PARLIAMENT
OF THE REPUBLIC OF SOUTH AFRICA

DISCUSSION PAPER ON
THE FOURTH INDUSTRIAL REVOLUTION
YOUTH EXPO

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LIST OF ACRONYMS

"4IR":	Fourth Industrial Revolution
AI:	Artificial Intelligence
CSIR:	Council for Scientific and Industrial Research
DBE:	Department of Basic Education
DED:	Department of Economic Development
DHET:	Department of Higher Education and Training
DSI:	Department of Science and Innovation
DST:	Department of Science and Technology
DTI:	Department of Trade and Industry
IBP:	Innovation Bridge Portal
ICT:	Information and Communications Technology
IDC:	Industrial Development Corporation
IoT:	Internet of Things
ISTEAM:	Innovation, Science, Technology, Engineering, Arts and Mathematics
MPs:	Members of Parliament
NA:	National Assembly
NCOP:	National Council of Provinces
NGOs:	Non-Governmental Organisations
PSET:	Post-School Education and Training
QLFS:	Quarterly Labour Force Survey

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STEM:	Science, Technology, Engineering and Mathematics
TIA:	Technology Innovation Agency
USA:	United States of America

1. INTRODUCTION

The Fourth Industrial Revolution ("4IR") represents a fundamental change in the way we live, work, and relate to one another. It will affect aspects related to our sense of privacy, our notions of ownership, our consumption patterns, the time we devote to work and leisure, how we develop our careers and cultivate our skills, and meet people and nurture relationships.

The First Industrial Revolution was spearheaded in England with the introduction of railways and steam engines, which culminated in mechanical production. The Second Industrial Revolution was driven by the United States of America (USA), with ideas emanating from England. It focused largely on generating electricity, which today, defines much of the mechanised utility in daily human life (modes of transport and all electrical appliances and conveniences). It largely impacted and improved modes of transportation for goods and related services.

The Third Industrial Revolution focused on electronic technologies and was initiated and advanced in the USA, which cumulatively transformed the information and communications sector. This significantly affected the use of fixed and mobile communications (phones, televisions, computers, etc.). It is often referred to as the computer or digital revolution. The "4IR" zooms into digital technologies and builds on the digital revolution and is driven by Artificial Intelligence (AI). Along this digital trajectory, everything around us will be automated. The various forms of AI can extensively contribute to the improvement of quality of life. However, it must be underpinned and guided by a strong regulatory regime to ensure the balanced and responsible use of these technologies.

The "4IR" is a new chapter in human development, enabled by extraordinary technological advances matching those of the first, second and third industrial revolutions combined. These advances are merging the physical, digital, and biological worlds in ways that create both huge opportunities and potential threats. The speed, breadth and depth of this revolution are forcing us to rethink how countries develop, how organisations create value, and even what it means to be human.

The "4IR" is not regarded as a technology revolution. The revolution is about convergence as the technologies have been there since the first industrial revolution. It is the consideration of how the different technologies interact. It includes the convergence, interactivity and complementarity of big data fields, analytics and artificial intelligence.[1]

As the physical, digital, and biological worlds continue to converge, new technologies and platforms will increasingly enable citizens to engage with governments, voice their opinions, coordinate their efforts, and even circumvent the supervision of public authorities. Due to the

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[1] World Economic Forum (2016).
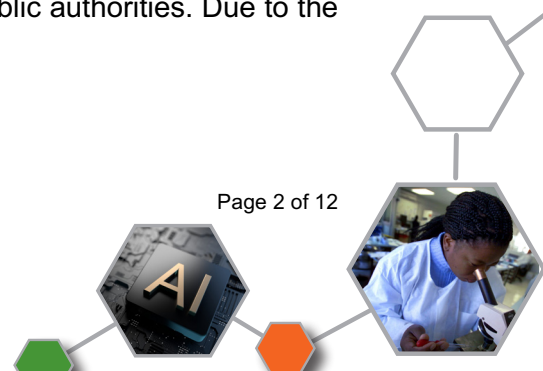
intense pace of technology, and particularly digital technology development, the "4IR" is broader and faster than any industrial revolution preceding it.

2. PROBLEM STATEMENT

This Digital Revolution is a new chapter in human development, enabled by extraordinary technological advances that go way beyond that of the first, second and third industrial revolutions combined. The world is on the brink of a 5th and 6th revolution. It is therefore important that as parliament and government together we act with urgency. The biggest challenge however in South Africa's development is youth unemployment. The African Development Bank estimates that at least 50 per cent of the youth in Africa will be unemployed and economically inactive by 2025. According to the Quarterly Labour Force Survey (QLFS) – Q2:2022 stats, the results continue to show that youth remain vulnerable in the labour market in South Africa. The second quarter of 2022 saw the total number of unemployed youth (aged 15-34) increase by 2 per cent (or 92,000) to 4,8 million from Q1:2022. There was a noticeable increase of 7.2 per cent or 370 000 in the number of employed youth during the same period.

For a continent with a population of 65 per cent young people, this has led to the ongoing debate of whether or not Africa is ready for the "4IR" and beyond. The "4IR" could be described as the advent of "cyber-physical systems". Involving entirely new capabilities for people and machines. It represents entirely new ways in which technology becomes embedded within societies and even our human bodies. Examples include amongst others genome editing, new forms of machine intelligence, breakthrough materials, and approaches to governance that rely on cryptographic methods such as the blockchain.

According to the World Economic Forum, the top three skills required to thrive in "4IR" include Complex problem-solving, Critical thinking, and Creativity. These skills are different from the top skills listed by the World Economic Forum in 2015. As such, for the youth to be able to contribute to the "4IR", they need to upskill.

This complex, digital revolution is thus upon South Africa and Africa as a continent. Young people have a huge role to play in Africa's development during the new digital era. With such a high population of young minds, South Africa's readiness for "4IR" shouldn't be the question. Rather the role of young people in promoting the "4IR" should be the main focus.

In his 2020 SONA, President Cyril Ramaphosa announced the introduction of robotics in Grades R to 3 in 200 schools, with a plan to implement it fully by 2022. As such, Government has been developing curricula for coding and robotics for grades R to 9 and many innovation initiatives emerged since. To continue this momentum, it is just fitting to exploit all social media and communications platforms to generate extremely high public and media focus. This is a unique opportunity to launch into the public domain a country-wide search to bring young innovators into one space to showcase their inventions to the whole of South Africa and beyond.

It is important to demonstrate the massive strides made by South Africans in driving radical digital revolution despite the many challenges we continue to face as a young democracy. "Let's celebrate our young scientists and innovators to showcase their work, and their talents
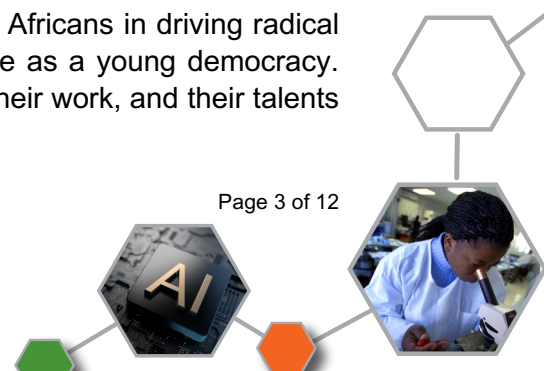
but also to show off to other young people and members the challenges that this sector is facing. These solutions, and with them the strength and responsiveness of our innovation system, should be celebrated and further reinforced."

Parliament's constitutional mandate requires that it provides meaningful opportunities for the involvement of the public in its legislative business[2]. It is for this reason that Parliament continues to drive the "4IR" process as a cross-cutting sector-wide engagement. This will allow the various clusters of parliamentary committees to continue to empower themselves for the impact of the "4IR".

3. PARLIAMENT AND THE "4IR"[3]

In October 2017, a South African Parliament multi-party delegation led by the Deputy Speaker Honourable Lechesa Tsenoli embarked on a study tour to the Denmark Parliament (Folketing), the Danish Board of Technology and the then Department of Science and Technology (DST), now known as the Department of Science and Innovation (DSI) was undertaken. Denmark boasts of having one of the best Information and Communications Technology (ICT) infrastructures in the world.

To give impetus and expression to the lessons learned from the Denmark Study Tour in 2017, the Speaker of the National Assembly, Honourable Baleka Mbete endorsed a proposal that the Deputy Speaker of the National Assembly (NA), in collaboration with the Deputy Chairperson of the National Council of Provinces (NCOP), Honourable Raseriti Tau and the House Chairperson of Committees, Oversight and ICT, House Chairperson Cedric Frolick would champion an initiative to commence strategic discussions with leading agencies and institutions. Specifically, around South Africa's state of readiness for an impending "Fourth Industrial Revolution".

At the first-ever parliamentary round table discussion on the "4IR" that took place on 31 May 2018, it was unanimously agreed that neither Parliament nor Government could not effectively deal with the challenges identified on their own. It was crucial to involve all sectors, public and private with a particular focus on the citizenry. Parliament launched its May 2018 ""4IR"" roundtable with numerous ""4IR"" initiatives including round tables, expos, and awareness campaigns.

Stemming from the first "4IR" Roundtable discussion held on 31 May 2018, Parliament continued its commitment to engage in public dialogue to further explore opportunities and address any threats that may be associated with the "4IR". These engagements included various "4IR" public awareness campaigns, Expos, roundtable discussions and webinars amongst others.

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[2] Constitution of the Republic of South Africa (1996).

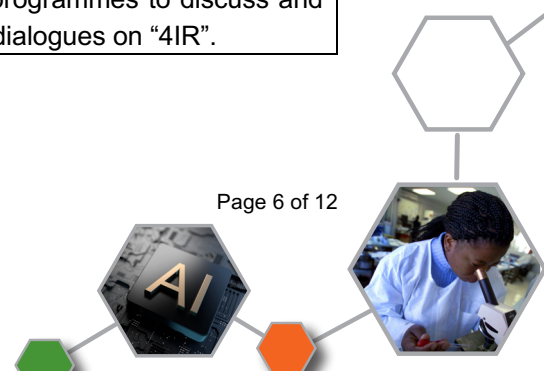[3] Parliament of RSA (2018; 2019; 2022).

3.1 Key Findings and Recommendations

Below is an overview of key findings and recommendations that emanated from initiatives such as the roundtable discussions.

NO	FINDING	RECOMMENDATION
Roundtable 1: May 2018		
1	There are departments that have initiatives on the "4IR". Department of Science and Technology (DST) Department of Trade and Industry (DTI) Department of Higher Education and Training (DHET) Department of Economic Development (DED) Department of Labour (DOL) Department of Basic Education (DBE) Industrial Development Corporation (IDC) Technology Innovation Agency (TIA)	Adopt an integrated approach and develop a National Strategy on the "4IR"
2	An Inter-ministerial task team has been initiated	Consolidate the Inter-ministerial task team
		Presidential Advisory Council as a focused approach towards the development, production, uptake and usage of cutting-edge technologies throughout the economy, taking into account the possible negative consequences on employment and job creation. The proposed Advisory Council shall commission high-level research, international and regional benchmarking, and engage stakeholders within and outside government in meetings and other fora to obtain and consider the views of a cross-section of societal role players in the development of the Fourth Industrial Revolution National Action Plan.
3	Lack of co-ordination and integration across spheres and sectors	A National Blueprint is recommended to regulate the "4IR"
		Public-private partnership model is required to create an innovative and competitive manufacturing ecosystem
		Consultative process, being initiated by Parliament
Roundtable 2: February 2019		

NO	FINDING	RECOMMENDATION
1	Rapid organisational change that "4IR" is creating in not only organisations but also society and legislatures	Paradigm shift required across sectors Organisations to understand how "4IR" technology such as the Internet of Things (IoT), and AI, can improve the work at grassroots level
2	• The future of regulation in relation to Adaptive regulation, Regulatory sandboxes and greenhouses, Outcome-based regulations, One-size fits all scenario and Collaboration. • Regulation to date has been largely based on a one-size fits all model and with the advent of digital technology, one-size-fits-all does not fit all.	• **Adaptive regulation:** Agile government requires adaptive regulation. Due to the high level of complexity, appropriate agile governance, regulation and decision-making require a systems approach • **Regulatory sandboxes and greenhouses:** There is a role for legislatures and policymakers to encourage regulation to create these sandboxes and greenhouse environments • **Outcome-based regulations:** Include regulations not determining the technical inputs by technologies that are being applied here but driven by the outcomes • **One-size fits all scenario:** Regulation needs to reduce red tape and an application of a regulatory framework is required that is risk-weighted and allows small start-ups to be able to scale their solutions in a safe environment. • **Collaboration:** National and international collaboration is necessary and explore the integration of Africa into the "4IR" space.
3	"4IR" strategies are mainly focusing on technology and the digital landscape	• Create research capacity to develop a strategy for the digital and industrial economy. • Introduce a social compact and include the human aspect into strategies. • Political commitment required including the review of mandates o Review of policy coherence and alignment when exploring the development of systems for connectivity.
	• Awareness and understanding of "4IR" are one of our main themes of the digital industrial policy.	• Design and implement information and awareness programmes to discuss and have policy dialogues on "4IR".

NO	FINDING	RECOMMENDATION
	• Members of Parliament (MPs) need to understand the implications of the "4IR" and what responsibility it confers in relation to oversight and the key role of MPs in communicating important issues to the public.	• There is a need to explore the self-regulatory dimensions of all of this as it relates to ethical decision-making to enhance a good/responsible citizenry.
4	An aging workforce	• Africa has a younger population and there is a huge opportunity for the world to invest in the young people of Africa and do skills development
5	Industrialisation vs Automation	• There is a need to look at jobs in relation to industrialisation and automation
6	Commercialise innovation and protect intellectual property rights	• Not only focus on research-based innovation that is being commercialised but also explore solutions introduced by industry and commercialising that together with protecting the intellectual property rights
7	• The current education system (both pedagogy and the content in its current state) does not support "4IR" • Teacher-centred and learner-centred methodologies are not adequate • It takes at least 2 years to change a curriculum	• There is a need for curriculum reform/change in the existing curriculum development • There is a need for learner-led methodologies i.e. 5Cs ○ critical thinking, collaborating, creativity, communication skills, computational skills ○ Simulations ○ Coding programmes • Create an enabling environment for innovation
8	There is a need to establish strategic partners	• Partnerships with a shared "4IR" vision are required to include social and human scientists. ○ Country-wide, cross-sectoral plan of action is required including academia, industry, civil society
9	Data bias: There are limited African databases. The systems are trained with data that is available and most of the existing data does not come from Africa	Africa must participate in global data creation spaces
10	• Limited public access to data ○ There is a lack of data ownership	• Social media can be used to collect data ○ Policies required to deal with data ownership include encrypting data.

NO	FINDING	RECOMMENDATION
11	• Cyber security is critical since initially the internet was developed with a focus on connectivity and not security. A similar trend is emerging with the "4IR".	• From the onset, there should be a focus on security aspects relating to "4IR"
12	• The focus on Science, Technology, Engineering and Mathematics (STEM) must change to Innovation, Science, Technology, Engineering, Arts and Mathematics (ISTEAM).	• It is pivotal to include the creative industry in technology development to ensure a holistic enabling environment that embraces the needs of industry and society.

3.2 Key findings and recommendations pertaining to the role of Parliament

| NO	FINDING	RECOMMENDATION
Roundtable 1: May 2018		
1	Parliament has a key strategic role to play in the "4IR"	All Members and the parliamentary administration must be fully au fait of the impact of the "4IR" on the core constitutional functions of Parliament i.e. law-making, oversight, public participation intergovernmental relations, and international relations.
2	Parliament through its law-making functions must ensure that an appropriate legal framework is established for the "4IR"	Parliament must prioritise the development of a legislative framework to address the gains and challenges of the "4IR"
		Parliament should drive a countrywide process to ensure the appropriate integration across the provinces and local government.
3	Parliament should ensure evidence-based oversight over "4IR" initiatives of the Executive	The appropriate parliamentary structures should be identified to ensure coordination and synergy, particularly across and within the four critical sectors (society, industry, business and skills)
4	Parliament is ideally placed through its public participation function to increase awareness, education and discussion on the "4IR" amongst all sectors of society	Parliament should ensure that broader civil society, such as organised labour, Non-Governmental Organisations (NGOs), the media, etc. is well-informed to engage knowledgeably and meaningfully
5	Parliament itself should harness the benefits of the "4IR"	The parliamentary administration should adapt its strategy, systems and processes to incorporate "4IR" in its support functions.
Roundtable 2: February 2019		

NO	FINDING	RECOMMENDATION
1	Parliament through its public participation functions must ensure the implementation of a sector-wide information and awareness campaign	Parliament should formalise strategic partnerships as part of its "4IR" information and awareness campaign
2	Parliament should ensure evidence-based oversight over "4IR" initiatives of the Executive	The appropriate parliamentary structures should be identified to ensure coordination and synergy, particularly across and within the four critical sectors (society, industry, business and skills)
3	• Parliament through its law-making functions must ensure that an appropriate legal framework is established for the "4IR". • There is a need to develop policies, legislation and regulations that create an enabling environment for innovation to allow the economy to grow.	• Parliament should prioritise the development of a legislative framework for the "4IR" landscape • Parliament should drive a countrywide legislative process to ensure the appropriate integration across the provinces and local government. • The "4IR" requires all stakeholders to be in constant dialogue due to the nature of the technologies that characterize it and most importantly, this requires Parliament to take the lead. • Parliament should review its internal procedures that govern its constitutionally mandated functions
4	Parliament should rigorously drive its "4IR" information and awareness campaign to optimise the opportunities emerging within this space	The parliamentary administration should develop an institutional "4IR" strategy that will inform its systems and processes.

4. THEME FOR THE EXPO

There have been various commitments to ""4IR"" initiatives. Including Committees of Parliament with the mandate to conduct oversight over the Executive implementation of the ""4IR"". As such, the Deputy Speaker, Honourable Lechesa Tsenoli in collaboration with the Chairperson of the Portfolio Committee on Higher Education Science and Innovation, Honourable Nompendulo Mkatshwa has embarked on a joint venture to celebrate young innovators through a series of initiatives to showcase youth innovation in 2023.

It is important to note that the PC"4IR" principles are modelled around the proposed pillars of the PC"4IR" report and the National Development Plan 2030. These principles inform a rationale behind each intervention to achieve the primary objective of a '"4IR"-Enabled RSA'. The key objective is to host the 1st Youth Innovation Exhibition during 2023 with the theme "Celebrating Youth Innovation in the ""4IR"" and Beyond".
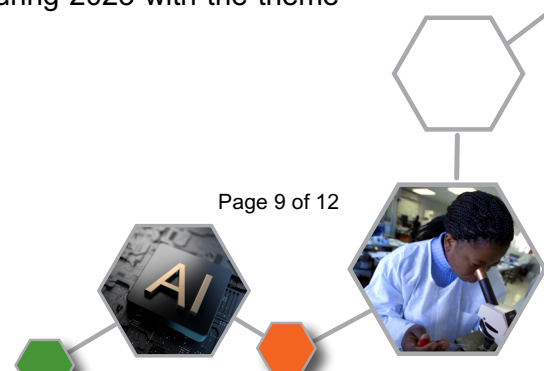
This campaign is launched during Youth Month, with the participation of legislatures and various departments in showcasing these exhibitions highlighting South Africa's Young Scientists and Innovators embedded within the District Development Model (DDM).

Using a fully integrated approach, the campaign and finally the exhibition demonstrates the extraordinary work done by women, people with disabilities, young scientists, and innovators from across the country.

Key Objectives

- To host the 1st Youth Innovation Exhibition with the theme "Celebrating Youth Innovation in the ""4IR"" and Beyond"
- To launch a public awareness and science communication campaign focusing on the future world of work.
- To create a directory/portal (similar to an initiative already in existence is the Innovation Bridge Portal (IBP) a DSI initiative in collaboration with the Council for Scientific and Industrial Research (CSIR). "The IBP brings together public and private sector stakeholders in the entrepreneurship ecosystem to benefit innovators and entrepreneurs. Through promoting collaboration among our ecosystem of stakeholders, the portal will serve as a one-stop shop repository of information on opportunities and networks. The portal is expected to be the ultimate catalyst for enabling innovators to thrive, promoting economic growth and job creation.
- To promote the transformation agenda, we acknowledge that ""4IR"" influences all sectors, particularly women and people with disabilities.
- To recognize women in ""4IR"".
- Develop an online learning series with print downloads and visual tutorials.
- Produce an ongoing Television / Radio Series to be launched on 20 June 2023.
- Develop a range of educational materials utilizing an exciting array of platforms e.g., social media, Twitter, tik tok and websites, etc.

5. CONCLUDING REMARKS

The "4IR" has impacted all sectors of society, especially with the onset of the COVID-19 pandemic. COVID-19 brought drastic changes from face-to-face teaching and learning in four-walled lecture halls, and inequality among countries, institutions, and students which was unveiled and exposed. For example, the COVID-19 pandemic has compelled educational institutions across the world to change from traditional pedagogies of curriculum delivery to digital platforms and has thus been a catalyst for the "4IR".

The anticipated impact the "4IR" will have on society has laid the platform for South Africa and the rest of the African continent. Specifically, to embrace the opportunities presented and develop a shared "4IR" vision for Africa. It is eminent that the posed challenges are becoming unique opportunities whereby current and future technologies are leveraged and the potential threats mitigated. To be achieved by ensuring a cohesive and comprehensive national response involving the citizenry and prioritising the key areas of focus in developing policies, laws and programmes of action.
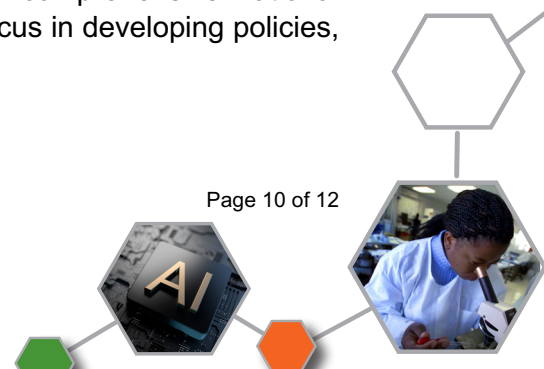
The inequalities during the pandemic were evident as historically disadvantaged institutions and sectors continued to experience technological infrastructural and staff capacity limitations. The lack of suitable infrastructure and access to technology can cause some constraints for the successful integration of remote conditions. Challenges include access to digital devices such as laptops and data, digital literacy training, and connectivity, amongst others.

It is evident that inequalities remain a huge challenge across all sectors of society. However, while challenges do remain in the system, South Africa has made many strides in the "4IR" landscape. The "4IR" conversation is becoming rigorous and it is acknowledged that there is a need to redefine this phenomenon to suit our context.

The following is recommended[4]:

- Government and Parliament to ensure adequate budget is appropriated to successfully implement the "4IR";
- The PSET sector to continuously review and implement a curriculum needed to create an enabling environment that contributes to the "4IR";
- The high costs associated with accessing information need to be addressed by Government through relevant partnerships with the private sector;
- Government should place a special focus on the marginalised and rural areas;
- Government and relevant stakeholders should support the work of local creatives, innovators and creators who, through their localised solutions, contribute to the reduction of costs associated with the implementation of the "4IR";
- Due to the speed at which the Internet of Things is developing, Government should ensure that no learner or teacher is left behind through continuous improvement of competency and foundational skills;
- Parliament to develop systems to ensure that there is a deeper engagement with the public on the research and innovation underway in the Post-School Education and Training (PSET) sector, as well as the implications of the "4IR" on labour and employment;
- Government needs to fast-track the rollout of digital infrastructure that facilitates access to information, enhancing transparency and building interconnected communities;
- Government and Parliament to continue their efforts to review, amend or create policy and legislation that supports the successful implementation of the "4IR";
- Government and stakeholders should use the COVID-19 disruption as a lesson to evaluate its current initiatives within the education sector and reinforce the need for creating an adaptable workforce that approaches learning as a continuous process.

Parliament thus maintains its vision of an activist and responsible People's Parliament devoted to improving the quality of life for all citizens. As the highest public political institution in the country, our contribution to truly representing the people will be to contribute to taking action to close the inequality gap. Parliament, therefore, has an obligation through its oversight functions to facilitate proactive oversight over the implementation of the Executive's priorities.

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[4] Parliament of RSA (2022).

It is thus imperative that Parliament create a regulatory and enabling environment by developing a "4IR" legislative framework to ensure that effective oversight is conducted.

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