more comfortable with robotic services than older ones, reflecting broader trends where digital natives, who are more familiar with technology, show higher acceptance levels. This supports the technology acceptance model (TAM), which links familiarity and perceived ease of use to acceptance (Mthombeni, 2024). Older individuals' discomfort may stem from less exposure to technology and fears of obsolescence. It also reveals that trust in government significantly affects comfort with robotics. Citizens who believe their government will manage technological changes effectively are more likely to embrace these innovations. This finding aligns with research on the role of institutional trust in mitigating technology-related fears, emphasising the need for transparent governance to foster technology acceptance.

Moreover, concerns about inadequate educational preparation for technological work highlight a gap in the education system. This discomfort among those who feel schools are unprepared for the 4IR reflects global concerns about educational readiness for a technology-driven job market. The subsequent regression analysis will further explore and quantify these relationships, providing deeper insights into the factors influencing public attitudes towards the 4IR.

## 6. What influences citizens attitudes towards the fourth industrial revolution?

I independently examined the first model's ability to predict attitudes toward 4IR acceptance and favorability based on knowledge of science and technology and familiarity with 4IR technologies, as shown in Table 5. The findings of module 1 demonstrate that although the association was adverse ($\beta$ = -.064, P = .001), technology knowledge was a significant predictor of favourable sentiments about the 4IR. This

indicates that respondents' attitudes toward the 4IR change as their knowledge of science and technology develops. In contrast, there was a positive connection (R =.125, p = .001) between the familiarity level and favourable sentiments regarding the 4IR. This means that as familiarity with science and technology increases, attitudes toward the 4IR also increase. Overall, the level of familiarity was the strongest predictor of favourable attitudes towards the 4IR, which explains 1.6% ($R^2$ = .016) of the variance in the model. The relative impact of socio-economic factors such as income, work status, internet access, and education on the favourable/positive attitudes towards the 4IR is captured in model 2. According to the model, income is a strong predictor of positive views, and the association was strong (β =.137, p =.001). This implies that persons with varied levels of income are more likely to have an optimistic outlook than those with no money. The second biggest predictor of favourable opinions towards the 4IR was the degree of familiarity (β =.120, p = .001). The familiarity with 4IR technologies persisted as a strong predictor of favourable sentiments in both models.

**Table 5: Predictors of favourable attitudes towards the 4IR**

| Model | | R | $R^2$ | Unstandardized Coefficients | | Standardized Coefficients | F | P-value | t | Sig. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | B | Std. Error | Beta | | | | |
| 1 | (Constant) | 0.127 | 0.016 | 1.435 | .032 | | 21.913 | .000 | 45.269 | .000 |
| | Science & tech knowledge | | | -.034 | .010 | -.064 | | | -3.247 | .001*** |
| | Familiarity | | | .042 | .007 | .125 | | | 6.349 | .000*** |
| 2 | (Constant) | .177 | .031 | 1.034 | .058 | | 29.714 | <.001 | 17.857 | .001 |
| | Income | | .031 | .030 | .004 | .137 | | | 6.937 | .001*** |
| | Familiarity | | .045 | .034 | .005 | .120 | | | 6.349 | .001*** |
| | Internet access | | .053 | .555 | .147 | .076 | | | 3.777 | .001*** |
| | Education level | | .057 | .032 | .009 | .071 | | | 3.467 | .001*** |
| | Employment | | .062 | .050 | .016 | .060 | | | 3.114 | .002** |
| | Age | | .063 | -.028 | .014 | -.039 | | | -1.965 | .049* |
| | Science & tech knowledge | | | | | -016 | | | | |

(1) All models control for province of residence and level of urbanisation. Statistical significance is denoted as follows: *** p<0.001, **p<0.01, * p<0.05. (4) Positive coefficients indicate greater acceptance of robots and automation

While familiarity with science and technology was a significant predictor of favourable sentiments about the 4IR, respondents were asked their level of familiarity with 4IR technologies versus the normal social media platforms. The familiarity with autonomous automobiles, artificial intelligence, and social media sites like Facebook, YouTube, and Twitter is shown in Figure 1. According to the descriptive analysis, most respondents (47%) and (45%), respectively, indicated that they were unaware about artificial intelligence and driverless cars. The data also reveals that while most respondents (45%) know enough about social media sites like Facebook, YouTube, and Twitter to be able to explain it to a friend, a large percentage of the respondents (34%) have heard of but know very little to nothing about them.

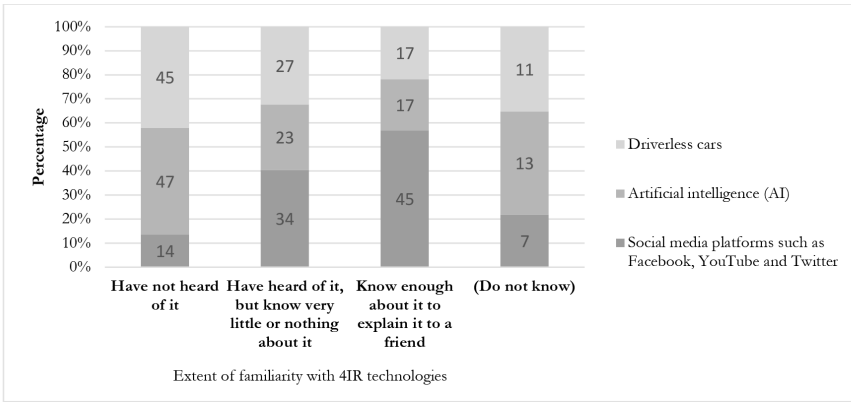



*Figure 1: familiarity with 4IR technologies.*

The important finding is that respondents know more about social media than they would about the fourth industrial revolution. These findings confirm those of a recent study that found South Africa's citizens self-rated knowledge about the fourth industrial revolution to be relatively low (Mtotywa, Moitse & Seabi, 2022). These results demonstrated that understanding of the 4IR is lacking and needs to be improved. Mtotywa et al. (2022, p. 1481), in their study, found a disparity in "knowledge, with

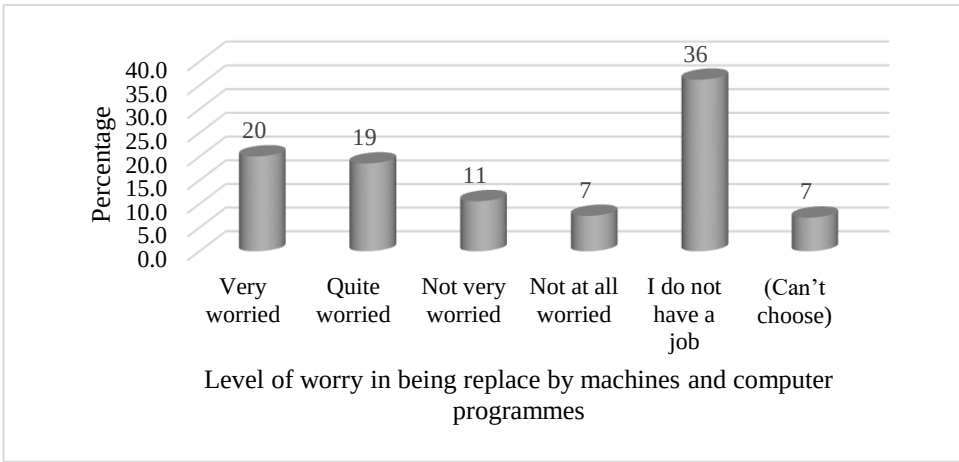
higher knowledge levels identified among participants with higher socio-economic status, is concerning in these findings." With a Gini index of 0.63, South Africa is the nation with the highest level of inequality, further compounding its problems (Mtotywa et al., 2022; Statistics South Africa, 2019).

**How concerned are South African citizens about job replacement by robotic automation?**

Given that the respondents generally agreed that machines and computer programs will replace humans in the workplace in the next ten years, it was prudent to ascertain from the respondents how concerned, if at all, they are that they will be replaced. According to the statistics in Figure 2, 19% of respondents are very concerned, and 20% of respondents are quite concerned about the possibility that their jobs may be taken over by machines or computer programs. Only 17% of respondents reported feeling no fear at all, and 36 % of respondents who were unemployed opted not to report their level of worry. Most participants exhibit techno-sceptical views, with their main concern being that technology will be detrimental in the sense that it will cost them their employment. 36% of participants, a sizable portion, did not describe their level of fear because they did not have occupations that they believed technology may take away from them. Thus, those who do not seem as influenced by technology appear to be less concerned about technology replacing people.

I find that South Africans hold opinions on the possibility that automation will have an impact on the labour market that are nearly equal to those of Britons, according to data from the 2017 Attitudes Survey (European Commission, 2017). However, South African workers are significantly more concerned than those in the UK about how automation would affect their own jobs (38.7% in SA vs. 10% in UK) (European Commission, 2017). Given the widespread worry about the possible threat the 4IR poses to jobs in the future, "how confident is the public that the government can successfully intervene to limit adverse effects of new technologies on the labour market?"

*Figure 2: level of worry about job replacement*




On the topic of job replacement and the level of worry citizens may have, the study further asked to what extent they would support or oppose a private company making this change: "Imagine a private company plans to introduce new computer technology into a factory and that it will make the factory more profitable – but most workers at the factory will lose their jobs" (HSRC, 2018, p. 2). The findings indicated in Figure 3 demonstrate that, on average, more than half (51.2%) of respondents reject the use of the new technology in their sector. This opposition is consistent with the previous question's findings, which indicated that most employed respondents are concerned about being replaced by machines. Workers who are at risk of losing their jobs to technology exhibit neo-Luddite sentiments because they are sceptical of technology and reject it. Only a small percentage (4%) exhibits excitement for technology.

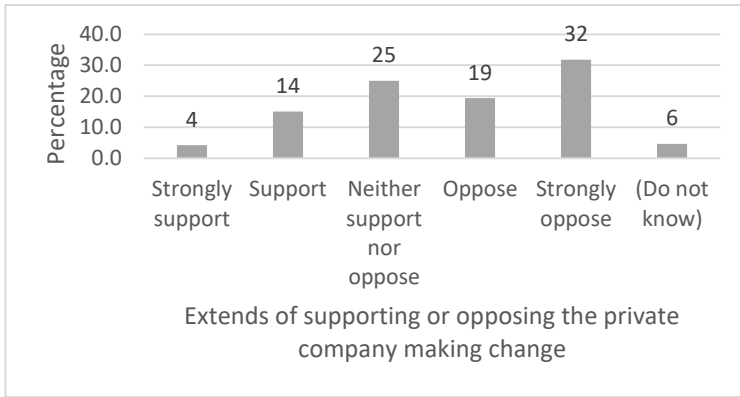



*Figure 3: level of support for introduction of new technologies by private sector.*

**How comfortable are South African citizens about robotic services?**

I began by reviewing the responses to the survey's enquiries regarding the comfort or unease associated with four uses of automation: "(i) having a medical procedure performed by a robot; (ii) factories where workers are replaced by robots; (iii) receiving goods delivered by a drone or a robot; and (iv) stores where cashiers are replaced by robots." The descriptive data in Figure 4 depicts the respondents' attitudes regarding robots. Responses were recorded on a scale ranging from 1 to 10, where 1 represents "completely uncomfortable" and 10 "absolutely comfortable" (HSRC, 2018).

Only 10% to 15% of the participants, as indicated by scores of 7 to 10 on the scale, were, on average, comfortable with any of these situations. With a value of 5 or 6 on the scale, between 19% and 22% of respondents said they would feel only moderately comfortable with certain usage of robots. Between 66% and 70% of participants supplied the normative response, which was one of general unease with such propositions. The scales' average ratings ranged from low (M = 1.40) for having a robot conduct a medical procedure on them. In the event of "factories where workers are replaced by robots," the mean score is (M = 1.42) after that. The highest mean score (M = 1.52) related to receiving items delivered by a drone or a robot, while the midpoint mean score (M = 1.45) related to robots taking the job of cashiers. It is safe to assume that the participants are generally pessimistic about robots taking over human tasks and less hopeful about robots taking over enlisted tasks.

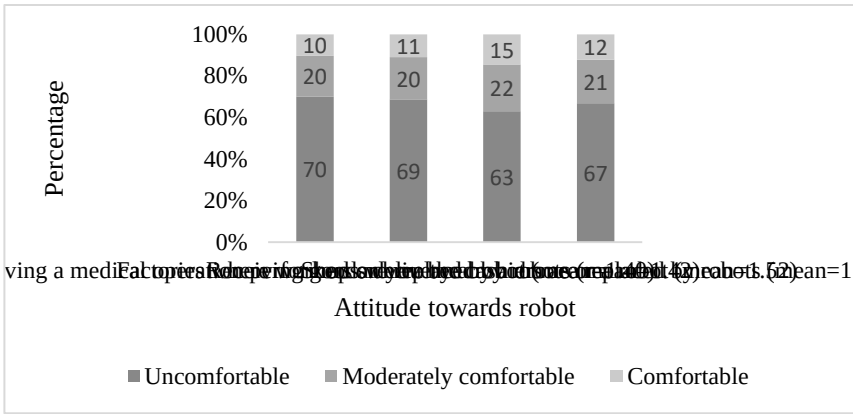



*Figure 4: Attitudes towards robotic services*

## Discussion

The bivariate analysis of public attitudes towards robotic services in the fourth industrial revolution (4IR) in South Africa reveals notable patterns related to demographic variables, confidence in government intervention, and perceptions of educational preparedness. Younger individuals demonstrate a higher comfort level with robotic services compared to older individuals, as indicated by a lower odds ratio for older age groups (Mthombeni, 2024). This trend aligns with the expectation that digital natives are generally more receptive to technological innovations. Confidence in government intervention significantly influences attitudes towards robotics, with those who trust in government measures showing greater comfort with robotic services. This finding emphasises the role of institutional trust in shaping public perceptions of technology. Furthermore, a lack of confidence in the education system's ability to prepare students for technological advancements correlates with greater discomfort towards automation, highlighting a potential gap in the educational framework for the 4IR.

The regression analysis supports and extends these bivariate findings. It confirms that age and confidence in government intervention are strong predictors of attitudes towards robotic services. The regression model shows that younger individuals and those with higher trust in government measures are more likely to have favourable attitudes towards robotics. Additionally, the regression analysis underscores that familiarity with science and technology, rather than just knowledge, is a robust predictor of positive attitudes towards the 4IR, reinforcing the

bivariate result that educational preparedness impacts comfort with automation. Socio-economic factors, such as income and education level, also emerge as significant predictors in the regression analysis, reflecting broader disparities in technological acceptance. Overall, both bivariate and regression analyses illustrate that enhancing familiarity with 4IR technologies, increasing institutional trust, and addressing educational and socio-economic inequalities could improve public acceptance and confidence in automation, facilitating a smoother transition into the technological future (Pulkka, 2017; Rankin, 2016; Reed & Lansley, 2016).

## Conclusion

This study examined public attitudes towards robotic services within the context of the fourth industrial revolution (4IR) in South Africa, highlighting the interplay between demographic factors, trust in government, and perceptions of educational preparedness. The findings revealed that younger individuals exhibit greater comfort with robotic technologies compared to their older counterparts, driven by their inherent familiarity with digital innovations. Trust in government interventions significantly shapes attitudes towards robotics, with higher confidence correlating with more positive views on automation. Moreover, concerns about the education system's preparedness for technological advancements are associated with increased discomfort towards robotics, underscoring the need for educational reform. Regression analysis corroborates these results, confirming that age, government trust, and familiarity with technology are critical predictors of attitudes towards robotics. The study also identified socio-economic factors that influenced public attitudes, emphasising disparities in technology acceptance based on income and education levels. These insights provided a comprehensive understanding of the factors affecting robotic service acceptance and suggest several strategies to foster a more inclusive and supportive environment for technological integration. To address the challenges posed by the 4IR, it is crucial to strengthen social safety nets by providing universal basic income or enhanced unemployment benefits to support workers displaced by automation. This would help mitigate the economic impact on individuals who lose jobs due to technological advancements. Additionally, promoting digital literacy and STEM education is essential for preparing the workforce of the future. By integrating 4IR topics into educational curricula, we can equip students with the skills needed for technology-driven industries

and bridge the digital divide, ensuring that all individuals have access to opportunities in this evolving landscape. Finally, ensuring ethical AI and data governance is vital to prevent potential harms associated with AI technologies. Developing policies that promote transparency, accountability, and fairness in AI and data practices can safeguard against bias, protect privacy, and ensure that these technologies benefit society in a just and equitable manner.

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