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INTEGRATED 4IR SECTOR SKILLS STRATEGY AND PLAN

Final 4IR Sector Skills Strategy Report, including Executive Summary

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List of Acronyms

4IR	Fourth Industrial Revolution
AI	Artificial Intelligence
AR	Augmented Reality
AWS	Amazon Web Services
CATHSSETA	Culture, Arts, Tourism, Hospitality and Sport Sector Education and Training Authority
CHE	Council on Higher Education
CPUT	Cape Town University of Technology
CSIR	Council for Scientific and Industrial Research
DBE	Department of Basic Education
DCDT	Department of Communication and Digital Technologies
DHA	Department of Home Affairs
DHET	Department of Higher Education and Training
DMRE	Department of Mineral Resources and Energy
DPE	Department of Public Enterprise
DSBD	Department of Small Business Development
DST	Department of Science and Technology
DTIC	Department of Trade, Industry and Competition
ECD	Early Childhood Development
EDT	Education Digital Technology Ecosystem
ERRP	Economic Reconstruction and Recovery Plan
ETDP SETA	Education, Training and Development Practices Sector Education and Training Authority
FET	Further Education and Training
HEI	Higher Education Institution
HSRC	Human Sciences Research Council
ICT	Information and Communication Technologies
IoT	Internet of Things

IPAP	Industrial Policy Action Plan
IT	Information Technology
MANCOSA	Management College of Southern Africa
merSETA	Manufacturing, Engineering and Related Services
MICT SETA	Media, Information and Communication Technologies Sector Education and Training Authority
NCPF	National Cybersecurity Policy Framework
NDP	National Development Plan
NGB	National Gambling Board
NMU	Nelson Mandela University
NPO	Non-Profit Organisation
NQF	National Qualifications Framework
NSDP	National Skills Development Plan
NTSS	National Tourism Sector Strategy
OECD	Organization for Economic Cooperation and Development
OFO	Organising Framework for Occupations
PC4IR SIP	Presidential Commission on Fourth Industrial Revolution Strategic Implementation Plan
PSET	Post-School Education and Training
QCTO	Quality Council for Trades and Occupations
RPL	Recognition of Prior Learning
RSA	Republic of South Africa
SEDA	Small Enterprise Development Agency
SETA	Sector Education and Training Authority
SMME	Small, Medium and Micro Enterprises
SSP	Sector Skills Plan
STEM	Science, Technology, Engineering and Mathematics
TIA	Technology Innovation Agency
TP	Training Provider

TUT	Tshwane University of Technology
TVET	Technical and Vocational Education and Training
UJ	University of Johannesburg
UNISA	University of South Africa
UoT	University of Technology
UWC	University of the Western Cape
VR	Virtual Reality
WEF	World Economic Forum
WITS	University of the Witwatersrand
WSU	Walter Sisulu University

Glossary of Terms

Big Data	Large, difficult-to-manage volumes of data, both structured and unstructured that inundate businesses on a day-to-day basis.
Blockchain Technology	An advanced database storage mechanism that stores data in blocks that are linked together in a chain and allows transparent information sharing within a business network.
Cloud Computing	The on-demand availability of computing resources as services over the internet, eliminating the need for enterprises to procure, configure, or manage resources themselves, and only pay for what they use.
Cybersecurity	Collective methods, technologies, and processes that help protect the confidentiality, integrity, and availability of computer systems, networks and data, against cyber-attacks or unauthorised access.
Digital Divide	Gaps in opportunities between different individuals, households, businesses and geographic areas at different socio-economic levels, in accessing ICT, as well as the ability to use the internet for a wide variety of activities.
Digital Inclusiveness	Activities that are necessary to ensure access to and use of ICTs for all individuals and communities, including the most disadvantaged.
Global Competitiveness	The ability of an industry or firm to produce and sell products and services of greater quality, lower costs, and superior innovation than its domestic and international competitors.
Larger Employers	Employers with 50 or more employees.
Policy	An outline of a course of action or statements of guidance adopted by the government of a country, at a national level, in pursuit of national objectives.
Sector	An area of economic activity in which businesses share the same or related business activity, product, or service.
Smaller Employers	Employers with less than 50 employees.
Strategy	Strategic plans designed by governments to guide action, and often the allocation of resources, over a specified period of time and towards the fulfilment of a policy objective.
Sub-sector	An area of economic activity that forms part of one of the larger areas into which the economic activity of a country is divided.

1   Executive Summary

In order to assist CATHSSETA sub-sectors in understanding how they can integrate the 4IR technologies into the different areas in which they operate, CATHSSETA has commissioned the development of a 4IR Integrated Sector Skills Strategy and Plan, including a detailed assessment of interventions to be carried out in achieving sub-sector competitiveness. This is expected to enable organisations within the CATHSSETA sub-sectors to capitalise on existing 4IR opportunities (CATHSSETA, 2022).

Throughout the study, **several key issues** hindering the development of 4IR skills across CATHSSETA sub-sectors were identified. These issues include skills gaps, potential job losses due to automation, lack of access to required 4IR infrastructure, inadequate training supply, the absence of new qualifications, insufficient stakeholder collaboration, and policies that do not sufficiently promote 4IR workforce development and digital inclusiveness.

The Fourth Industrial Revolution (4IR) has brought significant changes to the job market, necessitating new skill sets that are not currently widespread among learners, artisans, and beneficiaries. This has resulted in a skills gap. In this context, skills gaps refer to the mismatch between the skills and competencies that individuals possess and the skills and competencies that are required by employers to meet the demands of 4IR. The skills gap occurs when individuals lack the necessary skills to perform their jobs effectively, and employers are unable to find individuals with the required skills to meet their workforce needs.

There is also a lack of equal access to 4IR training infrastructure, which is a critical issue that requires urgent attention. Additionally, CATHSSETA sectors are faced with lack of understanding of required 4IR skills and the Post-School Education and Training (PSET) system does not sufficiently support the reduction of the 4IR skills gaps. These issues are further compounded by budgetary constraints that limit access to 4IR training, and inadequate capacity among labour forces to utilize 4IR technologies. Another critical issue that arises from 4IR is the potential for job losses due to automation.

Access to required 4IR infrastructure is another significant challenge for 4IR adoption, with many communities lacking access to the necessary resources. Moreover, current training providers are unable to deliver high-quality 4IR training, and the accreditation of training providers does not sufficiently support the development of 4IR skills. This is compounded by the fact that the skills development environment inadequately supports the rapid, large-scale development of 4IR skills, and emerging skills are not rapidly identified and accounted for within organizations. Additionally, there is a shortage of 4IR entry-level qualifications, and stakeholders are generally not sufficiently aware of 4IR.

There is also insufficient stakeholder collaboration, especially with employers, to enhance 4IR skills development in CATHSSETA sectors, with skills supply stakeholder collaboration inadequately supporting 4IR skills development. The Sector Education and Training Authority's (SETAs) do not adequately collaborate to avoid different SETAs developing the same 4IR qualifications and skills. These factors contribute to a less-than-optimal skills development environment.

In addition, current policies, strategies, and frameworks in South Africa are insufficient to promote 4IR workforce development, skills-building, and digital inclusiveness. Therefore, it is imperative that all stakeholders work jointly to address the key issues identified above. Furthermore, it is crucial to address these key issues to effectively develop 4IR skills across CATHSSETA sub-sectors.

Addressing these challenges will require a collaborative effort from various stakeholders, including the government, training providers, and organisations within the CATHSSETA sub-sectors. Understanding and addressing these key issues will be critical as organisations strive to integrate 4IR technologies into their operations.

In order to be able to combat the challenges listed, **4IR visionary statements** were developed guide decision-making and strategic planning for skills development within the sub-sectors. Some of these

visionary statements were tested during the surveys to assess the extent to which these statements are being met, and a dashboard summarizing the findings was also created as per below.

Figure 1-1: 4IR Visionary Statement Dashboard
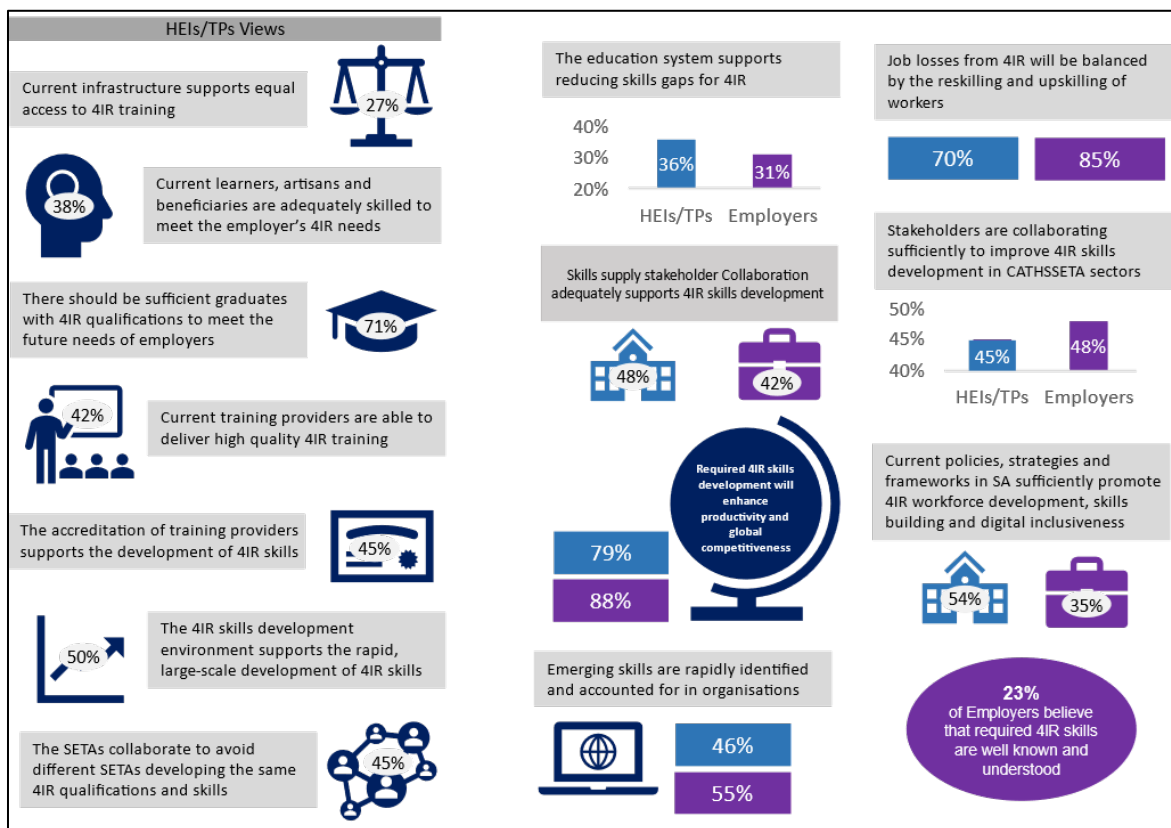
Further details on the 4IR visionary statements are provided in the report. Eleven (11) **areas of focus** were identified to assist the CATHSSETA sub-sectors to work towards the 4IR visionary statements. They include:

1. **4IR Learning Interventions** - 4IR learning interventions are focused on developing skills relevant to this new era. However, the identification and development of 4IR Learning Interventions is still lacking. Key interventions include identifying 4IR skills needs, establishing new 4IR learning interventions, meeting of entry-level requirements for these interventions, and increasing 4IR partnerships and collaboration.

2. **Awareness on 4IR/4IR Skills and Engagement** - Research highlights a lack of awareness of emerging 4IR skills and skills gaps in the workforce. For example, 33% of employers indicated they lack awareness on how and where 4IR technologies can be adopted. The key intervention to address this is conducting 4IR communication among stakeholder types.

3. **Digital Inclusiveness** – The digital divide in South Africa limits access to 4IR implementation opportunities and skills development for disadvantaged groups, despite having good, fixed broadband and wireless infrastructures. Survey results indicate that 69% of employers and 63% of higher education institutions believe that the current infrastructure is inadequate to support 4IR training, with the hospitality and arts sectors having the highest proportion of employers who found the infrastructure to be inadequate. The key intervention to address this is providing skills and training to access digital technologies.

4. **Reskilling and Upskilling of Labour Force** - Reskilling and upskilling are important for the labour force due to factors such as digital transformation and the emergence of new job roles.

Reskilling is necessary for employees whose jobs become redundant due to automation, while upskilling enhances current skill sets. The key intervention to ensure labour forces are upskilled and reskilled is redefining of jobs and tasks.

5. **Collaboration Between SETAs** – The Collaboration Between SETAs is crucial for the development of 4IR skills, with key stakeholders in the CATHSSETA sector including the Department of Higher Education and Training (DHET), CATHSSETA, Media, Information and Communication Technologies Sector Education and Training Authority (MICT SETA), Manufacturing, Engineering and Related Services (merSETA), Education, Training and Development Practices Sector Education and Training Authority (ETDP SETA), and other role players. A collaboration forum is proposed to create a unified approach to achieve 4IR readiness and eliminate fragmentation. CATHSSETA could position itself as a driver to achieve 4IR training or seek the help of DHET to review the country's skills development policy. Collaboration areas include digital inclusiveness, policy, strategy, research, funding, learning programme development/implementation, capacitation of training providers (TPs), training, and delivery mechanisms, and Small, Medium and Micro Enterprises (SMMEs).

6. **Financial Support** - The funding for educational initiatives in South Africa has increased, but it is still insufficient for the effective functioning of education institutions, especially in terms of 4IR technologies. The lack of financial support is a constraining force to 4IR skills development for employers and training providers. Therefore, interventions that aim to ensure more financial support for 4IR education and training initiatives are critical, including funding 4IR related projects and improving affordability of 4IR infrastructure and technologies.

7. **4IR Policies, Strategies, Legislation and Frameworks** - Stakeholders believe that national policies and frameworks need to be developed or updated to advance 4IR in South Africa, as current policies are seen as inadequate in promoting workforce development, skills-building, and digital inclusiveness. A sub-sectoral analysis shows that only 14% of employers in the Hospitality sector find policies adequate compared to 56% of employers in the Tourism and Travel Services sector. Key interventions needed are reviewing and updating current policies, gathering input for future policies, and developing new policies, strategies, and frameworks for 4IR.

8. **Training and Delivery Mechanisms** - The fourth industrial revolution (4IR) is changing the way education is delivered and training is provided. AI, IoT, and robotics are enabling personalized learning, online learning, gamification, blended learning, and digital credentials. Key interventions include incorporating 4IR in teaching and learning, providing access to required 4IR resources and conducting 4IR training for employees.

9. **Capacitated Training Providers and Training Institutions** - The lack of qualified (TPs) is hindering the acquisition of 4IR-related skills by learners, particularly in disadvantaged communities. There is a need for interventions to capacitate TPs and training institutions, including increasing capacitation programmes for trainers/lecturers.

10. **Research on 4IR** - CATHSSETA stakeholders claim that there is a shortage of research and development in the 4IR space, especially in the Conservation sub-sector. They suggest interventions including conducting research and development and sharing and publishing research studies.

11. **Skills Development in SMMEs** - SMMEs are critical for South Africa's National Development Plan 2030 as they have the potential to create jobs and enhance competitiveness. However, while 65% of SMMEs see 4IR skills training as a priority, only 35% are actively developing these skills. To address this gap, the key intervention includes increasing funding and investment in SMMEs.

By focusing on these key areas, the 4IR Skills Strategy aims to equip organisations within the sub-sectors with the necessary skills and knowledge to succeed in the current 4IR environment.

Finally, **strategic outcomes** that will be achieved through the successful implementation of the above areas of focus were developed and these are as follows:

1. **4IR Learning Interventions -** The outcomes for this area of focus will be more frequent and diverse determination of sector 4IR skills needs, as well as growths in the numbers of learning interventions that use digital learning content and for proficiency in sector digital solutions. Increasing partnerships and collaboration will also occur within the 4IR space. In addition, the intervention will result in a growth in the number of learners for a given CATHSSETA budget, growth in sector digital solutions related to business intelligence provided by employers and training providers, and a decrease in the cost of information dissemination related to digital solution learning activity in section

2. **Awareness on 4IR/4IR Skills Engagement** - The outcomes will be growth in sector digital solutions related to business intelligence provided by employers and training providers, as well as a decrease in the cost of information dissemination related to digital solution learning activity in section.

3. **Digital Inclusiveness -** The outcome will be improved digital literacy (ability to use digital devices like smartphones and tablets) within the sector.

4. **Reskilling and Upskilling** - The outcome will be updated sector value chains and role profiles.

5. **Financial Support** - The outcomes will be increased funding for developing digital solutions for the sector, including localisation budgets, as well as improved mobile data affordability for digital solution learning interventions.

6. **4IR Policies, Strategies, Legislation and Frameworks -** The outcomes will be growths in the numbers of input providers that identify regulatory obstacles to digital solution adoption and learning, as well as numbers of input providers that propose solutions to regulatory obstacles to digital solution adoption and learning. Furthermore, there will be increased lobbying efforts to remove regulatory obstacles to digital solution adoption and learning / revised 4IR policies, strategies and frameworks.

7. **Training and Delivery Mechanisms -** The outcomes will increased number of learners reached at a lower cost per learning intervention and lower unit cost per qualification issued, increased access to digital solution learning in terms of both geographical location as well as affordability, as well as in business acumen of SMME business owners.

8. **Capacitated TPs and Training Institutions** - The outcome will be increased digital literacy capacitation programmes available for trainers/lecturers.

9. **Research on 4IR -** The outcome will be an increase in actionable business intelligence emanating from research efforts.

10. **Skills Development in SMMEs -** The outcomes will be an increase in the business acumen of SMME business owners.

The successful implementation of these strategic outcomes will enable the sector to embrace 4IR technologies and practices, address skills gaps, and foster innovation, growth and sustainability.

2   Introduction

This document outlines the Strategy for CATHSSETA. The 4IR Strategy is expected to result in a more efficient, productive, and competitive organisations within CATHSSETA sub-sectors, stemming from 4IR skills development programmes greater in effectiveness and efficiency. The strategy includes detailed interventions required to achieve these.

The following table provides an outline of the sections contained in this document.

Table 2-1: Overview of Sections

Section	Contents	Description
2	Introduction	This section covers the document purpose and provides an overview of CATHSSETA and the Project.
3	Current 4IR Skills Development Business Model	This section provides an overview of the current 4IR skills development landscape within the CATHSSETA sub-sectors.
4	4IR Visionary Statements	This section outlines the visionary statements for CATHSSETA in respect to 4IR.
5	Summary of Key Issues	This section outlines the key issues identified that impede the development of 4IR skills within CATHSSETA sub-sectors.
6	4IR Skills Development Intervention Process	This section outlines the process followed to identify the focus areas for the Strategy within which various interventions are required.
7	Areas of Focus for Strategy	This section outlines the key areas underpinning the Strategy, including key interventions required for 4IR skills development in the CATHSSETA sub-sectors.
8	Achieving Global Competitiveness	This section provides insight on how organisations in the CATHSSETA sub-sectors can achieve global competitiveness.
9	Strategic Outcomes following Interventions	This section provides a summary of key interventions proposed for the 4IR Strategy, and the strategic outcomes for each intervention.
10	Conclusion	This section gives a summary on the above contents of the 4IR Strategy.

2.1   Project Background

In order to assist CATHSSETA sub-sectors in understanding how they can integrate the 4IR technologies into the different areas in which they operate, CATHSSETA has commissioned the development of a 4IR Integrated Sector Skills Strategy and Plan, including a detailed assessment of interventions to be carried out in achieving sub-sector competitiveness. This is expected to enable organisations within the CATHSSETA sub-sectors to capitalise on existing 4IR opportunities (CATHSSETA, 2022).

3 Current 4IR Skills Development Business Model

The current 4IR skills development ecosystem comprises various components, categorised into the market, channels, offering, SETA, and an enabling environment. These components are outlined below:

- Market – the market refers to stakeholders to whom 4IR skills development initiatives are offered (Coursera, 2022). Within the context of this report, the market includes stakeholders such as large employers, small, medium, and micro enterprise (SMME) employers, as well as unemployed learners, who would enrol in 4IR skills programmes either for skilling, reskilling or upskilling purposes.

- Channels – these represent stakeholders responsible for developing and delivering 4IR skills training programmes to the market. In the context of this report, they include stakeholders such as training providers and HEIs (community colleges, traditional universities, technical and vocational education and training (TVET) institutions, as well as universities of technology (UoTs). The Department of Basic Education (DBE) and Early Childhood Development (ECD) centres are also included in the channels for their responsibility in ensuring learners are equipped with necessary competencies, including Science, Technology, Engineering and Mathematics (STEM) subjects necessary for 4IR, upon completion of basic education.

- Offering – this refers to mechanisms through which 4IR skills programmes are delivered by channels to the market. They include short courses, skills programmes bursaries, as well as on the job training mechanisms such as learnerships, internships and apprenticeships.

- SETAs – are tasked with developing 4IR skills development plans within their sub-sectors, in response to the 4IR skills needs identified. In addition to CATHSSETA, these include the merSETA, the MICT SETA as well as the Education, Training and Development Practices SETA (ETDP SETA). Within their scope of operation, the SETAs are responsible for activities including conducting skills research, providing financial support (discretionary and mandatory grants) to employers and TPS, as well as to learners in the form of stipends, as well as developing new training programmes (Khetha, 2017).

- Enabling environment – this refers to a supportive skills development ecosystem that fosters the acquisition and application of skills, knowledge, and competencies. Enabling environments include relevant policies, departments and institutions, and infrastructure that promote access to education and training, encourage innovation and entrepreneurship, and facilitate the use of new technologies and approaches (International Labour Organisation, 2021).

The diagram below depicts the current 4IR skills development ecosystem as outlined above.

Figure 3-1: Current 4IR Skills Development Business Model
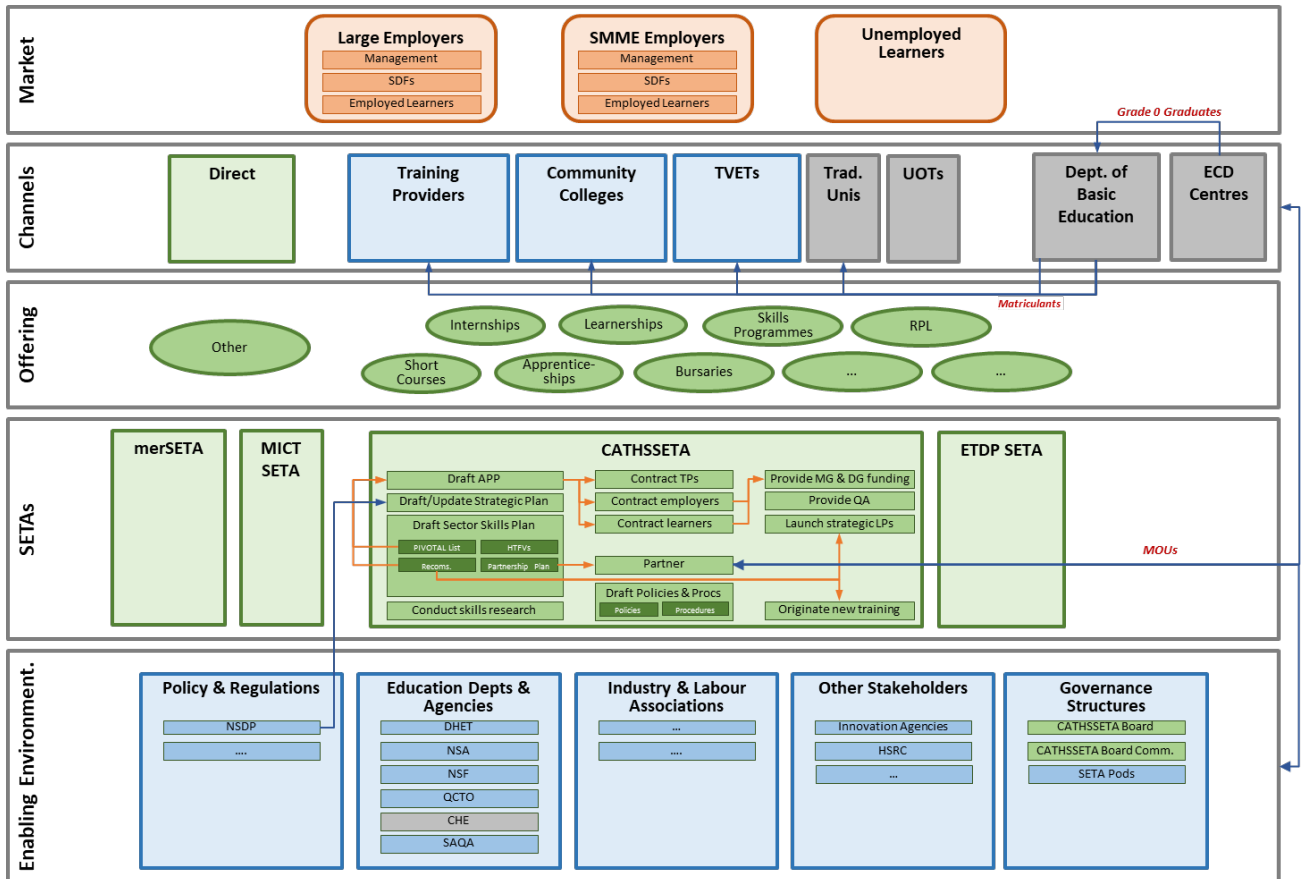
4   4IR Visionary Statements

Visionary statements are concise and compelling statements that express the future vision and objectives of an entity (Ray, 2021). The 4IR visionary statements, thus, outline the future vision and objectives of the CATHSSETA sub-sectors with regard to 4IR skills development and supply, and thus, serve as a guides for decision-making and strategic planning. The 4IR visionary statements for CATHSSETA sub-sectors are outlined in the below table:

Table 4-1: 4IR Visionary Statements

#	Contents	Description
1	Skills Gaps	There will be an adequate volume of people with 4IR skills to meet the demand for such skills by Employers.
2		There will be an adequate volume of employed and unemployed graduates with 4IR qualifications to fill the demand from Employers for people in roles requiring these qualifications.
3		The level of flexibility and innovation in the 4IR skills development business model will meet changing 4IR labour market demands.
4		The 4IR skills will be known and understood.
5		The PSET system, including institutional arrangements, will support the minimisation of skills gaps for the 4IR.
6	Jobs Losses/ Skills Gaps	The extent of job losses will be limited by the reskilling and upskilling of workers to meet the changing demands of the 4IR.
7	Digital Inclusiveness/ Access	The level of digital inclusiveness (digital literacy, infrastructure) will support equitable access to 4IR training.
8	Training Supply	Training providers will be capacitated to deliver 4IR education and training of a high quality.
9		The accreditation of training providers will support the development of the required 4IR skills.
10	New Qualifications	The level of flexibility and responsiveness of the skills development model will support the rapid and sizeable development of 4IR skills.
11		The skills development business model will rapidly identify and account for emerging 4IR skills.
12	Collaboration	The level of collaboration between various stakeholders involved in skills supply will support the development of the required 4IR skills.
13		The SETAs will collaborate to avoid duplication of skills development for 4IR.
14		There will be collaboration with external stakeholders to implement an improved skills development model.
15	Competitiveness	The skills development business model will deliver the 4IR skills required for enhanced productivity and global competitiveness.
16	Policies	4IR policies, strategies and frameworks will promote 4IR related workforce development, skills-building and digital inclusiveness.

The above 4IR visionary statements were assessed through field research, in the form of electronic surveys, in order to determine the extent to which the CATHSSETA sub-sectors believe the statements

are currently being met. The dashboard in **Figure 4-1** below summarises the findings. Light blue shaded illustrations and graph bars in the below dashboard indicate results obtained from Higher Education Institutions (HEIs) and TPs, while the purple shaded illustrations and graph bars indicate results obtained from employers.

Figure 4-1: 4IR Visionary Statement Dashboard
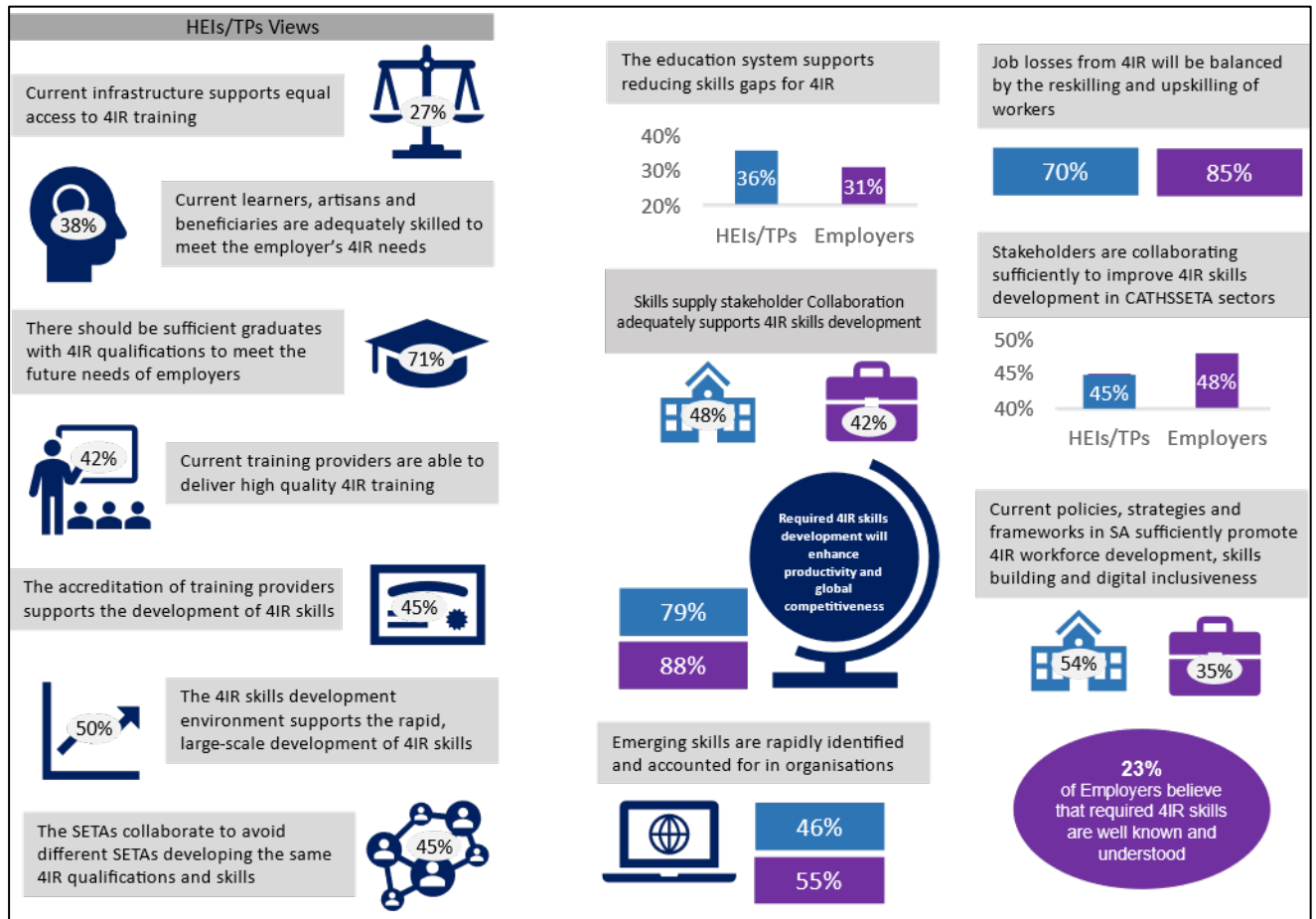
From the above dashboard, it can be noted that current infrastructure is perceived not to be sufficient to support equal access to 4IR training. In addition, with regard to 4IR training, current TPs are perceived not to be adequately capacitated to deliver high quality 4IR training, and that their accreditation does not adequately support the development of 4IR skills. Furthermore, the PSET system is perceived to be inadequate in supporting the reduction of 4IR skills gaps, while 4IR skills are perceived to not be well known and understood. The proposed interventions to meet these visionary statements are outlined in Section 7.

5   Summary of Key Issues

The table below outlines the key issues impacting on the development of 4IR skills across CATHSSETA sub-sectors.

Table 5-1: Summary of Key Issues

#	Issue Category	Key Issues
1	Skills Gaps	• Current learners, artisans and beneficiaries are inadequately skilled to meet employers' 4IR needs • Current infrastructure does not adequately support equal access to 4IR training • Required 4IR skills are not adequately well known and understood • The PSET system does not adequately support reducing skills gaps for 4IR • Budgetary constraints limit the availability of and access to 4IR training initiatives • Labour forces within CATHSSETA sub-sectors are inadequately capacitated to utilise 4IR technologies
2	Jobs Losses/ Skills Gaps	• 4IR results in potential for job losses due to automation
3	Digital Inclusiveness/ Access	• There is a lack of access to required 4IR infrastructure
4	Training Supply	• Current training providers are not adequately able to deliver high quality 4IR training • The accreditation of training providers does not adequately support the development of 4IR skills
5	New Qualifications	• The 4IR skills development environment inadequately supports the rapid, large-scale development of 4IR skills • Emerging skills are not rapidly identified and accounted for within organisations • There is a shortage of 4IR entry level qualifications • There is a lack of awareness on 4IR among stakeholders
6	Collaboration	• There is insufficient stakeholder collaboration to improve 4IR skills development in CATHSSETA sectors • Skills supply stakeholder collaboration does not adequately support 4IR skills development • The SETAs do not adequately collaborate to avoid different SETAs developing the same 4IR qualifications and skills
7	Policies	• Current policies, strategies and frameworks in SA sufficiently promote 4IR workforce development, skills-building and digital inclusiveness

6 4IR Skills Development Intervention Process

In order to achieve the CATHSSETA sector, 4IR future state as contained in the visionary statements, a structured process was followed to identify the focus areas within which various interventions are required. The process as well as the identified focus areas are illustrated below:

Figure 6-1: 4IR Skills Development Intervention Process
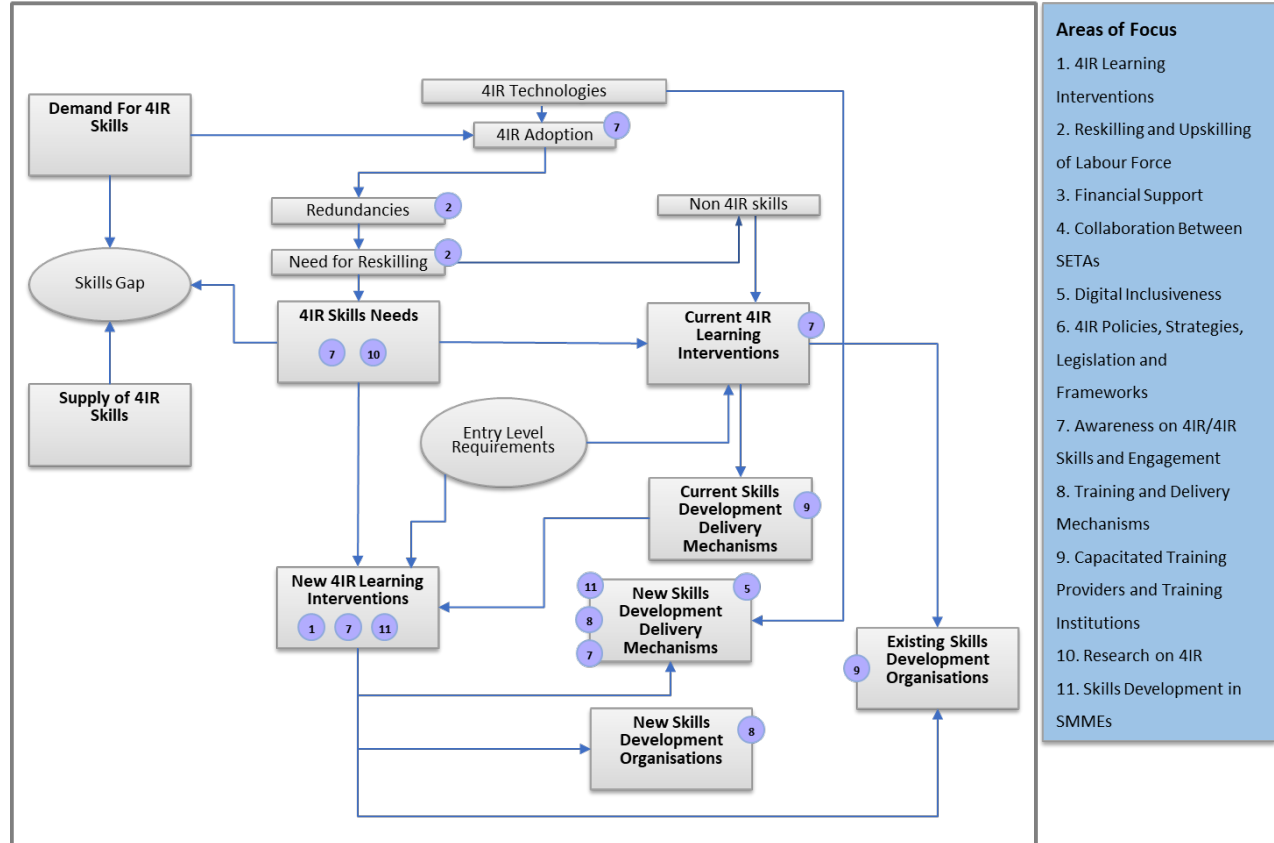
The components of the above process are outlined below:

- **4IR Technologies -** sector specific 4IR digital technologies require specific skills to develop, operate and maintain.

- **4IR Adoption -** employers and their service providers may adopt 4IR digital solutions in order to remain profitable and sustainable in a competitive market. In order to ensure that these employers, especially SMMES, benefit from 4IR digital solutions, the following focus area was identified: (7) Awareness of 4IR Technologies, Skills and Engagement.

- **Redundancies -** the automation of many processes previously performed by humans may lead to job redundancies which may require employers to redeploy potentially redundant staff. Redundancies impact the Need for Reskilling, and also give rise to the following focus area: (2) Reskilling and Upskilling of the Labour Force.

- **Need for Reskilling -** redundancies resulting from process automation are counterbalanced by a demand for new roles and capacity to execute new and improved business processes, highlighting the need for reskilling. This indicates the following focus area: (2) Reskilling and Upskilling of the Labour Force.

- **Non-4IR Skills -** several 'Non-4IR skills' including 'people skills' have become increasingly prominent given the automation of business processes that has resulted in many business processes becoming more customer and human centric.

- **Skills Gap -** the adoption of 4IR digital solutions may give rise to a *demand* for skills to operate and maintain these solutions, to localise foreign 4IR digital solutions already adopted or to develop local digital solutions to replace those foreign. The *supply* of 4IR skills refers to the availability and affordability of the required 4IR skills. The skills gap refers to the difference between the demand and the supply of 4IR skills, and is a key determinant of 4IR Skills Needs.

- **4IR Skills Needs -** translating the skills gap and need for reskilling into clearly articulated and quantified 4IR skills needs that can be used for planning will require awareness and knowledge of 4IR digital solutions and skills requirements within the CATHS sector. This indicates the following focus areas:

  o (7) Awareness of 4IR Technologies, Skills and Engagement,

  o (10) Research on 4IR.

- **Current 4IR Learning Interventions -** in order to benefit from the current 4IR learning interventions, sector employers, especially small businesses, need to be aware of available 4IR learning interventions. This indicates the following focus area: (7) Awareness of 4IR Technologies, Skills and Engagement.

- **Existing Skills Development Organisations and Skills Development Delivery Mechanisms -** existing HEIs and TPs must be effectively capacitated to deliver their 4IR learning interventions effectively. This indicates the following focus area: (9) Capacitated Training Providers and Training Institutions.

- **New 4IR Learning Interventions -** Where current 4IR skills learning interventions fail to meet the sector 4IR skills needs, new 4IR learning interventions need to be provided. It is important to understand what learning interventions are already available, as well as to focus on the needs of SMMES as the largest providers of employment, when developing new interventions. This indicates the following focus areas:

  o (7) Awareness of 4IR Technologies, Skills and Engagement,

  o (11) Skills Development in SMMEs.

- **New Skills Development Delivery Organisations and Mechanisms -** it is also possible that new skills development organisations may be established to provide 4IR learning interventions. 4IR learning interventions should leverage digital technologies to perform more distributed and efficient training delivery to a greater number of learners for the same budget. This requires that the digital divide is bridged, with the assistance of regulations where applicable, as well as that the availability and capabilities of 4IR technologies is known. Furthermore, special attention must be focused on the benefits of 4IR enabled delivery mechanisms to SMMEs. This indicates the following focus areas:

  o (5) Digital Inclusiveness,

  o (6) 4IR Policies, Strategies, Legislation and Frameworks,

  o (7) Awareness of 4IR Technologies, Skills and Engagement,

  o (8) Training and Delivery Mechanisms,

  o (11) Skills Development in SMMEs.

- **Entry Level Requirements for 4IR Learning Interventions -** every effort should be made to leverage the capabilities of 4IR technology to lower the barriers to entry for 4IR learning interventions as well as aggressively grow the numbers of learners that can be reached.

7 Areas of Focus for Strategy

Areas of focus for a strategy form the foundation for its development, and consequently, represent the key areas in which efforts should be concentrated in order to improve the current state (Wright, 2021). This section outlines the key areas of focus for the 4IR Skills Strategy, including the context informing the key areas as well as the proposed key interventions. As depicted in the previous diagram, the key areas of focus include:

1. 4IR Learning Interventions

2. Awareness on 4IR/4IR Skills and Engagement

3. Digital Inclusiveness

4. Reskilling and Upskilling of Labour Force

5. Collaboration Between SETAs

6. Financial Support

7. 4IR Policies, Strategies, Legislation and Frameworks

8. Training and Delivery Mechanisms

9. Capacitated Training Providers and Training Institutions

10. Research on 4IR

11. Skills Development in SMMEs

7.1 4IR Learning Interventions

Learning interventions are focused, purpose-driven approaches to assisting learners develop new skills (McDonald, 2022). Within the context of 4IR, learning interventions assist learning in developing skills relevant to the 4IR. There is a need for the identification and development of 4IR Learning Interventions. Survey findings indicate that **57% of employers** are of the view that 4IR skills training is a priority for their organisation. Analysis was conducted in order to assess the extent to which 4IR skills training is a priority for organisations at sub-sector level **Arts, Culture and Heritage (77%)** having the highest proportion of employers for whom 4IR skills training is a priority, followed by **Tourism and Travel Services (67%)**.

Despite the above findings, only **37% of employers** are actively developing 4IR skills, with the discrepancies greater at sectoral level (**50%** of employers within **Tourism and Travel Services**, and only **31%** within the **Arts, Culture and Heritage**), as highlighted in the figure below, with the majority of employers across the sub-sectors indicating financial support as a key resource impacting on their ability to actively develop 4IR skills.

Figure 7-1: Proportion of Employers Actively Developing 4IR Skills
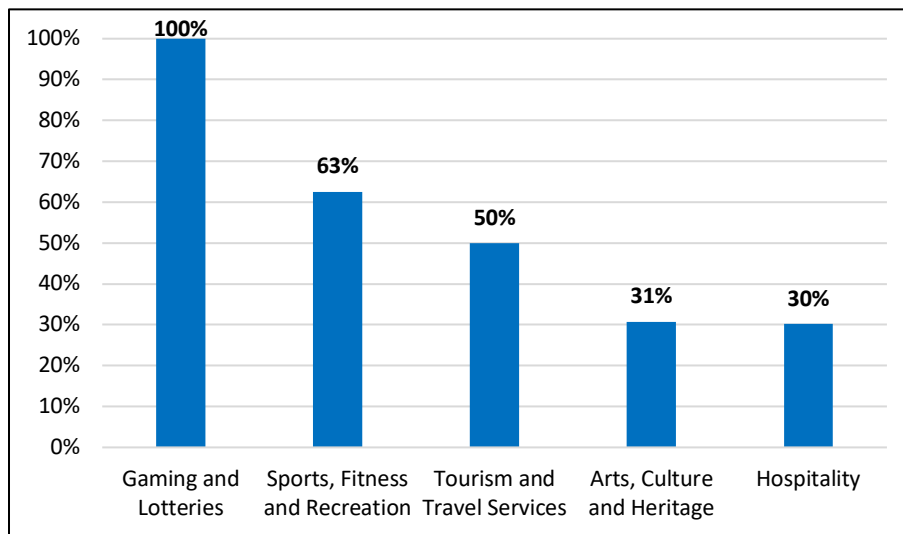
Source: *CATHSSETA (2023)*

Financial support required is explored further in Section 6.6. Other areas of support identified by employers include accessibility and availability of 4IR qualifications, as well as the availability of potential recruits with relevant 4IR qualifications as areas of support required in order to pursue 4IR development Skills. As such, key interventions required to improve the availability of 4IR learning interventions are explored below.

7.1.1   Key Interventions

The following key interventions, mapped to 4IR visionary statements, are proposed in order to increase 4IR learning interventions:

Table 7-1: Key Interventions – 4IR Learning Interventions

#	Key Intervention	4IR Visionary Statement
1	Identifying 4IR Skills Needs	• The level of flexibility and responsiveness of the skills development model will support the rapid and sizeable development of 4IR skills. • The skills development business model will rapidly identify and account for emerging 4IR skills.
2	Establishing New 4IR Learning Interventions	• There will be an adequate volume of employed and unemployed graduates with 4IR qualifications to fill the demand from Employers for people in roles requiring these qualifications. • The accreditation of training providers will support the development of the required 4IR skills. • The level of flexibility and responsiveness of the skills development model will support the rapid and sizeable development of 4IR skills. • The skills development business model will rapidly identify and account for emerging 4IR skills.
3	Meeting of Entry Level Requirements for 4IR Learning Interventions	• The accreditation of training providers will support the development of the required 4IR skills.

#	Key Intervention	4IR Visionary Statement
		• The level of flexibility and responsiveness of the skills development model will support the rapid and sizeable development of 4IR skills.
4	Increasing 4IR Partnerships and Collaboration	• The level of collaboration between various stakeholders involved in skills supply will support the development of the required 4IR skills. • There will be collaboration with external stakeholders to implement an improved skills development model.

The above key interventions are explored further below.

7.1.1.1 Identifying 4IR Skills Needs

4IR has created a demand for new skills that are essential for active participation in the digital economy. To build a workforce that has the requisite skills for the latest technologies, it is crucial to understand the qualifications currently available to support these skills needs (Schwab, 2021).

According to survey data, employers show a keen interest in developing 4IR competencies, with **88%** believing that such development will enhance productivity and global competitiveness. Despite this, only **23%** of the respondents agreed that the required 4IR skills are well-known and understood, which underscores the need to identify the skills that will be in demand for future job roles. It is important for the market to inform the identification of skills that will be needed and in demand in a future 4IR integrated economy. From surveys conducted with employers, the latter have indicated some skills that they believed have emerged as a result of 4IR, as illustrated below.

Table 7-2: 4IR Emerging Skills

#	4IR Emerging Skill	Arts, Culture and Heritage	Conservation	Gaming and Lotteries	Hospitality	Sports, Fitness and Recreation	Tourism and Travel Services
1	Advanced Computer, IT and software	30%	50%	67%	18%	13%	27%
2	Applied Mathematics	0%	0%	0%	2%	0%	0%
3	Computer Literacy	30%	33%	67%	29%	25%	33%
4	Critical Thinking	50%	0%	67%	27%	50%	33%
5	Data Analytics	30%	17%	67%	18%	50%	47%
6	Data Science and Modelling	20%	0%	33%	4%	0%	13%
7	Digital Content Production	60%	33%	33%	6%	13%	20%
8	Graphic Designing	50%	33%	67%	18%	13%	60%
9	Machine Learning	0%	0%	0%	4%	25%	7%
10	Network Security (Incl. cloud security)	20%	17%	67%	14%	13%	47%
11	Physics	10%	0%	0%	2%	0%	0%

#	4IR Emerging Skill	Arts, Culture and Heritage	Conservation	Gaming and Lotteries	Hospitality	Sports, Fitness and Recreation	Tourism and Travel Services
12	Programming Languages	10%	0%	33%	2%	0%	7%
13	Videography and Photography	70%	33%	0%	12%	13%	40%

Source: Employers Survey (2023)

How can CATHSSETA Assist?

CATHSSETA may play a critical role in the identification of 4IR skills needs, through the following:

1. Identifying 4IR skills in demand in the Sector Skills Plan (SSP) to ensure sub-sectors' needs are reflected, knowledge is disseminated, and that planning for 4IR may commence;

2. Integrating the identified skills that are in demand in the context of future 4IR "reconstructed" job roles into the SETA's SSP. This may necessitate updates to the Organising Framework for Occupations (OFO) codes to capture new or emerging occupations.

3. Investing in new training mechanisms that align to identified skills, as highlighted in **Table 6-3**.

How can other stakeholders contribute to the identification of 4IR skills needs?

1. Other stakeholders, including MICT SETA, TPs, and employers, may establish new 4IR learning interventions to increase the current supply.

7.1.1.2   Establishing New 4IR Learning Interventions

The establishment of new 4IR learning interventions is necessary to respond to the emerging skills needs. Through surveys conducted with employers, emerging skills for which new 4IR qualifications will be required were identified per sub-sector. These are outlined below.

Table 7-3: Emerging 4IR Skills for which New Qualifications will be Required

#	4IR Emerging Skill Requiring Qualifications	Arts, Culture and Heritage	Conservation	Gaming and Lotteries	Hospitality	Sports, Fitness and Recreation	Tourism and Travel Services
1	3D Printing	40%	17%	0%	2%	0%	27%
2	Artificial Intelligence (AI)	60%	17%	0%	8%	13%	27%
3	Augmented Reality	40%	0%	0%	6%	0%	20%
4	Big data	30%	17%	67%	6%	0%	20%
5	Biometrics	10%	17%	0%	14%	25%	7%
6	Blockchain	10%	0%	0%	6%	0%	7%
7	Cloud Computing	30%	0%	67%	20%	13%	40%
8	Cyber Security	20%	17%	100%	20%	25%	47%
9	Internet of Things (IoT)	30%	17%	100%	6%	25%	13%
10	Machine learning	20%	0%	0%	8%	13%	20%

#	4IR Emerging Skill Requiring Qualifications	Arts, Culture and Heritage	Conservation	Gaming and Lotteries	Hospitality	Sports, Fitness and Recreation	Tourism and Travel Services
11	Nanotechnology	20%	0%	0%	6%	0%	7%
12	Robotics	20%	0%	0%	4%	0%	7%
13	Simulation	30%	0%	33%	6%	0%	7%
14	Quantum Computing	20%	0%	0%	6%	0%	7%
15	Virtual Reality (VR)	60%	50%	67%	10%	0%	33%

Source: Employers Survey (2023)

While the above table identifies the skills for which qualifications will be required in future, such as 3D Printing, and AI, some institutions currently already offer qualifications in these emerging skills. These include institutions such as Nelson Mandela University's (NMU) 3D Printing- Introduction to Additive Manufacturing course, as well as the MSc in AI offered by institutions such the University of the Witwatersrand (Wits), University of Johannesburg (UJ), and the University of Cape Town (UCT). The table below summarises the qualifications in emerging 4IR skills current being offered locally.

Table 7-4: Current 4IR Qualifications

#	Name of Course/ Qualification	Institution	Practical/ Theoretical	Duration
1	3D Printing- Introduction to Additive Manufacturing (Coursetakers, 2023)	NMU	Practical	8 hours
2	SAQA ID 71850: AI And Machine Learning Further Education and Training (FET) Certificate: IT Database Development (CTU Training Solutions, 2023)	CTU Training Solutions	Theoretical	12-18 months
3	MSc Artificial intelligence (WITS, 2023)	Wits, UJ, UCT	Theoretical	1 year course work 1 year research
4	Techniques of Artificial Intelligence (module as part of undergraduate degree) (UNISA, 2023)	University of South Africa (UNISA)	Theoretical	1 year
5	Artificial Intelligence (AI) in the Fourth Industrial Revolution (4IR) (UJ, 2021)	UJ	Theoretical	-
6	DPhil in Virtual and Augmented Reality in STEM Education (UJ, 2021)	UJ	Theoretical	1 year
7	Postgraduate Diploma in e-Skills (UWC, 2018)	University of the Western Cape (UWC)	Theoretical	1 year
8	BSc Honours in Big Data Analytics (WITS, 2023)	Wits	Theoretical	1 year
9	Advanced Short Course in Big Data (77070) (UNISA, 2023)	UNISA	Theoretical	3 months
10	MSc - Data Science Program at UCT (UCT, 2023)	UCT	Theoretical and Practical	-
11	SLP in Introduction to Blockchain (UJ, 2021)	UJ	Theoretical	6 hours
12	Cryptocurrency and Blockchain Basics (Enterprise University of Pretoria, 2023)	University of Pretoria (UP)	Theoretical	1 day

#	Name of Course/ Qualification	Institution	Practical/ Theoretical	Duration
13	Machine Learning for Engineers (WITS, 2023)	Wits	Theoretical	5 days
14	Machine Learning Module (UNISA, 2023)	UNISA	Theoretical	1 year
15	Masters in Nanoscience and Nanotechnology (UWC, 2023)	UJ, NMU, the University of the Free State (UFS), UWC	Theoretical	2 years
16	MSc Robotics (WITS, 2023)	Wits	Theoretical and Practical	1-2 years
17	i-Set Robotics - Components and Pedagogy (UNISA, 2023)	UNISA	Theoretical and Practical	15 weeks
18	Robotics and Programming Short Course (Eduvos, 2022)	Management College of Southern Africa (MANCOSA)	Theoretical and Practical	1 day
19	Postgraduate Diploma in e-Skills (Institutional Advancement, 2018)	UWC	Theoretical	1 year
20	DPhil in Virtual and Augmented Reality in STEM Education (UJ, 2022)	UJ	Theoretical	1 year
21	Virtual Reality Development (Damelin, 2023)	Damelin	Theoretical and Practical	11 weeks
22	SLP in Cloud Computing (UJ, 2021)	UJ	Theoretical	14 hours
23	Cyber Security (CPUT, 2023)	Cape Peninsula University of Technology (CPUT),	Theoretical	5 months
24	Certificate in Cybersecurity Professional Practice and Leadership (CPPL) (WITS, 2023)	Wits	Theoretical	-
25	Intelligent Systems Development (Using Tensorflow) (UJ, 2023)	UJ	Theoretical	3 months

Further to the above, the following 4IR courses and qualifications were identified through consultations with HEIs and TPs.

Table 7-5: Emerging 4IR Courses and Qualifications

#	Name of Course/ Qualification	Institution
1	Artificial Intelligence course	UWC, UJ
2	Machine Learning course	UWC
3	Data Engineering course	UWC, Stellenbosch University
4	Advanced IoT	UWC
5	Bachelor of Data Science	Stellenbosch University
6	BSc Computer Science	Stellenbosch University
7	Cloud Computing course	UWC
8	Postgraduate Diploma in Immersive Technologies	UWC
9	Digital Learning course	Sparrow Combined Further Education and Training (FET) College
10	Digital Programming Language course	Sparrow Combined Further Education and Training (FET) College
11	Sound Technology course	Aviwe Business Development Services
12	Video Editing course	Aviwe Business Development Services

Despite the existence of these qualifications, barriers exist to the development of 4IR learning interventions in South Africa. These include:

1. Lack of funding – developing and offering 4IR courses can be expensive, and many institutions may not have the necessary funding to invest in these courses (Huge Connect, 2019).

2. Shortage of qualified instructors – Consultations have shown a shortage of experienced instructors able to teach 4IR courses (CATHSSETA, 2023).

3. Bureaucracy in getting qualifications accredited by the government – the process of accrediting courses with the government can be time-consuming and expensive, which can discourage institutions from offering 4IR courses (Winkler, 2015).

> "The talent has become like a precious commodity. So even advanced countries like the US and Japan - I was in Japan, that is where I did my PhD - they scramble for talented academics, talented researchers, talented professionals in this [4IR] space. "
>
> *HEI Interview, 2023*

As per the survey, HEIs and TPs have indicated that, in order to build on 4IR skills, the following 4IR learning interventions will be required in future.

Figure 7-2: 4IR Learning Interventions required in Future
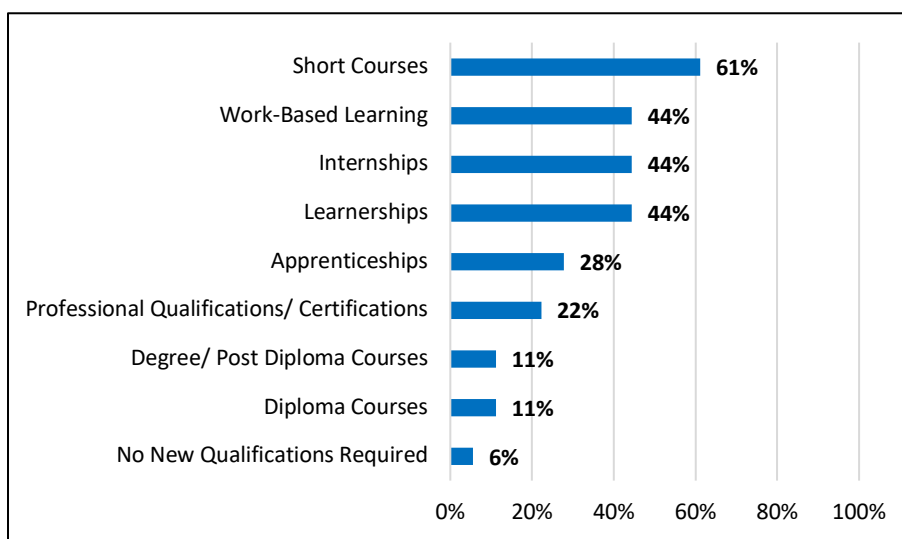
Source: Employers Survey (2023)

In addition to the learning interventions that will be required above, 4IR Skills Development can be achieved through:

12. New or updated learning programmes,

13. TP capacitation (see section 6.9),

14. Mentoring and coaching, and

15. Bootcamps and hackathons.

How can CATHSSETA Assist?

CATHSSETA may assist in facilitating the establishment of new 4IR learning interventions through the following:

1. Introduce new, or increase the current supply of 4IR and sub-sector related qualifications, including in AI and VR for the Arts, Culture and Heritage sub-sector, and cloud computing and cyber security for Hospitality and Tourism and Travel Services sub-sectors, in partnership with industry and other stakeholders.

2. Advocate for the development and provision of relevant 4IR and sub-sector qualifications with the private sector.

3. Engage with industry experts, TPs and HEIs and lobby for the development of 4IR interventions relevant to the CATHSSETA sub-sectors to facilitate increased supply of 4IR learning interventions through traditional and non-traditional skills programmes as outlined above.

CATHSSETA can also consider the following when developing accredited or credit bearing courses. These include:

1. The necessity to update OFO codes rapidly to ensure the availability of emerging 4IR occupations, allowing employers to include the OFO codes in their WSP/ATR. The SETA should also consider accepting non-OFO aligned occupations, should the sector require such.

2. The SETA may lobby the Quality Council for Trades and Occupations (QCTO) and South African Qualifications Authority (SAQA) for shortened turnaround times on approvals during the development of learning programmes.

3. The incorporation of qualifications from NQF 4 and above for 4IR related training in order to cover the required complexity or standards required by 4IR.

4. Enhanced monitoring, especially of new qualifications related to the 4IR, to ensure their continued integrity.

How can other stakeholders contribute to the establishment of new 4IR learning interventions?

1. HEIs may assist by establishing knowledge centres to develop 4IR research skills and build capacity in students.

2. Umalusi may assist by developing and evaluating qualifications and curricula relevant to 4IR for institutions within their ambit.

3. DHET should continue to introduce 4IR Centres across all TVETs in order to increase the supply of 4IR qualifications. These 4IR Centres have already been implemented in some TVETs including Goldfields in the Free State, and are aimed at conducting programmes related to internet, robotics and 3D printing, with a focus on elevating the community (SA News, 2022).

4. Trade unions can lobby government departments, such as the DHET for support in the development of 4IR learning interventions. The support may be in the form of funding for the development of the programmes, or tax incentives for employers investing in training.

7.1.1.3   *Meeting of Entry Level Requirements for 4IR Learning Interventions*

There is a shortage of candidates who meet the 4IR entry level qualification requirements, such as a Matric pass with high grades in Mathematics and Physics, which constrains the extent of 4IR skills development that is possible at graduate and post-graduate level.

> "The quality of students that come to [university name redacted] is not good enough I feel like. Like their preparedness for what we offer is not at the level that we expect them to be."
>
> *Training Provider Interview, 2023*

In addition, the literacy rate in South African adults is around 87% (Naidoo, 2022). In 2022, 15% of South Africans between the ages of 25 and 34 years of age held a tertiary qualification, compared to the average of 47% across the Organisation for Economic Co-operation and Development (OECD) countries (OECD, 2022).

As a result if the challenges in meeting entry level requirements for 4IR courses, emerging 4IR occupations remain unfilled. Similar to the emerging 4IR skills identified from surveys conducted with employers in **Section 6.1.1.1**, emerging 4IR occupations have also been identified. The table below highlights the percentage of employers which believed that the following occupations would emerge as a result of 4IR.

Table 7-6: Emerging 4IR Occupations

#	4IR Emerging Occupations	Arts, Culture and Heritage	Conservation	Gaming and Lotteries	Hospitality	Sports, Fitness and Recreation	Tourism and Travel Services
1	Audio-Visual 3D Technician	38%	0%	33%	2%	0%	6%
2	Applications Developers/Manager	15%	17%	33%	6%	0%	17%
3	Computer Network and Systems Engineer	23%	33%	67%	17%	0%	33%
4	Data Scientist/ Engineer	8%	0%	33%	4%	0%	17%
5	Digital Artist	38%	0%	100%	8%	0%	22%
6	Fraud and Risk Analyst	15%	0%	100%	6%	0%	22%
7	Multimedia Specialist	46%	0%	100%	11%	25%	22%
8	Information Technology Specialists and Technician	31%	33%	100%	17%	0%	33%
9	Internet of Things Specialist	8%	17%	67%	8%	13%	17%
10	Smart Technology Developer	8%	0%	33%	6%	0%	11%

Source: Employers Survey (2023)

How can CATHSSETA Assist?

The following target solutions/ interventions may be adopted by CATHSSETA to facilitate the meeting of entry level requirements and improve the quality of candidates:

1. Lobby the Department of Basic Education (DBE) and relevant stakeholders to improve the quality of literacy, numeracy, computer literacy and STEM subjects in schools, as well as analytical and critical thinking skills.

2. Conduct research aimed at understanding key skills gaps as it pertains to learners entering the PSET system. This includes key skills gaps relating to literacy and mathematics skills.

3. Engage with the DBE to identify the key challenges impacting on the quality of education at grassroot level which ultimately results in poorly prepared learners entering the PSET system, and to propose recommendations aimed at addressing this challenge.

4. Advocate for the use of Recognition of Prior Learning (RPL). This intervention has been successful in Malaysia – the Skills Certification Program grants skills certificates to workers who lack formal educational qualifications but have obtained relevant knowledge, experience, and skills in the workplace (Asian Development Bank, 2021).

7.1.1.4   *Increasing 4IR Partnerships and Collaboration*

SMMEs can be capacitated in the 4IR competencies through collaborations with other, especially larger, stakeholders (Francis, 2019). Concluding partnerships and collaborations with other stakeholders presents SMMEs with several benefits, including (Forbes, 2020):

- Access to expertise and resources;

- Access to new markets and customers;

- Mentorship and coaching;

- Shared risks and costs;

- Improved credibility and reputation;

- Increased networking opportunities and further collaborations.

How can CATHSSETA Assist?

CATHSSETA may play an advocacy role in this regard to:

1. Lobby other stakeholders, including the Department of Trade, Industry and Competition (DTIC) and HEIs as research and development centres, to localise 4IR digital solutions that will help SMMEs in the sector to grow, hire and train more workers

2. Lobby SEDA and DTIC to develop commercial and technological solutions that allow multiple SMMEs to partner with large corporations to improve the adoption of 4IR solutions identified by CATHSSETA to grow the industry and allow all participants to hire and train more workers

How can other stakeholders increase partnerships and collaboration?

1. SMMEs may conclude potential partnerships with stakeholders including SETAs and development agencies such as the Small Enterprise Development Agency (SEDA).

7.1.2   **Resource Mobilisation**

Various stakeholders are required in order to facilitate digital inclusiveness as a key intervention of 4IR. These include the DHET, CATHSSETA, larger employers (50 or more employees), smaller employers (less than 50 employees), HEIs/TPs, industry associations, as well as other stakeholders such as development institutions and NPOs. The key resources (stakeholders) required, as well as their roles, are outlined in the section below. The following are descriptions of each of the responsibility indicators outlined in the table:

D – Driver – drives/ influences the implementation of key interventions

C – Contributor – actively provides input to the conducting of key interventions

R – Reporter – reports on activities undertaken as part of key interventions

A – Advocator – promotes/supports the conducting of key interventions

E – Evaluator – assesses/analyses the effectiveness or quality of key interventions

P – Participator – observes the implementation of key interventions

Table 7-7: Resource Mobilisation – 4IR Learning Interventions

#	Issue Category	Stakeholders						
		DHET	CATHSSETA	Larger Employers	Smaller Employers	HEIs/TPs	Industry Associations (e.g. Trade Unions)	Other Stakeholders (e.g. Innovation Agencies, AWS)
1	Identification of 4IR Skills Needs	D, C, E	D, R, E	D, C	A, P	D	A	A
2	Establishment of new 4IR Interventions	D, C, E	D, R, E	A	A	D, C	D, C	D, C
3	Meeting of entry level requirements for 4IR learning interventions	D, C, E	A	C	C	D	N/A	N/A
4	Increasing 4IR Partnerships and Collaboration	P	A, P, C	C, E	P, E	P	D	C

7.2 Awareness on 4IR/4IR Skills and Engagement

4IR is transforming the global economy, creating new job opportunities while disrupting old ones. However, there is a reported lack of awareness of emerging 4IR skills and skills gaps in the workforce, along with low demand for 4IR courses. Despite the confidence of employers within CATHSSETA sub-sectors in their understanding of the 4IR, further insight highlights a lack of complex understanding of 4IR technologies and their application (CATHSSETA, 2021).

The above was supported by **33%** of employers who indicated they lack awareness on how and where 4IR technologies can be adopted. Sub-sector analysis of these results found that **50%** of employees within the **Arts, Culture and Heritage** sub-sector lack this awareness, while it was **33%** from **Tourism and Travel Services**, and **30%** from the **Hospitality** sub-sectors. There is also a general lack of knowledge on implementation methods relating to the 4IR technologies that would benefit and improve workplace processes (KPMG, 2020). Similar findings were noted amongst most organisations within the six CATHSSETA sub-sectors, with stakeholders unaware of the potential benefits of implementing the 4IR technologies internally (CATHSSETA, 2021).

> "4IR technologies may require significant changes to business processes and organizational structures. Some stakeholders may be resistant to these changes, which could impede adoption and limit the potential benefits of 4IR. "
>
> *Employer Interview, 2023*

7.2.1 Key Intervention

The following key interventions, mapped to 4IR visionary statements, are proposed in order to increase the Awareness on 4IR /4IR Skills Engagement:

Table 7-8: Key Interventions – Awareness on 4IR/4IR Skills Engagement

#	Key Intervention	4IR Visionary Statements
1	Conducting 4IR Communication Among Stakeholder Types	• The 4IR skills will be known and understood. • The level of collaboration between various stakeholders involved in skills supply will support the development of the required 4IR skills.

The above key intervention is outlined further below.

7.2.2 Conducting 4IR Communication Among Stakeholder Types

Stakeholders have indicated that the current demand for 4IR courses was low. To increase the demand for 4IR courses in South Africa, marketing of 4IR training is crucial. CATHSSETA can assist by helping training providers to showcase their 4IR offerings and expertise and use targeted marketing channels such as social media platforms, SETA websites and platforms, industry-specific forums, and relevant professional networks. This can help institutions reach students who are interested in 4IR courses.

7.2.2.1 Communication for Marketing of 4IR Training

Stakeholders have indicated that the current demand for 4IR courses was low.

> "The demand [for these courses] is mediocre"
>
> *Training Provider Interview, 2023*

In response to the above challenge, stakeholders indicated that marketing of 4IR training can increase the demand for 4IR courses in South Africa.

> "We have not invested in marketing, but the demand could be higher than what it is now if we could have known."
>
> *Training Provider Interview, 2023*

How can CATHSSETA Assist?

CATHSSETA can assist with the following, in terms of increasing marketing for 4IR training being offered:

1. Assist training providers to showcase their offerings and expertise in the 4IR space to different sub-sectors. This can include showcasing courses in Sound Technology and Video Editing offered by Aviwe Business Development Services, as well as Digital Learning and Digital Programming Language courses offered by Sparrow Combined Further Education and Training (FET) College.

2. Assist training providers to use targeted marketing channels such as social media platforms, SETA websites and platforms, industry-specific forums, and relevant professional networks. This can help institutions reach students who are interested in 4IR courses.

How can other stakeholders improve communication related to marketing of 4IR training?

1. The market can leverage seminars, publications, and online educational forums to increase awareness on 4IR and 4IR skills.

7.2.2.2 Communicating Identified Emerging 4IR Skills and Skills Gaps

35% of surveyed employers believed that they lack awareness of 4IR skills relevant to their organisation. Across the sub-sectors, **36%** of employers from **Hospitality**, **30%** from **Arts, Culture and**

Heritage, and **27%** from **Tourism and Travel Services** indicated that they lacked awareness of 4IR skills relevant to their organisation.

How can CATHSSETA Assist?

CATHSSETA may communicate identified 4IR emerging skills and skills gaps to stakeholders through the following interventions:

1. Engage in discussions with key informants covering all 6 sub-sectors, including other SETAs (e.g., MICT SETA), industry associations, and innovation agencies.

2. Collaborate with MICT SETA and merSETA for joint research projects, innovation labs, and partnerships with tech companies to gain insights into emerging technologies and the skills needed to work with them.

3. Encourage registered employers from all sub-sectors to submit WSP data. This can be done by sending reminders to registered employers to submit their WSP data.

4. Share the identified 4IR skills gaps and 4IR emerging skills per sub-sector documented in the Annual Sector Skills Plan with key stakeholders such as the employers and the training providers.

5. Develop and disseminate brochures, pamphlets, infographics, and other informational materials that highlight the importance of 4IR skills, the benefits of acquiring these skills, and the potential career opportunities they offer.

How can other stakeholders improve communication related to identified 4IR skills gaps and emerging 4IR skills?

1. Employers across 6 sub sectors and training institutions should communicate with each other regarding the 4IR skills gaps in organisations as well as regarding available 4IR offering. This can be achieved through CATHSSETA playing an advocacy role by facilitating communication between the 2 parties.

2. Policies such as Presidential Commission on the Fourth Industrial Revolution Strategic Implementation Plan (PC4IR SIP) and National Skills Development Plan (NSDP) should be revised to prioritise the identification and development of 4IR skills. Although it is not within the SETA's mandate to amend these policies, the SETA can play an advocacy role to ensure that these policies are revised.

3. Organisations from the 6 sub-sectors can play a crucial role in creating awareness by providing information on identified 4IR skills to CATHSSETA. The latter should ensure that employers are encouraged to communicate these identified emerging skills.

7.2.2.3   *Engaging with Stakeholders Relevant to 4IR space*

When asked about the support they would require to develop 4IR skills, **24%** of organisations indicated that they would require knowledge on potential applications of 4IR.

CATHSSETA can increase stakeholder engagement through the following:

1. Organise seminars, workshops, and webinars with employers, learners, and other key stakeholders to disseminate information on 4IR.

2. Advertise relevant 4IR seminars organized by other stakeholders through communication channels such as websites and emails, source relevant 4IR publications published by industry associations and experts, and create awareness of available online 4IR educational forums and skills transfer centres.

3. Advocate for links between employed and unemployed learners and available skills transfer centres and 4IR experience centres.

4. Advocate for the communication of identified emerging 4IR skills through policy documents, reports, and initiatives related to skills development and the 4IR.

How can other stakeholders contribute towards 4IR related engagement?

1. Stakeholders such as innovation agencies can establish Skills Transfer Centres as a channel to provide 4IR skills training to employees and learners within the CATHSSETA sub-sectors.

2. Traditional Universities and Universities of Technology can establish 4IR Experience Centres to increase the market's exposure to 4IR technologies. This can lead to more effective training and a more skilled workforce.

7.2.3   Resource Mobilisation

Various stakeholders are required in order to facilitate awareness of 4IR/4IR skills and engagement as a key intervention of 4IR. These include the DHET, CATHSSETA, larger and smaller employers, HEIs/TPs, industry associations, as well as other stakeholders such as government departments and agencies, and incubators/innovation centres including eKasi Labs. The key resources required, as well as their proposed roles, are outlined in the section below.

Table 7-9: Resource Mobilisation – Awareness on 4IR/4IR Skills Engagement[1]

#	Issue Category	Stakeholders							
		DHET	CATHSSETA	Larger Employers	Smaller Employers	HEIs/TPs	SETAs (e.g. MICT SETA)	Industry Associations	Other Stakeholders (e.g. Incubators/ Innovation Agencies)
1	Conducting 4IR Communication among Stakeholder Types	D, C, E	D, C, A, P, E	C, P	C, P	C, P	P, C	C, D	C, D

7.3   Digital Inclusiveness

Digital Inclusiveness, or the digital divide, relates to the extent that unequal access to technology will limit access to 4IR implementation opportunities as well as to 4IR-enabled skills development for the disadvantaged. Despite having one of the best-fixed broadband and wireless infrastructures in Africa, critical necessities such as fixed broadband, including fibre, are inaccessible to the majority of the South African population owing to limited penetration and affordability nationally (Beyode, et al., 2019).

For purposes of this study, respondents were asked to provide the extent to which they agree that the current level of infrastructure is adequate to support equal access to 4IR training, the results of which indicate that **69% of surveyed employers**, and **63% of surveyed HEIs/TPs** believed the current infrastructure is inadequate to support 4IR training. Further analysis at sectoral level indicates that the sub-sector with the highest proportion of employers who found the infrastructure to be inadequate to support 4IR training was **Hospitality (79%)**, followed by **Arts, Culture and Heritage (62%).**

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[1] **D** – Driver; **C** – Contributor; **R** – Reporter; **A** – Advocator; **E** – Evaluator; **P** – Participator

The current lack of digital inclusiveness in South Africa may be attributed to a number of factors, including a lack of access to the relevant skills and training and insufficient infrastructure required to access digital technologies. These findings have been supported by primary data:

> "We found that adapting technology reduces student's access to work. We have had to take things offline and make it hard copy. We cannot adopt 4IR because it makes it more difficult for students. They do not have data, they do not have resources to access that level of facility, its expensive for them."
>
> *Training Provider Interview, 2023*

> "The digital divide is mainly attributed to government policies and processes. They do not cater to everyone; they prioritise certain people and certain areas. At the moment, 5G cannot be taken to the villages because they do not even have 4Gs. All major developments take place in the cities and urban areas."
>
> *Training Provider Interview, 2023*

7.3.1   Key Intervention

The following key interventions, mapped to 4IR visionary statements, are proposed in order to increase digital inclusivity:

Table 7-10: Key Interventions - Digital Inclusiveness

#	Key Intervention	4IR Visionary Statement
1	Conducting Skills and Training Needed to Access Digital Technologies	The level of digital inclusiveness (digital literacy, infrastructure) will support equitable access to 4IR training.

The above key intervention is explored further below.

7.3.1.1   *Conducting Skills and Training Needed to Access Digital Technologies*

CATHSSETA's involvement in ensuring increased skills and training needed to access digital technologies may include the following interventions:

1. Advocate for the improved quality of STEM subjects in schools.

2. Fund and accredit dedicated STEM institutions in under serviced areas.

3. Developing mechanisms to fund and support NPOs that provides an equivalent 4IR training service to commercial employers.

4. Advocating for the translation of existing training and/or the development of new training to be translated into all official languages.

5. Advocate for funding organisations such as Harambee, Yes4Youth and other equivalents to provide basic digital literacy training that would enable job seekers to be trained in specific 4IR solutions that improve their employability.

How can other stakeholders ensure increased access to digital technologies?

1. TPs and Education Departments and Agencies can develop and provide education and training opportunities required to access digital technologies through formal qualifications, courses, skills transfer.

1. Non-profit Organisations (NPOs) and Innovation Agencies can assist the DHET and DBE with developing a comprehensive school education programme and providing access to digital skills training for underprivileged youth through training courses and programmes.

2. Employers within the Hospitality and Arts, Culture and Heritage sub-sectors can engage with CATHSSETA to provide the SETA with information of digital technology trends within the organisations. This may allow the SETA to lobby with relevant stakeholders for the implementation of such technologies.

7.3.2   Responsibilities to Bridge the Digital Divide

Beyond the provisions of adequate and affordable networks, power, data and digital devices, the closing of the digital divide has three components.

1. Adopting 4IR technology for use in Business Processes, inclusive of developing, identifying, implementing and integration the appropriate 4IR digital solutions in business operations

2. Adopting 4IR technology for Training Delivery, inclusive of developing, identifying and implementing the appropriate 4IR digital solutions that enables new forms and types training delivery

3. Accessing 4IR Enabled Training, inclusive of the basic skills to operate the digital devices and solution user interfaces. For small employers data affordability is also included.

The responsibilities for the three different elements of sector digital inclusion between CATHSETA and the different stakeholders in CATHSETA's skills development universe differ as indicated below:

Figure 7-3: Digital Inclusiveness Stakeholder Responsibility

	Lack of Access to 4IR Technologies	To Adapt 4IR Technology for use in Business Process	To Adapt 4IR Technology for Training Delivery	To Access 4IR Enabled Training
				• ECD • Basic Education
Larger Employers	• Non-SETA responsibility		• Self	• Self
Small Employers			• N/A	• CATHSSETA • DHET Partnerships with Data Service Providers
4IR Service Providers			• Self	N/A
HEIs, TVETs, CETs	• DHET • HEIs, TVETs, CETs		• DHET • ETDP SETA • CATHSSETA (C -sector specific training)	• N/A
Training Providers	• N/A		• CATHSSETA • Other Stakeholders (industry associations, innovation agencies etc.)	• CATHSSETA • Other Stakeholders
Unemployed Learners	• N/A		• N/A	• CATHSSETA + ETDPSETA • DHET • HEIs, TVETs, CETs • Training Providers

The responsibilities for the different stakeholders with regard to ensuring digital inclusiveness are outlined below:

1. Larger Employers

Larger employers will assume responsibility for identifying, integrating and implementing 4IR digital solutions to improve their business processes and training delivery, as well as ensuring that their workers have access to 4IR enabled training.

2. Smaller Employers

Smaller employers will also assume responsibility for identifying, integrating and implementing 4IR digital solutions to improve their business processes, with guidance from CATHSSETA. The SETA will assume responsibility for lobbying for 4IR enabled training to be 'zero-rated' by the communication network providers in partnership with DHET.

3. Higher Education Institutions (HEI)

DHET as well as HEIs will be responsible for producing students with the necessary skills to develop 4IR solutions, inclusive of localising foreign developed 4IR solutions, to be used by employers in their business processes and training delivery.

4. Technical and Vocational Education and Training (TVET) institutions and Training Providers

TVETs will be responsible for providing accreditation, skilled training personnel (facilitators, assessors, moderators) and content for training in 4IR digital solutions, as well as adopting 4IR digital solutions for use in their training delivery, which constitute their core business processes. In this regard, ETDP SETA will be responsible for training in 4IR digital solutions that TVETs adopt to change their training delivery model and processes, while CATHSETA should ensure TVETs and their associated employers adopt the appropriate 4IR digital solutions for training delivery.

5. Community Education and Training (CET) institutions

CETs will be responsible for providing the basic digital skills that allow workers to be trained for and operate 4IR digital technologies adopted by employers in their business processes, as well as adopting 4IR digital solutions for use in their training delivery models. The ETDP SETA will be responsible for training in 4IR digital solutions that CETs adopt to change their training delivery model and processes in this regard.

6. Unemployed Learners

CATHSETA will be responsible for planning and providing funding for 4IR digital solution training interventions for unemployed learners. They may lobby DHET to secure zero-based solution arrangements with network providers for digital training solutions serving unemployed learners. HEI, TVET and TPs will be responsible for delivering 4IR digital solution training to unemployed learners.

7.3.3 Resource Mobilisation

Various stakeholders are required in order to facilitate digital inclusiveness as a key intervention of 4IR. These include the DHET, CATHSSETA, employers (larger and smaller), HEIs/TPs, industry associations, as well as other stakeholders such as development institutions and NPOs. The key resources required to improve digital inclusiveness, as well as their roles, are outlined in the section below.

Table 7-11: Resource Mobilisation – Digital Inclusiveness[2]

#	Issue Category	DHET	CATHSSETA	Larger Employers	Smaller Employers	HEIs/TPs	Govt. Departments (e.g. DMRE, DPE, DRDLR, DCDT)	Industry Associations	Other Stakeholders (e.g. Development Institutions, NPOs)
1	Conducting Skills and Training Needed to Access Digital Technologies	C, P	A, R	D, P,E	P	P, C	N/A	A,C	C, P

7.4 Reskilling and Upskilling of Labour Force

Upskilling is defined as the learning of new skills to enhance current skillsets, while reskilling refers to the learning of new skills with the goal of pursuing a new job or career path. Within the 4IR era, Reskilling and Upskilling are important due to factors that include (International Business School, 2021):

1. Digital transformation – due to the accelerated adoption of 4IR technologies, employers have had to retrain their employees in skills that will allow them to utilise the technologies.

2. New job roles – employees require skilling in new job roles and tasks emerging as a result of accelerated digitalisation.

3. Due to some jobs becoming redundant as a result of automation, employees will need to reskilled or upskilled in order to occupy new roles.

> "From an employer perspective, productivity and competitiveness are key and can only be achieved if you have employees that are skilled, such as being technical, artisans, tools etc. So reskilling and upskilling are positive disruptions."
>
> *SETA Interview, 2023*

7.4.1 Key Intervention

The following key interventions, mapped to 4IR visionary statements, are proposed in order to increase digital inclusivity:

Table 7-12: Key Interventions: Reskilling and Upskilling

#	Key Intervention	4IR Visionary Statement
1	Redefining Jobs and Tasks	There will be an adequate volume of people with 4IR skills to meet the demand for such skills by Employers.

The above key intervention is explored further below.

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[2] **D** – Driver; **C** – Contributor; **R** – Reporter; **A** – Advocator; **E** – Evaluator; **P** – Participator

7.4.1.1 *Redefining Jobs and Tasks*

Redefining jobs and tasks entail analysing tasks and responsibilities associated with each job and identifying the skills and knowledge needed to perform those tasks in a 4IR environment. This is an important aspect of 4IR skills development as it helps organisations identify new skills and knowledge required within the context of a changing job market. It was noted from stakeholders that employers encounter difficulties in filling these vacancies, with **only 39%** of employers indicating that they have the ability to fill these 4IR related vacancies. The employers should, thus, develop training programs that focus on developing the specific skills and knowledge required for each job or reassign employees who will be impacted. CATHSSETA may assist in this regard by engaging with employers and/or providing 4IR skills research findings that inform the revision of roles.

How can other stakeholders improve ICT resources and infrastructure?

1. Employers should analyse tasks and responsibilities associated with each job and identify the skills and knowledge required to perform those tasks within a 4IR environment. This includes identifying occupations likely to be impacted by automation. 4IR is resulting in the emergence of new skills and occupations (World Economic Forum, 2020). Therefore, it is critical that employers develop the necessary skills to be able to fill these 4IR related vacancies.

7.4.2 Resource Mobilisation

Stakeholders required in order to facilitate the reskilling and upskilling of labour forces include the DHET, CATHSSETA, employers (larger and smaller), HEIs/TPs, industry associations, as well as other stakeholders such as innovation agencies. The key resources (stakeholders) required, as well as their roles, are outlined in the section below.

Table 7-13: Resource Mobilisation - Reskilling and Upskilling of Labour Forces[3]

		Stakeholders					
#	**Issue Category**	**CATHSSETA**	**Larger Employers**	**Smaller Employers**	**HEIs/TPs**	**Industry Associations (e.g. Trade Unions)**	**Other Stakeholders (e.g. Innovation Agencies)**
1	Redefining Jobs and Tasks	A	D, P, E	D, P, E	N/A	N/A	N/A

7.5 Collaboration Between SETAs

In order to facilitate 4IR readiness and adoption, collaboration will be required. No single entity can contribute the required changes and impact on its own, however, the sum of all the various contributions, made in a co-ordinated and complimentary way, will yield the biggest results. As such, collaboration between SETAs is critical for the development of 4IR skills, as aligns to the following 4IR visionary statement:

> *'The SETAs will collaborate to avoid duplication of skills development for 4IR.'*

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[3] **D** – Driver; **C** – Contributor; **R** – Reporter; **A** – Advocator; **E** – Evaluator; **P** – Participator

The stakeholders identified as key in 4IR readiness and adoption in the CATHSSETA sector include DHET, CATHSSETA, MICT SETA and merSETA as technology SETAs, ETDP SETA and other key role players such as the Council on Higher Education (CHE) and HEIs. The areas of focus identified for these stakeholders are:

- Digital inclusiveness
- Policy
- Strategy
- Research
- Funding
- Learning programme development/implementation
- Capacitation of TPs
- Training and delivery mechanisms
- SMMEs

The following table depicts the model proposed for collaborations:

Table 7-14: SETA Collaboration Forum

	DHET	CATHSSETA	Tech SETAs (MICT SETA/ merSETA)	ETDP SETA	Others
Digital Inclusiveness	• Advocate for structural changes	• Training skills providers • SMMEs • Unemployed learners	• N/A	• HEIs • TVETs • CETs	• DCDT
Policy	• 4IR PSET Policy (RSA)	• N/A	• N/A	• N/A	• N/A
Strategy	• 4IR PSET Strategy (RSA)	• 4IR PSET Skills Development Strategy (CATHSSETA sub-sectors)	• N/A	• Lecturer Development	• DCDT (4IR Strategy)
Research	• N/A	• 4IR Adoption (CATHSSETA sub-sectors) • 4IR Skills Demand (CATHSSETA sub-sectors) • 4IR Skills Supply (CATHSSETA sub-sectors) • Skills Gaps (identified through SSP)	• 4IR Technologies	• N/A	• N/A
Funding	• N/A	• Fund all 4IR related skills development for CATHSSETA sub-sectors	• N/A	• Lecturer Development	• N/A

	DHET	CATHSSETA	Tech SETAs (MICT SETA/ merSETA)	ETDP SETA	Others
Learning Programme Development/ Implementation	• N/A	• Core CATHSSETA sub-sector skills	• Tech related training	• N/A	• QCTO
Capacitation of TPs	• N/A	• Training skills providers	• N/A	• HEIs • TVETs • CETs	• N/A
Training and Delivery Mechanisms	• N/A	• Unconventional (specific to CATHSSETA sub-sectors) • Inform HEIs on training numbers for lecturers • Fund training for TVET lecturers specific to CATHSSETA sub-sectors	• Drive capacitation for lecturers on 4IR technologies	• N/A	• CHE, HEIs (lecturer curricula)
SMMEs	• Incubators	• SMME 4IR skills providers (CATHSSETA sub-sectors)	• Tech SMMEs	• N/A	• N/A

Each cell in the model above identifies a role player and the role they should be playing, according to the focus areas above. For instance, DHET is envisioned to be an advocate for structural changes (role) in order to achieve digital inclusiveness (focus area). This means DHET should lobby other high-level stakeholders such as the DCDT to achieve greater access to affordable data and equipment across the country, particularly for learners, HEIs, TVETs and CET institutions. In terms of learning programme development/implementation, CATHSSETA is expected to continue developing programmes that respond to sub-sector needs (though they may not be 4IR related, depending on demand), whilst SETAs such as MICT SETA will be the primary developers of technology related training as the line SETA for many technology employers and TPs.

Other notable mentions include the role of ETDP SETA in capacitating TPs as their primary constituency, with CATHSSETA providing limited lecturer capacitation as part of its NSDP obligations. If CATHSSETA seeks to influence more of the research and development of 4IR at HEIs and the training of learners in 4IR related matters at higher National Qualifications Framework (NQF) levels (6-10) in HEIs, it may necessitate the help of DHET to review the skills development policy of the country, most notably NSDP, as it currently envisages SETAs being more active in the TVET and CET spaces, along with QCTO. However, CATHSSETA could position itself as a driver of 4IR readiness and training for 4IR *use*, which would still maintain it in the TVET space, as opposed to being involved in 4IR *development*, which would place it in the HEI and MICT sector spaces.

The collaboration forum is intended as a platform for knowledge sharing and consensus gathering. In addition, the platform is aimed at eliminating competition between various 4IR role players by fostering a collective working relationship that provides clear roles and removes duplications and addresses omissions in duty.

7.6   Financial Support

In the South African context, while it is widely acknowledged that funding for educational initiatives has increased in recent years, the level of the funding is still insufficient for the effective functioning of education institutions (Huge Connect, 2019). According to desk-based research, this may be due to budgetary constraints within industry, which have resulted in limited investment in 4IR technologies by African governments generally (Ice Tech, 2022). Concerns relating to the lack of financial support is supported by fieldwork, where it was found that a lack of funding is a constraining force to 4IR skills development for **48%** of employers. Similarly, **33%** (the highest proportion) of employers indicated that they require funding/grant support in order to develop 4IR skills.

These sentiments were corroborated by fieldwork, with certain training providers highlighting the lack of funding as being the primary reason as to why their organisation cannot offer 4IR specific training initiatives.

> "The main reason we cannot offer training [on 4IR related topics] is [because of a lack of] funding for the training. Finance is the biggest problem."
>
> *Training Provider Interview, 2023*

The existence of adequate financial resources to implement 4IR skills development education and training initiatives is, therefore, a critical component to developing 4IR skills within the CATHSSETA sub-sectors. As such, there is a need to develop interventions that aim to ensure that more financial support is channelled towards CATHSSETA sub-sectors to implement 4IR education and training initiatives. These interventions are discussed in the section that follows.

7.6.1   Key Interventions

The key proposed interventions are articulated in the table below and have been mapped to 4IR visionary statements.

Table 7-15: Key Interventions – Financial Support

#	Key Intervention	4IR Visionary Statement
1	Funding 4IR Related Projects	• There will be collaboration with external stakeholders to implement an improved skills development model..
2	Improving Affordability of 4IR Infrastructure and Technologies	• The level of flexibility and responsiveness of the skills development model will support the rapid and sizeable development of 4IR skills. • 4IR policies, strategies and frameworks will promote 4IR related workforce development, skills-building and digital inclusiveness.

The following expands on each of the key interventions outlined above:

7.6.1.1   *Funding 4IR Related Projects*

According to input from desk-based research, the funding of 4IR related projects is important because it enables researchers to acquire the necessary resources and infrastructure to conduct their research effectively, including technologies, software, hardware, and equipment, as well as access to data and specialised expertise (WEF, 2016). As a result of the high cost of offering 4IR training, some institutions such as universities have had to reduce research funding. Furthermore, other HEIs cited financial challenges as being a hindrance to implementing 4IR projects, and indicated that other, more financially capable institutions have the funds to implement said projects.

> "The second one is that again, in terms of resources, especially [university name redacted], I think they are better endowed compared to us. If they see something exciting, they easily find ways within their financial resources to put it in place while for us, we struggle.
>
> *HEI Interview, 2023*

How can CATHSSETA Assist?

CATHSSETA can ensure that adequate funding is channeled toward 4IR projects by:

1. Provide funding to researchers undertaking 4IR projects within the various HEIs in order to enable them to acquire required resources; and

2. Play an advocacy role by lobbying for other stakeholders, such as innovation agencies, to invest in the provision of relevant 4IR infrastructure to institutions where 4IR projects are being conducted and collaborating with other stakeholders to afford researchers access to 4IR conferences and workshops, including by sourcing funding for the participation.

7.6.1.2 *Improving Affordability of Infrastructure and Technologies*

One of the key elements of developing 4IR skills is access to the relevant infrastructure and technology to learn and develop said skills. However, as discussed in Section 6.2, one of the key issues resulting in a lack of access to said technologies is the extent to which South Africans can afford to access these technologies. In addition to impacting South Africans at an individual level, the challenge with affordability also affects the ability of institutions to provide education and training, as some schools do not have the technology to teach students how to utilise devices (Huge Connect, 2019). The challenge around affordability as it relates to 4IR skills development was highlighted as being a key concern amongst HEIs and Training Providers through fieldwork input, with **83%** of these stakeholders indicating that a lack of financial resources impeded their ability to provide 4IR Training. This was echoed in qualitative consultations with training providers.

> "Our company doesn't provide any 4IR related courses because we do not have money and funding is a really big issue. As it stands people do not have money to get trained and I also do not have money for bursaries. If I had funding I would provide training for 4IR related courses. We cannot afford to offer editing and lighting training due to finance issues, and I believe that if finances can be solved then our company would be able to offer these 4IR related trainings."
>
> *Training Provider Interview, 2023*

The above is supported by fieldwork input from employers, with **80%** of respondents within the arts, culture and heritage sub-sector citing the lack of funding as a key constraint to developing 4IR skills, with **67%** of respondents within the gaming and lotteries sub-sector indicating the same. Furthermore, when asked to cite the key reasons behind why their organisation was unable to fill 4IR related vacancies, **67%** of respondents from the **Arts, Culture and Heritage** sub-sector indicated that the inability to fill in particular 4IR related vacancies was due to the high cost of upskilling employees. Similarly, **50%** of respondents from the **Conservation** sector indicated the same.

Similar trends were noted amongst respondents when asked what support their organisations' required to develop 4IR skills, with **60%** of respondents within the **Arts, Culture and Heritage** sub-sector indicating that their organisation requires more funding and/or grants to adopt 4IR training, with **33%** of respondents within the **Conservation** sub-sector indicating the same.

Furthermore, from the employers' perspective, in addition to not having funds to train employees, it is recognised that organisations will have to adapt or replace IT infrastructure with modern technologies in order to effectively adopt the 4IR, and this will require significant capital expenditure (Beyode, et. al., 2019). This view was supported by fieldwork input, with certain employers within the hospitality sub-sector highlighting the significant costs associated with adopting 4IR related technology within their organisation.

> "Changing technology is going to come at a huge cost. We have got fibre and Wi-Fi, but we are still struggling with connectivity issues because of the old walls that we have. New hotels have thin walls which makes it easier. We are a group of hotels, which contains a total of 14 hotels. Our specific hotel is more than 50 years old. Changing technology as you just want, like where you put your access card in that little holder and then it switches on your lights- the cost implications to upgrade technology wise is not really viable for. We looked into doing those upgrades to lights for our 101 rooms and it was going to cost us about R3 Million to implement."
>
> *Employer Interview, 2023*

In terms of identifying the sub-sectors which require more financial support to adopt 4IR and facilitate 4IR skills development, fieldwork input revealed that the **Arts, Culture and Heritage** sub-sector requires the most financial support, with **60% of respondents** within the sector indicating that they require funding/grants to adopt 4IR technologies. This was followed by the **Sports, Fitness and Recreation** and the **Conservation** sub-sectors, with **38% and 33% of** respondents indicating that they require financial support to adopt 4IR technologies respectively.

The input from fieldwork regarding the sub-sectors that require more financial support is important because it provides an indication of the specific sub-sectors which require more financial support and may inform the development of specific interventions aimed at channelling funds towards these specific sub-sectors.

How can CATHSSETA Assist?

To improve the affordability of accessing 4IR training and educational initiatives, CATHSSETA may consider:

1. Playing an advocacy role by lobbying other stakeholders such as development and innovation agencies, or stakeholders such as the HSRC and/or AWS, for additional funding for 4IR related skills development and lobbying other stakeholders who offer 4IR training to offer the training at subsidised cost for employers within the **Arts, Culture and Heritage, Sports, Fitness and Recreation, and Conservation sub-sectors**; and

2. Lobbying stakeholders including government departments (such as DHET) to subsidise company or employee training course fees and absentee payroll salary costs, to lessen the financial burden on the employers within the abovementioned sub-sectors. This may also include lobbying government departments (such as the DCDT) to ensure affordable access to relevant resources, including infrastructure, for employers.

7.6.2   Resource Mobilisation

Stakeholders required in order to facilitate the reskilling and upskilling of labour forces include the DHET, CATHSSETA, employers (larger and smaller), HEIs/TPs, industry associations, as well as other stakeholders such as the HSRC or AWS. The key resources required, as well as their roles, are outlined in the section below.

Table 7-16: Resource Mobilisation – Financial Support[4]

#	Issue Category	Stakeholders						
		DHET	CATHSSETA	Larger Employers	Smaller Employers	HEIs/TPs	Industry Associations	Other Stakeholders (e.g., AWS, HSRC)
1	Funding 4IR Related Projects	D, C, P, E	D, A, C, P, E	C, P	P, R	P, R	C	C, D
2	Improving Affordability of 4IR Infrastructure and Technologies	D, C, P	A, C	P	P	C, P, R	A,C	A, C

7.7   4IR Policies, Strategies, Legislation and Frameworks

There is a consensus amongst stakeholders consulted as part of this study that national policies and frameworks need to be developed or updated in order to enable the advancement of 4IR.

> "The government is responsible for policy formulation, we have a responsibility to introduce regulations and entities that ensure that proper education and training is facilitated to respond to skills needs."
>
> *Other Stakeholder Interview, 2023*

This is due to current policies, strategies and frameworks in South Africa being perceived as inadequate in promoting 4IR workforce development, skills-building and digital inclusiveness. These were the findings from surveys conducted with employers, and HEIs and TPs, where only **44% of surveyed stakeholders** believed the policies are adequate, as indicated in the figure below.

Figure 7-4: Extent to which Employers believed Current Policies, Strategies and Frameworks Promote 4IR Workforce Development, Skills-Building and Digital Inclusiveness
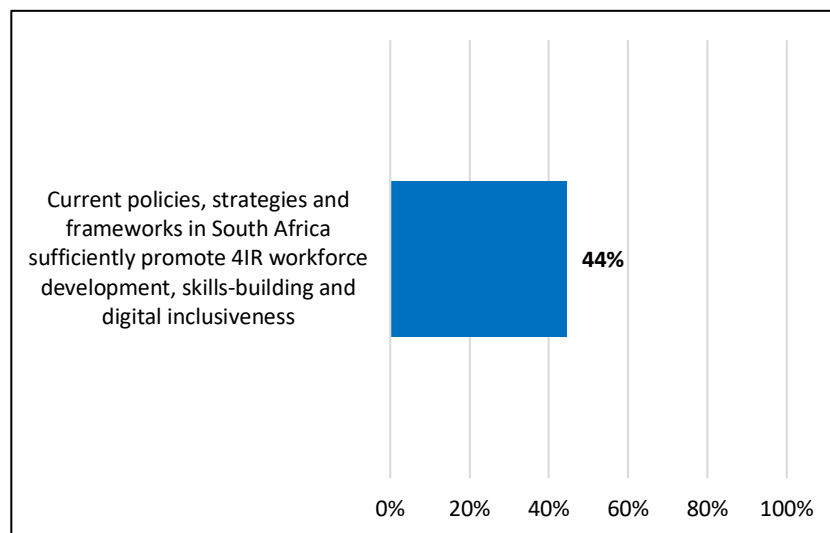
Source: Employers Survey (2023)

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[4] **D** – Driver; **C** – Contributor; **R** – Reporter; **A** – Advocator; **E** – Evaluator; **P** – Participator

A sub-sectoral analysis indicates that only **14%** of employers from the **Hospitality** sub-sector believed the policies to be adequate, as compared to **56%** of employers from **Tourism and Travel Services**, and **50%** from **Arts, Culture and Heritage**.

The current policies and frameworks relevant to the 4IR in South Africa include:

1. Presidential Commission on the Fourth Industrial Revolution Strategic Implementation Plan (PC4IR SIP)
2. Department of Science and Technology (DST) Ten-Year Innovation Plan
3. The National Cybersecurity Policy Framework (NCPF)
4. National Skills Development Plan (NSDP)
5. National Integrated ICT Policy White Paper
6. Industrial Policy Action Plan (IPAP)
7. Economic Reconstruction and Recovery Plan Skills Strategy (ERRP SS)

Stakeholders have highlighted the need for an integrated response to 4IR. As such, key interventions are required for the reviewing and updating of relevant policies, strategies and legislation.

> "…We also have the SP framework, which is a framework that is used to develop skills and skills plans in the sector, which then is translated into the annual performance plan and is then implemented. So it is an enabler because it allows the SETA to determine what interventions to employ in response to the skills needs identified in the sector, including those that are 4IR related. "
>
> *Other Stakeholder Interview, 2023*

7.7.1   Key Interventions

The following key interventions, mapped to 4IR visionary statements, are proposed in order to update current 4IR Policies, Strategies, Legislation and Frameworks:

Table 7-17: Key Interventions: 4IR Policies, Strategies, Legislation and Frameworks

#	Key Intervention	4IR Visionary Statement
1	Reviewing Current 4IR Policies, Strategies and Frameworks	4IR policies, strategies and frameworks will promote 4IR related workforce development, skills-building and digital inclusiveness.
2	Gathering Input for Future 4IR Policies, Strategies and Frameworks	
3	Developing New 4IR Policies, Strategies and Frameworks	

The above key interventions are explored further below.

7.7.1.1   *Reviewing Current 4IR Policies, Strategies and Frameworks*

Stakeholders agree that interventions are needed with regard to policies and frameworks. South Africa ranks 78th out of 141 countries in terms of digital skills readiness. This gap is particularly prevalent among historically disadvantaged groups such as women, youth, and SMME (Mzekandaba, 2020)s. As such, it poses a significant challenge for the country's efforts to transition to a knowledge-based economy and to realize the full potential of 4IR technologies.

> *"4IR needs to stop being an intellectual curiosity and become a reality. We need to stop relying on existing frameworks to understand your new world."*
>
> *Other Stakeholder Interview, 2023*

How can CATHSSETA Assist?

CATHSSETA's involvement in the review of current policies, strategies and frameworks may be to:

1. Lobby for policies focused on improving 4IR skills development for youth, women, and SMMEs. Because of the significant digital skills gap in South Africa, prioritising 4IR skills development for youth, women, and SMMEs, South Africa is needed to build a strong foundation for its 4IR ecosystem, ensure that its workforce is well-equipped to compete in the global marketplace and promote social and economic inclusion.

2. Advocate for the review of relevant policies, strategies and frameworks by relevant departments, including the DHET and DBE. The PC4IR SIP is critical in this regard. The plan outlines a range of strategic initiatives and priority areas for the adoption of 4IR, including the development of digital infrastructure, the promotion of digital skills and education, the creation of an enabling policy and regulatory environment, and the support of innovation and entrepreneurship in the technology sector. A key area of focus for the plan is education, in response to findings that the public education system in South Africa is severely strained in equipping learners with relevant 4IR skills, including creative thinking, and digital and entrepreneurship skills. In response, the plan proposes the development of a minimum infrastructure policy, cross-cutting zero-rated online e-learning platforms, 4IR hubs, gig economy (relying on temporary or part-time occupations) skills, as well as the establishment of an Education Digital Technology Ecosystem (EDT) (DCDT, 2021).

3. Lobby with relevant stakeholders to ensure that the proposed interventions in the PC4IR are implemented, especially for the Hospitality sub-sector where the least proportion of stakeholders believe current policies are adequate in promoting 4IR workforce development, skills-building and digital inclusiveness.

How can other stakeholders contribute to developing 4IR Policies, Strategies and Frameworks?

1. NGOs and government departments such as the DHET should ensure that enabling policies are developed to include focus on improving 4IR skills development for youth, women, and SMMEs.

7.7.1.2   *Gathering Input for Future 4IR Policies, Strategies and Frameworks*

CATHSSETA's involvement in the target solution/ key intervention to gather input for current policies, strategies and frameworks may include:

1. Develop and maintain an integrated sector career model and sector econometric model that allow CATHSSETA to continuously research and identify 4IR solutions that will help the industry expand to hire more workers and provide more training;

2. Integrate econometric models with sector strategies such as the National Tourism Sector Strategy (NTSS);

3. Focus the SETA's resources on developing training programmes for the 4IR solutions with the highest economic potential;

4. Perform in-depth international best practice research in compiling and maintaining industry career models; and

5. Evaluate individual 4IR digital solutions for their ability to improve the productivity of workers performing specific roles in the career model. The 4IR focus is not only on skills deemed valuable by employers but rather the ability of a technological solution to augment, improve or potentially replace skills deemed valuable by employers.

How can other stakeholders contribute to the gathering of input for future 4IR Policies, Strategies and Frameworks?

1. Employers, in collaboration with CATHSSETA, may provide input into skills trends across industries in order to inform the areas to be targeted by policies, strategies and frameworks.

2. HEIs may provide input into relevant 4IR training interventions necessary to delivering training in identified 4IR skills needs, to ensure policies promote these interventions.

3. NGOs may provide input on skills needs of underrepresented groups within labour forces.

7.7.1.3   Developing new 4IR Policies, Strategies and Frameworks

CATHSSETA's involvement in the development of new policies, strategies and frameworks may include:

1. Adapting necessary internal regulations to allow for funding of 4IR digital solution training to be provided to large numbers of employers;

2. Requesting support from relevant departments such as the Department of Tourism, to collaborate on the development of the integrated sector career model and sector econometric model that allows CATHSETA to continuously research and identify 4IR solutions to support with training programmes;

3. Collaborating closely with relevant government departments and agencies to maintain the model;

4. Collaborating closely with industry bodies and technology research organisations to maintain the sector career models.

5. Allowing learners to suggest 4IR digital solutions identified through own research that CATHSSETA should evaluate for inclusion in high impact solution list, so as to develop youth-oriented 4IR strategies. This is in response to the need to address the development of youth through appropriate policies and frameworks, as highlighted by stakeholders.

> "We have a responsibility as the SETA to ensure that we address rural development of youth. The policies and regulations that governs us in skills development are not specific on what initiatives SETAs my employ to address the urban and rural divide for instance. However, the SETAs themselves must do an analysis to see what interventions they can employ to address NSDP outcomes' and have enabling mechanisms."
>
> *Other Stakeholder Interview, 2023*

How can other stakeholders contribute to developing 4IR Policies, Strategies and Frameworks?

1. NGOs may advocate for policies that promote equitable access to 4IR skills training.

7.7.2   Resource Mobilisation

Stakeholders required in order to facilitate the reskilling and upskilling of labour forces include the DHET, CATHSSETA, employers (larger and smaller), HEIs/TPs, industry associations, innovation agencies and other stakeholders including NGOs. The key resources required, as well as their roles, are outlined in the section below.

Table 7-18: Resource Mobilisation - 4IR Policies, Strategies, Legislation and Frameworks[5]

#	Issue Category	DHET, DBE	CATHSSETA	Larger Employers	Smaller Employers	HEIs/TPs	Department of Tourism	Industry Associations	Other Stakeholders (e.g. NGOs)
1	Reviewing Current 4IR Policies, Strategies and Frameworks	C, P, D, E	A, C, P	D, C	P	C	C	C, A	C, D
2	Gathering Input for Future 4IR Policies, Strategies and Frameworks	D, C, P, E	D, A, C, P, E	C, P, R	C, P, R	D, C, P, R	C, P	C, P	P, C
3	Developing 4IR Policies, Strategies and Frameworks	D, A, C, P, R, E	D, A, C	D, C	C, P	D, C	D,C, E	D,C, E	C, P

7.8   Training and Delivery Mechanisms

The 4IR is characterised by the integration of advanced technologies such as AI, the internet of Things (IoT), and robotics, which are significantly altering the training and delivery mechanisms within the education sector, making learning more accessible, personalised, and engaging for students. This is being achieved through (World Economic Forum, 2016):

1. Personalised learning – AI allows institutions to personalise learning to meet the unique needs of each student. AI algorithms analyse data to determine the areas where students need more support and provide personalised learning materials to help them improve.

2. Online learning – e-learning platforms are increasingly being used to deliver training that can be accessed from any location.

3. Gamification – the use of game design elements in non-game contexts to make learning more engaging and interactive, with the help of advanced technologies like virtual reality (VR) and augmented reality (AR).

4. Blended learning – combining online and traditional classroom learning, allowing for a more flexible and customised learning experience, where students can access learning materials online and engage in classroom discussions and activities.

5. Digital credentials – digital badges that represent a learner's achievement in a specific skill or competency, which can be shared online and recognised by employers and institutions worldwide.

7.8.1   Key Interventions

The following key interventions, mapped to 4IR visionary statements, are proposed for training and delivery mechanisms.

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[5] **D** – Driver; **C** – Contributor; **R** – Reporter; **A** – Advocator; **E** – Evaluator; **P** – Participator

Table 7-19: Key Interventions - Training and Delivery Mechanisms

#	Key Intervention	4IR Visionary Statement
1	Incorporating 4IR in Teaching and Learning	• Training providers will be capacitated to deliver 4IR education and training of a high quality. • The level of flexibility and responsiveness of the skills development model will support the rapid and sizeable development of 4IR skills.
2	Providing Access to Required 4IR Resources	• The level of digital inclusiveness (digital literacy, infrastructure) will support equitable access to 4IR training.
3	Conducting 4IR Training for Employees	• The level of flexibility and innovation in the 4IR skills development business model will meet changing 4IR labour market demands. • The level of flexibility and responsiveness of the skills development model will support the rapid and sizeable development of 4IR skills.

The above key interventions are explored further below.

7.8.1.1   *Incorporating 4IR in Teaching and Learning*

All of the surveyed HEIs and TPs agreed that emerging 4IR skills are resulting in changes to curricula. However, only **42% of the HEIs and TPs** agreed that current training providers are able to deliver high quality 4IR training. This is cause for concern given the accelerated adoption of 4IR by industries. There is, thus, a need to enhance the incorporation of 4IR into teaching and learning. One of the ways in which this may be achieved is through the introduction and support for EdTech start-ups, which aim to develop next generation online learning, analytics, and campus management solutions. The use of 4IR technologies applicable to the country's context may also contribute to this (AWS, 2022). While emerging economies use the technology leader-follower framework, the adoption of strategies that bypass traditional, incremental steps and technologies in favour of more advanced and innovative solutions by developing countries will ensure they catch up with technologically advanced nations and reap the benefits of the 4IR (Dash, et al., 2022).

How can CATHSSETA Assist?

CATHSSETA can assist in the incorporation of 4IR in teaching and learning through the following interventions:

1. Conduct research into 4IR skills trends within the country, in conjunction with employers. This research will then inform the development of 4IR skills development initiatives specific to the local context.

2. Lobby for the revision of curricula offered in TVET colleges, so as to better align the curricula to the demands of the 4IR era.

3. Lobby for the development of 4IR focused departments and faculties within institutions of higher learning, to ensure that a central body is in place to oversee the development 4IR skills training programmes.

7.8.1.2   *Providing Access to Required 4IR Resources*

In adopting new teaching and learning approaches, various authorities are responsible for ensuring that these are accessible to all intended targeted learners, including by facilitating the availability of resources. The correct network resources for the accurate and efficient operation of 4IR technologies

such as the IoT system should be implemented (Rinf.tech, 2022). One approach is to make teaching and learning programmes mobile friendly in order to ensure that learners without access to computers can also access these programmes.

How can CATHSSETA Assist?

CATHSSETA can assist in providing access to required 4IR resources through the following interventions:

1. Lobby for TPs and institutions of knowledge to introduce and incorporate these mobile friendly applications and platforms into their 4IR skills development programmes.

7.8.1.3   *Conducting 4IR Training for Employees*

Given that 4IR trends are constantly changing, it is crucial that employees continuously broaden their skillset, which will, as a result, enable them to meet new workplace trends (Brush, 2020). Developing resilient and adaptable labour markets will ensure workers and countries manage the transition with the least disruption (Dash, et al., 2022).

How can other stakeholders contribute to conducting 4IR training for employers?

1. Employers may leverage digital labour platforms, which may assist in addressing labour market inefficiency on a global scale, facilitating job matching in local markets, reducing recruiting time, and create opportunities for workers to reach new markets and audiences (Dash, et al., 2022).

2. Employers may also develop business models which simultaneously offers both physical and digital experiences to audiences with different desires, will ensure that creative institutions optimise their returns from the new hybrid art space (Alkhaldi, 2022). CATHSSETA may assist in this regard by advocating for the enrolment of workers into 4IR skills development programmes in order to improve their skillsets.

7.8.2   Resource Mobilisation

Stakeholders required in order to facilitate the enhancing of training and delivery mechanisms include the DHET, CATHSSETA, employers (larger and smaller), HEIs/TPs, industry associations, as well as other stakeholders such as innovation agencies and the AWS. The key resources (stakeholders) required, as well as their roles, are outlined in the section below. The following are descriptions of each of the responsibility indicators outlined in the table:

Table 7-20: Resource Mobilisation – Training and Delivery Mechanisms[6]

#	Issue Category	Stakeholders						
		DHET	CATHSSETA	Larger Employers	Smaller Employers	HEIs/TPs	Industry Associations	Other Stakeholders (e.g. Innovation Agencies, AWS)
1	Incorporating 4IR in Teaching and Learning	D, C, P, E	D, A, C, E	N/A	N/A	C, P	N/A	A, C, P

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[6] **D** – Driver; **C** – Contributor; **R** – Reporter; **A** – Advocator; **E** – Evaluator; **P** – Participator

		Stakeholders						
#	**Issue Category**	**DHET**	**CATHSSETA**	**Larger Employers**	**Smaller Employers**	**HEIs/TPs**	**Industry Associations**	**Other Stakeholders (e.g. Innovation Agencies, AWS)**
2	Providing Access to Required 4IR Resources	D, C	D, A, C, E	C, P, R	P, R	C, P	A, C	D, C, P
3	Conducting 4IR Training for employers	D, C	A, R	D, E	D, E	P, C	P, C	P, C

7.9 Capacitated Training Providers and Training Institutions

There are challenges in addressing 4IR-related skills gap as a result of a lack of qualified TPs. This renders it difficult for learners in institutions of higher learning, such as TVETs, to acquire the necessary skills and knowledge to effectively participate in the 4IR economy.

> "When there is no course that is 4IR related at TVET level, then they cannot be capacitated on 4IR because they will not be teaching these learners the right information. They do not have any developed qualification that they can now say that they have a specific class on this specific 4IR course."
>
> *HEI Interview, 2023*

This is especially prevalent in disadvantaged communities, where institutions find it difficult to retain experienced international and local staff to provide 4IR training. As such, interventions are required to ensure TPs and training institutions are capacitated in order to deliver high quality 4IR teaching and learning.

7.9.1 Key Interventions

The following key intervention, mapped to 4IR visionary statements, are proposed for capacitating TPs and training institutions.

Table 7-21: Key Interventions – Capacitated Training Providers and Training Institutions

#	**Key Intervention**	**4IR Visionary Statement**
1	Increasing Capacitation Programmes available for Trainers/Lecturers	• Training providers will be capacitated to deliver 4IR education and training of a high quality.

The above key intervention is explored further below.

7.9.1.1 Increasing Capacitation Programmes available for Trainers/Lecturers

44% of the surveyed HEIs/ TPs believed that their ability to provide 4IR training is impeded by a lack of qualified trainers to provide training on 4IR skills.

> "I definitely feel that training providers should be trained more into the 4IR skills, I think it is a very crucial part that needs to be incorporated with CATHSSETA or any SETA."
>
> *Training Provider Interview, 2023*

CATHSSETA may act in the following capacities in the capacitation of training providers:

1. Organising 4IR workshops, seminars and webinars for trainers and lecturers (similar to workshops being organised by MICT SETA).

2. Collaborating with HEIs and other industry experts to develop training material required to upskill and reskill training providers at TVET level.

3. Advocating for partnerships between training providers and other stakeholders, such as industry associations, and other training institutions. These partnerships can provide opportunities for shared learning, resource sharing.

How can other stakeholders contribute to increasing capacitation programmes available?

1. Innovation agencies may develop short courses on trainings for trainers and lecturers and conduct workshops in order to ensure the trainers and lecturers are adequately capacitated in 4IR skills.

7.9.2   Resource Mobilisation

Stakeholders required in order to facilitate the capacitation of TPs and training institutions include the DHET, CATHSSETA, employers (larger and smaller), HEIs/TPs, industry associations, as well as other stakeholders such as innovation agencies and the DHA. The key resources (stakeholders) required to, as well as their roles, are outlined in the section below.

Table 7-22: Resource Mobilisation – Capacitated Training Providers and Training Institutions[7]

		Stakeholders						
#	Issue Category	DHET	CATHSSETA	Larger Employers	Smaller Employers	HEIs/TPs	Industry Associations	Other Stakeholders (e.g. Innovation Agencies, DHA)
1	Increasing Capacitation Programmes available for Trainers/Lecturers	D, A, C, P	D, A, C, P, E	N/A	N/A	D, C, P, E	A	C, P

7.10   Research on 4IR

CATHSSETA stakeholders believe that there is a lack of research and development being conducted in the 4IR space, pertaining to the understanding of 4IR.

> "I think it is lack of research, because we tend to assume that because there is this big term '4IR' everybody understands it the same when it comes to what it is and what it means for their sector."
>
> *Government Department Interview, 2023*

Furthermore, stakeholders added that they believed that the lack of understanding was observed at sectoral level, particularly in the Conservation sub-sector, thus necessitating additional research at that level.

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[7] **D** – Driver; **C** – Contributor; **R** – Reporter; **A** – Advocator; **E** – Evaluator; **P** – Participator

> "There needs to be research conducted to focus on the space of conservation."
>
> *Industry Expert Interview, 2023*

7.10.1   Key Interventions

The following key interventions, mapped to 4IR visionary statements, are proposed for greater research on 4IR to be conducted.

Table 7-23: Key Interventions – Research on 4IR

#	Key Intervention	4IR Visionary Statement
1	Conducting 4IR Research and Development	• The 4IR skills will be known and understood. • There will be collaboration with external stakeholders to implement an improved skills development model.
2	Sharing and Publishing 4IR Research Studies	• There will be collaboration with external stakeholders to implement an improved skills development model.

The above key interventions are explored further below.

7.10.1.1   Conducting 4IR Research and Development

In order to enhance 4IR Research and Development, **CATHSSETA** may act in the following capacity:

1. Conduct or commission additional 4IR research to understand 4IR trends in the 6 sub sectors.

2. Provide funding and grants to support research and development initiatives in the 4IR space.

3. Provide guidance to research institutions on the research that should be conducted.

4. Facilitate collaboration and networking among industry, academia, research institutions, and government agencies to foster a conducive ecosystem for Research and Development in the 4IR skills development space.

5. Contribute to the formulation of policies regarding Research and Development in the 4IR space. This can involve working with government agencies such as DHET, with contribution from innovation agencies and NGOs, to develop policies.

How can other stakeholders contribute to the recruitment and retention of international experts?

1. DHET, with contribution from innovation agencies NGOs, should ensure that enabling policies for 4IR research and development are developed, as highlighted in **Section 6.7.1**.

7.10.1.2   Sharing and Publishing 4IR Research Studies

Publishing findings from 4IR research studies is necessary in order to advance knowledge among the public, which ultimately informs policy formulation and fosters collaboration and innovation. In 2020, the National Gambling Board (NGB) conducted research to identify the impact of 4IR on the gambling industry. One of the findings of the report was that the regulation of data privacy is critical in all major applications of AI - all use of consumer data must adhere to South African data privacy law (NGB, 2020).

> "The likes of CSIR could also play crucial role in this. When I go into their website, they have good research. They need to publish 4IR related studies and then pump money into sector to ensure that 4IR is adopted."
>
> *Industry Expert Interview, 2023*

> "When they [SETAs] conduct research, they must share results with us, so that we know what the research says."
>
> *Training Provider Interview, 2023*

How can CATHSSETA assist?

CATHSSETA may adopt a similar approach of publishing 4IR research studies conducted and:

1. Share findings reports for 4IR research conducted on platforms such as websites and can also be shared on other engagement platforms.

2. Organise presentations, workshops and seminars to disseminate research findings. These events can be held with targeted audience including employers, learners, educational institutions and industry associations.

3. Utilise webinars, online platforms, and social media to share research findings. Webinars can be recorded and shared on the SETA's website or social media channels, allowing for broader audience to have access to the findings stemming from the research studies.

4. Collaborate with academic institutions and industry associations to share findings.

5. Prepare policy briefs and short executive summaries of research studies (including infographics), to disseminate key findings on newsletters and social media platforms.

6. Conduct research periodically to source 4IR research studies published by key industry stakeholders. These published research studies can then be shared with SETA stakeholders.

7. Act as a link between stakeholders to ensure that 4IR research studies conducted by each party is shared with each other.

8. Promote success stories of researchers or institutions that have effectively shared and published their 4IR research studies. This will encourage other researchers and institutions to share and publish their research studies.

9. Engage with government agencies such as the DHET to advocate for the development of policies that encourage and facilitate the sharing and publishing of 4IR research studies. In this regard, DHET has commissioned a multi-year Labour Market Intelligence Programme (LMIP) research with the aim of integrating skills planning within government strategies and plans, with findings published. Findings from the research should, thus, be incorporated policies that encourage and facilitate the sharing and publishing of 4IR research studies.

How can other stakeholders contribute to the sharing and publishing of 4IR research studies?

1. Industry associations for the CATHSSETA sub-sectors may commission research on 4IR similar to that conducted by the NGB for the Gaming and Lotteries sub-sector, and ensure the findings are published publicly.

7.10.2   Resource Mobilisation

Stakeholders required in order to facilitate the conducting of research on 4IR include the DHET, CATHSSETA, employers (larger and smaller), HEIs/TPs, industry associations, as well as other

stakeholders such as innovation agencies and the CSIR. The key resources required, as well as their roles, are outlined in the section below. The following are descriptions of each of the responsibility indicators outlined in the table:

Table 7-24: Resource Mobilisation – Research on 4IR[8]

#	Issue Category	Stakeholders						
		DHET	CATHSSETA	Larger Employers	Smaller Employers	HEIs/TPs	Industry Associations	Other Stakeholders (e.g. CSIR)
1	Conducting 4IR Research and Development	A, C	D, A, C, P, R, E	C, P	C, P	C, P	N/A	C, P
2	Sharing and Publishing 4IR Research Studies	A, C	D, C, P, E	N/A	N/A	C, P	N/A	A

7.11 Skills Development in SMMEs

SMMEs are recognised as essential contributors to South Africa's National Development Plan (NDP) 2030 through their potential to create jobs in several areas, including innovation influenced by 4IR, as well as improve competitiveness (Blose & Okeke-Uzodike, 2020). Of the SMMEs surveyed, 65% indicated that 4IR skills training is a priority for their organisations. However, only 35% were actively developing the 4IR skills. As such, greater support to SMMEs and their employees is required in order for their employees to receive and benefit from 4IR skills development initiatives.

7.11.1 Key Intervention

The following key interventions, mapped to 4IR visionary statements, are proposed for Training and Delivery Mechanisms.

Table 7-25: Key Intervention – Skills Development in SMMEs

#	Key Intervention	4IR Visionary Statement
1	Increasing Funding and Investment in SMMEs	The post-school education and training (PSET) system, including institutional arrangements, will support the minimisation of skills gaps for the 4IR.

The above key intervention is explored further below.

7.11.1.1 Increasing Funding and Investment in SMMEs

SMMEs require financial support, which may be in the form of 4IR-related grant funding, in order to better respond to the constraints they currently face (C4IR, 2021). This was confirmed through fieldwork, that a lack of access to financial support was one of the challenges identified as preventing SMMEs from acquiring 4IR related skills and implementing 4IR technologies.

> "The challenges that may prevent the delivery of 4IR skills to SMMEs is the lack of funding. Certain 4IR platforms require a lot of funding and cloud access, and to ensure you have the right systems in place will require funding."
>
> *Employer Interview, 2023*

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[8] **D** – Driver; **C** – Contributor; **R** – Reporter; **A** – Advocator; **E** – Evaluator; **P** – Participator

How can CATHSSETA assist?

CATHSSETA may adopt the following interventions to assist in increasing funding and investment for SMMEs:

1. Provide grant funding to the SMMEs to enable them to implement 4IR skills development programmes and solutions.

2. Identify available funding opportunities for SMMEs and disseminate this information to the SMMEs, including application requirements and procedures.

3. Provide financial training and support to SMMEs to improve their financial literacy and help them to access and manage funding.

4. Facilitate partnerships between SMMEs and financial institutions, such as banks or venture capital firms, to help SMMEs access funding and other financial services.

5. Develop customised funding products that are specifically tailored to the needs of SMMEs, such as flexible repayment terms or lower interest rates.

7.11.2   Resource Mobilisation

Stakeholders required in order to facilitate skills development in SMMEs include the DHET, CATHSSETA, employers (larger and smaller), HEIs/TPs, industry associations, as well as other stakeholders such as innovation agencies, incubation hubs, the Fourth Industrial Revolution Incubator (4IRI) and the Technology Innovation Agency (TIA). The key resources required, as well as their roles, are outlined in the section below.

Table 7-26: Resource Mobilisation – Skills Development in SMMEs[9]

		Stakeholders						
#	**Issue Category**	**DHET**	**CATHSSETA**	**Larger Employers**	**Smaller Employers**	**HEIs/TPs**	**Industry Associations**	**Other Stakeholders (e.g. Innovation Agencies, TIA)**
1	Increasing Funding and Investment in SMMEs	A, C, D	A, C, P	C, P	D, P, R, E	N/A	A, C	A, D, C

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[9] **D** – Driver; **C** – Contributor; **R** – Reporter; **A** – Advocator; **E** – Evaluator; **P** – Participator

8   Achieving Global Competitiveness

Achieving global competitiveness should be a key objective for the CATHSSETA sub-sectors, as highlighted in the following 4IR visionary statement informing the future vision and objectives of the CATHSSETA sub-sectors with regard to 4IR skills development and supply:

> *'The skills development business model will deliver the 4IR skills required for enhanced productivity and global competitiveness.'*

Within the 4IR era, the proposed vision for South Africa is a globally competitive, inclusive, and shared economy "matched with technological capability and production capacity driven by people harnessing the 4IR to propel it towards a set of social and economic goals" (Naidoo, 2021). Failure to recognise and capitalise on opportunities presented by the 4IR will impose considerable risks on stakeholders. Without attempts to move beyond existing models of innovation, entrepreneurship, and digital growth, businesses risk falling behind in the global "digital divide" and lowering their global competitiveness (Ndung'u & Signé, 2020).

The implementation of 4IR skills interventions is necessary in order to enhance the CATHS sectors' global competitiveness. This was confirmed through surveys conducted with stakeholders, **where 88% of employers and 79% of HEIs and TPs** were of the view that required 4IR skills development will enhance productivity and global competitiveness. From literature review, the following 4IR skills interventions were identified to improve global competitiveness:

1. Increasing productivity by improving skills development for workers through skills development initiatives such as apprenticeships, internships, and training courses (OECD, 2018);

2. Encouraging innovation by equipping workers with new skills to develop new products and improve existing ones (WEF, 2016);

3. Promoting adaptability by providing workers with skills to help companies become more agile and better able to adapt to changing market conditions (WEF, 2016);

4. Realising cost savings through improved processes and minimised wastage of resources, thus lowering costs for companies (WEF, 2018);

5. Designing strategies and structures that take advantage of the 4IR phenomenon (OECD, 2018);

6. Attracting and retaining talent (Deloitte, 2017).

By investing in skills development, employers may also attract and retain talent, demonstrating the organisation's willingness to develop talent and offer growth opportunities for employees. To achieve global competitiveness, companies need to design strategies and structures that take advantage of the 4IR phenomenon (Liu, 2017).

While the above may contribute to the overall global competitiveness of the CATHSSETA sub-sectors, ultimately, the global competitiveness may further be achieved through the implementation of the key interventions highlighted in **Section 6** of this Strategy, at global, national and sectoral level.

9   Strategic Outcomes following Interventions

The table below outlines the outcomes stemming from the implementation of key interventions for the Strategy.

Table 9-1: Summary Key Interventions and Outcomes for Strategy

#	Area of Focus	Key Intervention	Outcome
1	4IR Learning Interventions	Identifying of 4IR skills needs	More frequent and more diverse determination of sector 4IR skills needs
2		Establishing new 4IR learning Interventions	Growth in number of learning interventions that use digital learning content Growth in number of learning interventions for proficiency in sector digital solutions
3		Meeting of entry level requirements for 4IR learning interventions	Growth in number of learners for a given CATHSSETA budget
4		Increasing 4IR partnerships and collaboration	Growth in sector digital solution related business intelligence provided by employers and training providers Decrease in cost of information dissemination related to digital solution learning activity in section
5	Awareness on 4IR/ 4IR Skills Engagement	Conducting 4IR communication among stakeholder types	Growth in sector digital solution related business intelligence provided by employers and training providers Decrease in cost of information dissemination related to digital solution learning activity in section
6	Digital Inclusiveness	Conducting skills and training needed to access digital technologies	Improved digital literacy (ability to use digital devices like smartphones and tablets) within the sector
7	Reskilling and Upskilling	Redefining jobs and tasks	Updated sector value chains and role profiles
8	Financial Support	Funding 4IR related projects	Increased funding for developing digital solutions for the sector, including localisation budgets
9		Improving affordability of 4IR infrastructure and technologies	Improved mobile data affordability for digital solution learning interventions
10	4IR Policies, Strategies, Legislation and Frameworks	Reviewing current 4IR policies, strategies and frameworks	Growth in number of input providers that identify regulatory obstacles to digital solution adoption and learning
11		Gathering input for future 4IR policies, strategies and frameworks	Growth in number of input providers that propose solutions to regulatory obstacles to digital solution adoption and learning

#	Area of Focus	Key Intervention	Outcome
12		Developing new 4IR policies, strategies and frameworks	Increased lobbying efforts to remove regulatory obstacles to digital solution adoption and learning
13	Training and Delivery Mechanisms	Incorporating 4IR in teaching and learning	Increased number of learners reached at a lower cost per learning intervention Lower unit cost per qualification issued
14		Providing access to required 4IR resources	Increase in access to digital solution learning in terms of both geographical location as well as affordability
15		Conducting 4IR training for employees	Increase in business acumen of SMME business owners
16	Capacitated TPs and Training Institutions	Increasing capacitation programmes available for trainers/lecturers	Increased digital literacy capacitation programmes available for trainers/lecturers
17	Research on 4IR	Conducting 4IR research and development	Increase in actionable business intelligence emanating from research efforts
18		Sharing and publishing 4IR research studies	
19	Skills Development in SMMEs	Increasing funding and investment in SMMEs	Increase in business acumen of SMME business owners

10   Conclusion

As part of the Strategy, the report outlined the current 4IR skills development business model, including the various components where key interventions are necessary in order to effectively implement 4IR skills development interventions, as well as the visionary statements that serve as the future vision and objectives for the CATHSSETA sub-sectors with regard to 4IR skills development and supply. The structured process followed to identify 11 key focus areas for the Strategy, within which various interventions are required, was outlined. These key focus areas were informed by key challenges currently impacting 4IR skills development within the sub-sectors.

Based on the identified key issues and focus areas, recommendations were formulated outlining on how best to achieve intended outcomes. These include the introduction of 4IR learning interventions in order to equip employers with the necessary skills to operate digital technologies. In addition, new 4IR policies should be introduced and existing ones revised in order to ensure that an enabling environment is created for 4IR skills development. An enabling environment entails ensuring less complicated access to 4IR learning interventions through the revision of entry requirements, such as allowing for recognition of prior learning. This also entails ensuring that 4IR resources and infrastructure are in place for both employers as well as HEIs and TPs in order to facilitate 4IR skills development. Furthermore, emphasis should be placed on ensuring that funding and investment in SMMEs as increased, as these employ the greatest proportion of workers within the CATHSSETA sub-sectors.

The successful implementation of the recommended interventions within the CATHSSETA sub-sectors, as well as at national level will not only equip employees with the necessary 4IR skills, but will also enhance the overall competitiveness of these sectors on a global scale. By creating an enabling environment, introducing new policies and ensuring equitable access to 4IR, amongst other key interventions, the CATHSSETA sub-sectors may be able to embrace opportunities presented by the 4IR, and achieve sustainable growth and development.

References

Alkhaldi, N., 2022. *Technology is changing how art is made, displayed and sold.* [Online]
Available at: https://itrexgroup.com/blog/art-and-technology-changing-how-art-is-made-displayed-sold/
[Accessed 10 2023].

AWS, 2022. *Digital education, skills development crucial for SA in the 4IR.* [Online]
Available at: https://www.itweb.co.za/content/lLn147mQjOl7J6Aa
[Accessed 12 January 2023].

Blose, S. & Okeke-Uzodike, O., 2020. Pre-Fourth Industrial Revolution: Challenges for Small, Medium and Micro Enterprises in a Transforming Economy. *Journal of Contemporary Management,* 17(2), pp. 67 - 90.

Brush, K., 2020. *Upskilling.* [Online]
Available at: https://www.techtarget.com/whatis/definition/upskilling
[Accessed 23 November 2022].

C4IR, 2021. *Invitation to interested companies and organizations to partner with the Centre for the Fourth Industrial Revolution (C4IR) South Africa in the Accelerated Adoption of Internet of Things (IoT) for SMME Project..* [Online]
Available at: https://c4ir.co.za/2021/10/26/invitation-to-interested-companies-and-organizations-to-partner-with-the-centre-for-the-fourth-industrial-revolution-c4ir-south-africa-in-the-accelerated-adoption-of-internet-of-things-iot-for-smm/
[Accessed 16 January 2023].

CATHSSETA, 2021. *Research study on the impact of the 4th Industrial Revolution (4IR),* s.l.: s.n.

CATHSSETA, 2022. *Request For Quotation,* s.l.: CATHSSETA.

CATHSSETA, 2023. *4IR Sector Skills and Strategy Plan - Stakeholder Interviews and Surveys,* s.l.: s.n.

Coursera, 2022. *What Is a Target Market? And How to Define Yours.* [Online]
Available at: https://www.coursera.org/articles/target-market
[Accessed 20 April 2023].

Dash, . P., Filipov, A., Sharma, S. & Kaur, S., 2022. *G20 Collaboration For Smooth Transition To 4IR In Developing Countries.* [Online]
Available at: https://www.g20-insights.org/policy_briefs/g20-collaboration-for-smooth-transition-to-4ir-in-developing-countries/
[Accessed 12 January 2023].

DCDT, 2021. *Department of Communications and Digital Technologies' PC4IR Strategic Implementations Plan,* s.l.: s.n.

Deloitte, 2017. *2017 global human capital trends: Rewriting the rules for the digital age,* s.l.: Deloitte.

Forbes, 2020. *15 Trends that are expected to drive small business in 2021.* [Online]
Available at: https://www.forbes.com/sites/forbescoachescouncil/2020/12/11/15-trends-that-are-expected-to-drive-small-business-in-2021/
[Accessed 23 April 2023].

Hubspot, 2023. *What Is an Incubator? A Complete Guide for Startups.* [Online]
Available at: https://www.hubspot.com/startups/resources/what-is-an-incubator
[Accessed 14 April 2023].

Huge Connect, 2019. *Digital Divide in South Africa.* [Online]
Available at: https://hugeconnect.co.za/digital-divide-in-south-africa/
[Accessed 14 December 2022].

Ice Tech, 2022. *AFRICA CAN LEAD THE 4TH INDUSTRIAL REVOLUTION BY LOOKING INWARD AND USING HOMEGROWN TECHNOLOGY TO SOLVE ITS UNIQUE CHALLENGES..* [Online]
Available at: https://www.icetech.io/2022/11/africa-can-lead-the-4th-industrial-revolution-by-looking-inward-and-using-homegrown-technology-to-solve-its-unique-challenges/
[Accessed 9 January 2023].

International Business School, 2021. *3 reasons why upskilling or reskilling is important in 2021.* [Online]
Available at: https://www.eseibusinessschool.com/3-reasons-why-upskilling-or-reskilling-is-important-in-2021/
[Accessed 15 April 2023].

International Labour Organisation, 2021. *Changing demand for skills in digital economies and societies,* Geneva: International Labour Organisation.

International Labour Organisation, 2023. *Recognition of prior learning.* [Online]
Available at: https://www.ilo.org/skills/areas/work-based-learning/WCMS_672345/lang--en/index.htm#:~:text=The%20Recognition%20of%20Prior%20Learning,social%20inclusion%20and%20self%2Desteem.
[Accessed 27 February 2023].

Khetha, 2017. *SETA.* [Online]
Available at:
https://careerhelp.org.za/content/seta#:~:text=Sector%20Education%20and%20Training%20Authorities,industry%2C%20health%20and%20welfare%2C%20local
[Accessed 20 April 2023].

KPMG, 2020. *The 2020 Fourth Industrial Revolution Benchmark,* s.l.: KPMG.

Liu, C., 2017. International Competitiveness and the Fourth Industrial Revolution. *Entrepreneural Business and Economics Review,* 5(4), pp. 111 - 133.

McDonald, T., 2022. *Choosing the right learning intervention.* [Online]
Available at: https://mindtoolsbusiness.com/resources/blog/tips-and-expertise/choosing-the-right-learning-intervention
[Accessed 23 April 2023].

MICT SETA, 2021. *MICT SETA urges the public to make their voices heard on 11 new 4IR Future Skills Qualifications Johannesburg, South Africa: 16 September 2021.* [Online]
Available at: https://www.mict.org.za/mict-seta-urges-the-public-to-make-their-voices-heard-on-11-new-4ir-future-skills-qualifications-johannesburg-south-africa-16-september-2021/
[Accessed 12 January 2023].

Mzekandaba, S., 2020. *SA's digital journey continues poor form.* [Online]
Available at: https://www.itweb.co.za/content/kLgB1MeJZ9dq59N4
[Accessed 21 April 2023].

Naidoo, C., 2021. *Creating a globally competitive economy through the 4IR.* [Online]
Available at: https://www.usaf.ac.za/creating-a-globally-competitive-economy-through-the-4ir/
[Accessed 6 January 2023].

Ndung'u, N. & Signé, L., 2020. *The Fourth Industrial Revolution and digitization will transform Africa into a global powerhouse.* [Online]
Available at: https://www.brookings.edu/research/the-fourth-industrial-revolution-and-digitization-will-transform-africa-into-a-global-powerhouse/
[Accessed 5 January 2023].

NGB, 2020. *Annual Report 2019/20.* [Online]
Available at: http://www.thedtic.gov.za/wp-content/uploads/NGB_AR2020.pdf
[Accessed November 2021].

Odendaal, N., 2019. *Collaboration seen as key as SA moves to position for 4IR epoch.* [Online]
Available at: https://www.engineeringnews.co.za/article/collaborative-4ir-discussions-on-the-cards-as-a-new-digital-era-dawns-2019-05-17
[Accessed 15 December 2022].

OECD, 2018. *The future of productivity..* [Online]
Available at: https://www.oecd.org/economy/productivity-inclusive-growth-and-employability-9789264301665-en.htm
[Accessed 23 February 2023].

Ray, S., 2021. *What Is a Vision Statement? 15 Vision Statement Examples to Inspire.* [Online]
Available at: https://www.projectmanager.com/blog/guide-writing-perfect-vision-statement-examples
[Accessed 20 April 2023].

Rinf.tech, 2022. *IoT in Hospitality: Hotel Automation Trends and Use Cases.* [Online]
Available at: https://www.rinf.tech/iot-in-hospitality-hotel-automation-trends-and-use-cases/
[Accessed 10 January 2023].

SA News, 2022. *SA forges ahead with 4IR strategy.* [Online]
Available at: https://www.sanews.gov.za/south-africa/sa-forges-ahead-4ir-strategy
[Accessed 16 January 2023].

Schwab, K., 2021. *The Fourth Industrial Revolution.* [Online]
Available at: https://www.britannica.com/topic/The-Fourth-Industrial-Revolution-2119734
[Accessed 8 December 2022].

WEF, 2016. *The Future of Jobs,* s.l.: WEF.

WEF, 2018. *The Global Competitiveness Report,* s.l.: WEF.

Winkler, H., 2015. *South Africa's universities risk becoming bureaucratic degree factories.* [Online]
Available at: https://theconversation.com/south-africas-universities-risk-becoming-bureaucratic-degree-factories-49756
[Accessed 23 April 2023].

World Economic Forum, 2016. *The Fourth Industrial Revolution: what it means, how to respond,* s.l.: World Economic Forum.

World Economic Forum, 2020. *The Future of Jobs Report 2020,* s.l.: World Economic Forum.

Wright, T., 2021. *Strategic Focus Areas: How to create them + Examples.* [Online]
Available at: https://www.cascade.app/blog/strategic-focus-areas#:~:text=To%20Write%20KPIs-,What%20is%20a%20strategic%20focus%20area%3F,organization%20to%20achieve%20its%20goals.
[Accessed 20 April 2023].