Strategic Plan 2021–2030
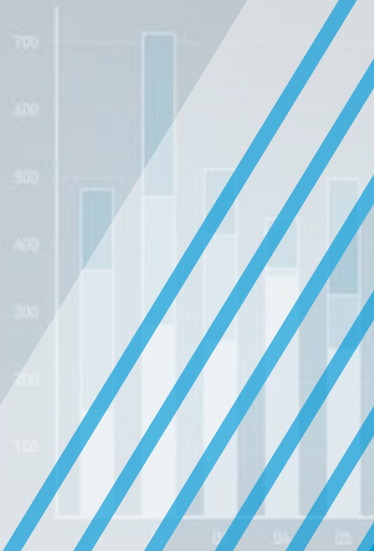# One Smart CPUT

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one
SMART
CPUT

❝ *The big challenge in creating the future is not predicting the future. It is not as if there is one future out there that is going to happen, and that the only challenge is trying to predict which of the potential futures will actually be the right one. Instead, the goal is to try to imagine a future that is plausible – the future that WE [CPUT] can create.* ❞
(In Toffler & Gibson, 2011)

[From the Vice-Chancellor, Chris Nhlapo's Inaugural Address, April 2019.]

In remembering that

❝ *CPUT does not belong to us who are here now, rather we are the guardians of the institution for the future generations. We will leave behind a legacy far beyond our time here.* ❞

Contents

1 Background to V2030

The Cape Peninsula University of Technology (CPUT) is the second largest University of Technology (UoT) in South Africa and the largest higher education institution (HEI) in the Western Cape (WC), as reported in 2018. It was established in January 2005, when the Cape Technikon and Peninsula Technikon merged. The commencement phase of the newly established CPUT (CPUT 1.0) focused on merging the two entities and trying to establish a new identity for CPUT. This was followed by the drafting of the merged CPUT's first strategic plan, called Vision 2020 (V2020). This plan comprises the identification of four strategic aims, namely to build a university that is highly efficient, sustainable and environmentally conscious; to create a vibrant, enabling and well-resourced living and learning environment for students; to enhance and develop the quality and effectiveness of research and knowledge production; and, to be known for high quality teaching and learning and a relevant curriculum.

1.1 Reflecting on Vision 2020

To meet the strategic aims of V2020, six cross-cutting themes were identified, namely innovation, work integrated learning, partnerships for long-term benefit, quality and sustainability, social transformation and the university's culture. The aims and cross-cutting themes provided a framework for CPUT for building the policies and procedures for its teaching, learning, research and innovation. Although V2020 did not include measurable outcomes, a first V2020 review was completed in November 2018. Though the response rate was not extensive, the analysis did indicate that, although CPUT did relatively well on the V2020 aims, the soft human-related elements needed attention – from there the focus on oneness in V2030. The results alerted to the deep-rooted differences in institutional culture, vision and ambition of the two entities, intensified by the geographical distances between campuses. Nonetheless, V2020 will be remembered for admirable achievements in research acknowledged nationally and internationally, and for excellent work integrated learning practices. Groundbreaking research included the launch of the first Nano-satellite (ZA-CUBE1) and the health advantages of rooibos tea.

Midway through Vision 2020, the #feesmustfall campaign transpied, which not only distracted CPUT from its core activities and focus, but also destroyed key infrastructure. Fortunately, CPUT continued to grow its areas of strength, such as its seven research focus areas, namely: Climate Change and Environment; Human and Social Dynamics; Space Science and Technology; Economic Growth and International Competitiveness; Design for Sustainability; Energy and Bio-economy; and Biotechnology. These research focus areas will direct CPUT's research agenda in the decade ahead.

Cognizance should be taken that CPUT has always operated within its brief to be a University of Technology (UoT). Indeed, given future anticipated technological developments, it is the "UoT'ness" of CPUT that will be its strength in the years to come. Consider the South African Technology Network's (SATN) definition of Universities of Technology, namely that '… A UoT offers technological career-directed educational programmes, focuses on innovative problem-solving research and engages with government/business/industry and communities as end users. The focus is on the study and application of technology from the points of view of innovation and engagement." CPUT will deepens it understanding and application of this definition.

As CPUT re-imagined itself and claimed it space as a leading University of Technology, in South Africa, on the African continent, and globally, the idea of establishing itself as One Smart CPUT (V2030) was conceived in November 2017. This vision was influenced in the hype of introducing the 4IR, AI and the explosion of education technological developments and opportunities, whilst also taking into consideration the National Development Plan and the United Nations adopted Sustainable Development Goals (SDGs), also known as Global Goals. It was agreed that the next phase (2021–2030) should be crafted with a view towards building One Smart CPUT with the focus on "oneness" and "smartness". The emphasis on oneness is directed at creating one institutional culture, a sense of belonging, and an environment in which everyone strives towards the same goals, taking pride in who

we are and how we conduct our "business" as a university. Oneness encourages working as teams, taking collective responsibility for our future, breaking down silos, working across departments, units, faculties, disciplines and research focus areas – evident in a deep sense of caring about the wellness of others in the workplace and the future of the University. Furthermore, CPUT acknowledges the need for social justice and therefore to be a generator and distributor of knowledge that enhances technological solutions to impact positively on communities and societies, enhancing life conditions, to develop entrepreneurial mindsets of students that can lead to employment and self-employment. All this is directed at dealing with real South African socio-economic, health, education, food security, environmental, climate, safety, public service delivery and technological imperatives and challenges.

Going forward, CPUT, as a living system, will remain mindful of the rapidly changing external environment in which it has to continually reinvent itself to remain globally excellent, but also locally relevant, and cutting-edge.

1.2 Living in times of Volatility, Uncertainty, Complexities and Ambiguity (VUCA)

> **" In the modern world, global higher education faces uncertainties due to globalization, the use of contemporary technologies and VUCA which describes the chaotic, turbulent and rapidly changing education environment, which is the new normal in global higher education. "** (Korsakova, 2019: 32)

If there is an event that will be known as a game changer for HEIs worldwide, it will undoubtedly be the outbreak of COVID-19 in 2020. It has proven to all sectors that change is unpredictable, inevitable, and that we are living in times which can best be described as volatile, uncertain, complex and ambiguous. What COVID-19 has already shown, is that future higher education workplaces will change in multiple ways: the way in which we communicate, procure, research, teach; and how students will learn, and how their [universities'] impact will be assessed by communities and government. Increasingly, universities will become technology-driven, which will pose challenges for the human side of institutions. There are, however, also some other critical developments in CPUT's external environment that reiterate the need for the Institution to embrace the notion of becoming One Smart University of Technology. The following serve as examples.

1.2.1 Changes in the Higher Education (HE) landscape that are of national and international nature

National challenges in South Africa include the age demography and serious youth unemployment (especially amongst the 4,500,000 youth in the age cohort of 18–25, also referred to as the NEET group, with no education, employment or training), lingering inequalities, the digital divide, poverty and the lack of funding for the so-called "missing middle" (students who are "too rich" to qualify for NSFAS support, but too poor to afford fees and qualify for commercial loans).

Though universities in South Africa have to participate in the widening of student access, there is great concern about the Department of Basic Education's ability to increase the number school leavers in the fields of Science, Technology, Engineering and Mathematics (STEM) – subjects critical to national development and productivity, economic competitiveness and societal well-being. As employability is one of the key criteria for student success, it is a concern that many HEIs graduate students with qualifications that do not match the evolving needs of workplaces, or develop the skills sets demanded by the 4IR and AI, not to mention future revolutions and developments.

1.2.2 African Agenda 2063

Though CPUT sees itself as a UoT claiming a global space, it acknowledges its responsibility to be a leader on the African continent. The African Agenda 2063 focuses on African citizenry, and has identified some key areas such as the high-speed train network, the African virtual and e-university, the African commodity strategy, the development of a continental free trade area, the African outer space strategy, a single air transport network and continental financial institutions. However promising and compelling these strategies and goals seem, South Africa and the rest of Africa still have a long way to go, and have to ensure first and foremost, that basic education provides the foundation for higher education institutions to build on the already existing skills, attitudes and knowledge of prospective students. In the absence thereof, HEIs, through their faculties of education, will have to play a much more strategic, proactive and leading role to transform education on all levels in South Africa, on the African continent, and globally.

1.2.3 National Development Plan (NDP) 2030

The NDP (2030) acknowledges the importance of Higher Education in leading and shaping the future of modern nations, of science and technology and views Higher Education as the major driver of information and knowledge system(s) to achieve economic development through targets.

1.2.4 White Paper on Science Technology and Innovation (STI)

The White Paper on Science Technology and Innovation (STI) directs South African UoTs to become key to the growth of leadership in technology development and transfer. As UoTs resonate well with industries, CPUT sees itself as a University that will increasingly transfer knowledge to industries and companies that are located in its region, country, Africa and globally. CPUT conceptualises regional contributions being produced by "knowledge spillovers" (Benneworth & Charles, 2005; Drucker & Goldstein, 2007), allowing proximate actors to more easily access knowledge-based resources. In doing so, One Smart CPUT will facilitate innovation and, where possible, contribute to regional economic development.

1.2.5 CPUT's future students

CPUT's future students belong to the native digital generation who are well exposed to technologies and the knowledge economy, social platforms and the World Wide Web. This generation of students are far more creative, and politically active and astute than their previous counterparts. They are known to be more entrepreneurial, multi-tasking, being hyper-aware of the world they are living in, and are technology-minded. Due to the outbreak of COVID-19, they are also the first generation of students who have had to function maximally in a new world of physical distancing and rules around health and safety. They will therefore require a deeper sense of connectedness and sharing, whilst being highly competent to work in a technology driven economy and world. To achieve this, CPUT, will ensure graduates develop attributes that will make them career ready and future fit. These attributes will be the following:

1.2.5.1 Technological capability and foresight

A CPUT graduate will recognise that society, technology and science are intertwined, and that technology and science have the capacity to effect changes in society. Furthermore, CPUT graduates will recognise that science and technology should be used for the overall benefit of society, even though their impacts may also sometimes be harmful. Graduates will also recognise that scientific knowledge and their related technologies will need to be transformed/ adapted to complex and changing circumstances. CPUT graduates would thus need to take a critical and reflective stance on how technology is used and to what ends, including issues of environmental awareness and sustainability.

Underpinning abilities for technological capability

- Using practical knowledge, which involves the ability to transform knowledge and technological capabilities to new contexts and platforms;
- Using practical knowledge that enables graduates to act in an environmentally sustainable manner;
- The ability to optimally communicate and follow through technological and other solutions;
- Autonomous decision making based on the transfer and application of practical knowledge;
- The ability to access relevant knowledge;
- An awareness of social priorities, responsibilities and associated problems that may have technological solutions;
- Critical and reflective stances to the use of technology.

1.2.5.2 Resilience and problem solving capability

CPUT graduates will recognise the complexity of problem solving in society (including technologically) and will be able to engage confidently with such complexity. Graduates will recognise that there are no simple solutions to problems in society, that there are many twists and turns, dead ends and necessary restarts, and that they will need to act with resilience to succeed in these journeys. Such journeys will typically occur within entrepreneurial, innovation and investigative/ research activities.

Underpinning abilities for building resilience

- Reflect on and evaluate progress;
- Administrative, organisational and financial skills;
- Locate, evaluate, synthesise and apply information in context (information literacy);
- Face difficult and complex challenges;
- Recover from setbacks and try again – showing resilience.

1.2.5.3 Relational capability

CPUT graduates will be able to 'stand in the shoes of others' in order to understand their needs, values and cultures so that their endeavours have optimal effects and/ or the best chances of success. In so doing, CPUT graduates will be able to act with understanding of those different from themselves, at both the interpersonal and inter-professional level. Furthermore, CPUT graduates will understand, learn with and so be able to engage with others to work on the best possible solutions to societal problems. This capability has advantages beyond CPUT, and will influence how CPUT graduates will work with community groups or in local government, and how they will relate to care for others. It will assist CPUT to work across professions and disciplines in the search for solutions to societal problems.

Underpinning abilities for relational capability

- Understanding and respect for others' knowledge;
- Embracing diversity;
- Recognising one's own shortcomings (including in technology/ practical knowledge);
- Effective communication across differences;
- Group and team work;
- Harnessing the collective practical wisdom of others.

1.2.5.4 Ethical capability

CPUT graduates will have an orientation to the well-being and improvement of society, rather than just ensuring their own well-being and advancement. It would involve hearing and acknowledging the concerns of others. As morality forms a cornerstone against which ethical decisions are made in practice, CPUT will enforce ethical behaviour in- and outside the classroom, may it be in contact tuition or on virtual platforms.

Underpinning abilities for ethical capability
- An orientation to the public good;
- Knowledge of field-specific professional ethics;
- Relational capability (see also 1.2.5.3);
- An ability to discern whether professional practices are within ethical boundaries;
- An ability to take ethical decisions;
- Conduct ethical research;
- An ability to act on unethical practices.

1.2.6 The future world of work and working in higher education

It is clear that automation and the components of the 4IR, as well as future industrial revolutions, will keep changing the world of work, including the work of higher education practitioners, scholars and lecturers. There is evidence that a significant proportion of jobs, including higher education jobs, will be redundant in the next ten years, and that, at least two billion jobs could disappear by 2030. COVID-19 has expedited the 4IR/ AI revolution and has proven that university staff can meet online, can run workshops online, can manage staff remotely, can support staff and students from a distance, and yet stay relevant and deliver excellent services.

The next couple of years will inevitably see the re-skilling of academic and support staff as they embrace technological developments, whilst they will have to unlearn old working habits and learn new ways of doing their work. Increasingly, HEIs will be looking for academic and administrative staff members who have the aptitude, curiosity and willingness to take up the opportunities created by technology, whilst being critical thinkers and problem-solvers, who are adjustable, resilient, agile and forward looking. The growing challenge will be to balance technological advancements and innovations with a deep understanding of human needs and the human psyche. This balancing act and understanding of the 21st century HEI, will play a significant role in the development of One Smart CPUT, given our focus on preparing our students for the world of work, being aware of the current needs of society, addressing environmental issues, and dealing with the impact of climate change.

2 One Smart CPUT: A concept with two dimensions

> " *One smart university is both a physical and virtual environment lead by humans coming together to create a more humane, immersive, interactive and automated experience for students, staff, faculty, researchers and the stakeholders of a university.* " (Uskov *et al*., 2017)

The notion of **One Smart CPUT** is designed in terms of two key dimensions that are in support of CPUT's one smart university concept.

Dimension 1: Oneness – The oneness dimension of V2030 is focused on our human-centricity through our smart people and the smart CPUT community that values and embraces unity (*ubunye*) in diversity (*ukungafani*). It directs CPUT to view itself in terms of trust, values, co-thinking, co-learning, co-creating and co-designing, dialogue and a unified spirit. For CPUT to become human-centric and human-hearted, it will require more than staffing, skills transfer, shared values and style, but will require a conscious way of living and shaping an identity of who we are and what we aspire to be as a collective or how we communicate and share information and build relationships at CPUT. Thus, we will ascribe to an African philosophy of *"ukuhamba unxibe izihlangu zomney umntu"*, meaning, "to walk in someone else's shoes".

Dimension 2: Smartness – The smartness dimension of CPUT's strategy is focused on technological developments and innovations as considered by the current and future industrial revolutions. It supports the notion that CPUT, as a University of Technology, will embrace technology in the broadest and most positive sense to advance a better humanity, better socio-economic circumstances, better health conditions, education, safety, food security and general living conditions in our region, the rest of Africa and globally. Smartness will embrace a philosophy of open innovation – advocating to create better futures, communities and careers.

CPUT's staff and students will be trendsetters, working together to explore critical questions across disciplinary boundaries, developing important intellectual and civic capabilities, and using those insights to forge the alleviation of complex problems facing South Africa and the world.

CPUT will respond with agility and resilience to an increasing volatile, uncertain, complex and ambiguous environment, and this ability will make us different, innovative and cutting edge – one smart university with impact and relevance.

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3 Vision, mission and values

Vision

CPUT is Africa's leading Smart University of Technology, globally renowned for innovation, with graduates that shape a better world for humanity

Mission

CPUT transforms its students, through world class researchers who inspire knowledge production and innovation that are cutting edge

Values

CPUT agrees to oneness and smartness by:

- Embracing a culture of **Ethics** and **Integrity**

- Seeking **Kindness** and showing compassion (human heartedness) for the well-being of all our students, staff, stakeholders and the CPUT community, as expressed in *ubuntu* as a way of living;

- Embracing **Restoration** as we deal with the legacy of our past and as we redress issues of equality, gender-based violence, and any form of discrimination;

- Being a testimony of **Unity** (*ubunye*), whilst embracing diversity (*ukungafani*) in all its forms by being honest, transparent, credible and respectful;

- Showing **Passion** and demonstrating enthusiasm, devotion, intensity, tenacity and total commitment to everything that we undertake as a university of technology; delivering uncompromising quality service, and always searching for better ways of doing things;

- Taking **Accountability** and accepting responsibility for all our actions and the actions that we commit to;

- Being **Technologically Astute** and understanding, as staff members or students of CPUT who aspire to become technologically astute, that we will embrace and take ownership of and experiment with the possibilities technology offers. These attributes facilitate the novel application of modern technology, enabling the enhancement of productivity and efficiency, whilst always focusing on innovation that is centred on a better world.

4 V2030 Framework for ONE SMART CPUT

> *A smart university successfully harnesses the potential of digital technology and connected devices and the use of digital networks to improve people's lives through technology embraced teaching, learning, research and engagement. A smart university empowers society. However, a smart university combines the smart "thing" with the "smart me" and "smart we".*

In order for CPUT to become One Smart University, the following strategic focus areas were identified and will steer CPUT towards 2030:

FOCUS AREA 1	A SMART ITC ENVIRONMENT AND ITC WORKFORCE

> *One Smart CPUT will have a highly efficient and effective ITC network in place that will support and enhance continuous improvement in teaching, learning, research and operations.*

GOAL 1: Becoming the leading FHESD on the forefront of innovative higher education studies and development to transform universities of technology, creating smart learning environments that will provide excellent and relevant content inside and outside CPUT's lecture venues

Objectives	Strategies	Key performance indicators
OBJECTIVE 1.1		
Leverage technologies and information resources for recruitment and retention efforts and support student services	Optimise the effectiveness of Customer Relationship Management (CRM) software to improve communication and engagement with prospective and current students Deploy data analytics to shape strategy and decision making in enrollment management Identify, evaluate, and implement enhancements to processes supported by the Student Information System (SIS) Investigate and implement technological solutions to foster communication and interaction between students and faculty administrators, academic advisors, HoDs, deans and academics	Evidence of attracting students that are ready to take up higher education and want to pursue a career that is technology driven and contribute positively to society Staff and Student satisfaction levels Student success rates Widening of access with success Student success rates Employability of our graduates Staff and student satisfaction levels regarding communication, strategies to build oneness and a sense of belonging

GOAL 1: Becoming the leading FHESD on the forefront of innovative higher education studies and development to transform universities of technology, creating smart learning environments that will provide excellent and relevant content inside and outside CPUT's lecture venues

Objectives	Strategies	Key performance indicators
Enablers Integrated digital processes, software and customised solutions for end-users Focused enrolment strategy Deans' vision cascading down on Faculty Managers Marketing Approach Efficiency of the Registrar's office Collaboration with Institutional Research Office Senior Leadership as demonstrated by DVCs Commitment of Senior Director: ICT	Deploy an early e-alert system to identify and engage at-risk students at both undergraduate and post-graduate levels Track and trace system to determine the employability of CPUT graduates Provide a robust, resilient, and reliable wired and wireless data network infrastructure Ensure an efficient digital system for the security of our staff, students and properties	Success and graduation rates Outcome of Graduate Destination Studies % of days without sufficient Internet connectivity Number of cases reported Campus safety and security surveys, incidents Ability to detect and charge offenders

OBJECTIVE 1.2

Provide state-of-the-art technology and services to enhance student learning and to foster curricular innovation **Enablers** Software and hardware to support CPUT's learner management system, information management system, HEMIS data integrity, Online assessment software A stable ITC Platform Vision and Leadership of Senior Director: ICT Commitment and Leadership DVCs Fundani Centre and E-learning Centre's leadership and support	Create individual and campus-wide opportunities for faculties, staff, and students to explore, evaluate, and implement new technologies to improve teaching, learning, and innovation in the classroom Provide dependable IT-enabled classrooms, computer labs, and smart virtual learning spaces with sufficient IT support for staff and students Provide a robust Learning Management System (LMS) and instructional technology to support ubiquitous learning, learning analytics, and adaptive learning Enhance training options and diverse training modalities for lecturers, researchers, administrative staff and students	Quality and appearance of CPUT's learning spaces/ environment Regular strategic update/ workshops to EM, Management, faculties to keep them abreast of technological advancement Uptake and appreciation of blended, flexible ways of teaching and learning Level of staff and students' digital competencies and confidence Increased levels of participation in digital training and research in the field Increased technology adoption across CPUT

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Objectives	Strategies	Key performance indicators
	Expand e-Portfolio technologies to enhance the creation and preservation of personal learning experiences for students, capturing their WIL experiences and enhance workplace readiness opportunities on CPUT's digital platforms through co-curricular activities Improve IT literacy of staff and students and ensure competency and continue with upskilling and retraining Develop an online co-curricular academy for all students to provide academic advising and counselling online	Number of training opportunities Number of symposiums to share best practices Number of trendsetting initiatives/ projects

OBJECTIVE 1.3

Provide technology infrastructure and support for research, scholarship, engagement and creative activities **Enablers** Advanced ITC software, customised for CPUT research projects and outputs, dashboards, information management, and analytics for taking decisions and to implement timely interventions Quality of communication between Senior Officers, e.g. DVC RTIP, Postgraduate Centre and Senior Director: ICT	Provide responsive support and innovative technical solutions to meet the research, and technology innovation needs of researchers, postgraduate and postdoc students Expand expertise in high-performance computing, open-source environments, big data, learning analytics, AI and business intelligence that will advantage CPUT and societies	The outcome of staff satisfaction surveys Quality of data to take informed decisions (% errors in data), Increase in research outputs, registration of patents, technology transfers, research contracts, spin-off companies

OBJECTIVE 1.4

Provide technology infrastructure and support for research, scholarship, engagement and creative activities	Provide ongoing support for existing administrative processes and systems Streamline workflow and update and automate business processes to improve business efficiency, reduce the use of paper and become an increasingly environment friendly UoT	Number and quality of training workshops Staff satisfaction levels regarding training Decrease in purchasing of paper and traditional stationery

GOAL 1: Becoming the leading FHESD on the forefront of innovative higher education studies and development to transform universities of technology, creating smart learning environments that will provide excellent and relevant content inside and outside CPUT's lecture venues

Objectives	Strategies	Key performance indicators
Enablers Software and integration of systems to ensure a seamless flow of business processes to optimize information flow, work flows and timely alerts of anomalies in the system and non-alignment of information flows	Provide access to data and analytical tools to support administrative decision making and compliance, thus contributing in generating CPUT's business intelligence, and support the Institutional Research, HEMIS, Audit and Risk Management functions of CPUT	Turn-around time for processes to be concluded

OBJECTIVE 1.5

Evaluate and implement new technologies to improve operational efficiency, administration and governance **Enablers** The development of a complete e-administrative and e-governance solution Leadership and Vision of Senior Director: ICT DVC: Teaching and Learning Registrar QMD's leadership	Research and deploy a new online/ in the cloud file storage solution/ archiving system that meets CPUT's needs, including cost, usability, security, compliance, and scalability Identify and implement new business technologies and systems that can improve and maintain the administrative functions of CPUT Investigate and implement technological solutions to help assessment initiatives Research and deploy a solution for managing, searching, and archiving digital assets	Document archiving and retrieval Increased user satisfaction Just-in-time information availability Number of innovative projects/ ideas coming from staff to improve our administrative and governance processes Innovations in e-/online assessment that will be secured and reliable An online system to manage and secure all CPUT's assets

OBJECTIVE 1.6

Provide a secure computing environment that ensures data privacy and integrity, and mitigates cyber-security threats **Enablers** Implementation of firewalls and cyber security systems and alerts to provide timely alert reports Design and maintenance of systems and for daily updates and data storage/ backups in different digital spaces	Create a comprehensive IT security position to help address the challenges with information security, network security, disaster recovery, and compliance issues Implement and maintain hardware and software essential for institutional information security	Information security and protection in adherence with regulations and legislation (e.g. POPI Act) No loss of data or information Processes/ activities in place to deal with IT hacking, leakage of information Number of hacking attempts Number of hacking attempts successfully prevented Number of workshops and number of staff attending to acquaint themselves with ITC risks and cyber security

GOAL 1: Becoming the leading FHESD on the forefront of innovative higher education studies and development to transform universities of technology, creating smart learning environments that will provide excellent and relevant content inside and outside CPUT's lecture venues

Objectives	Strategies	Key performance indicators
OBJECTIVE 1.7		
Ensure a strong ITC workforce capable of achieving the information technology goals of One Smart CPUT **Enablers** Assessment battery being part of selection and appointment process to test the depth and breadth of prospective ITC employees' technological skills, appetite for change, adaptability and having to operate in a continuously changing ITC environment HC DVC: OPS	Provide technical and leadership professional development opportunities for ITC employees Provide flexibility in scheduling and projects to allow staff time to work with innovative technologies Recruit, develop, and retain talented and future looking staff for the ITC department	Trained and capable ITC support Number of ITC innovations Number of software programming packages, customised for CPUT Acknowledgement/ recognition by the HE sector for CPUT's innovations Number of other HEIs benchmarking with CPUT

FOCUS AREA 2	SMART TEACHING AND LEARNING AND LEARNING ENVIRONMENTS

A smart, multi-disciplinary student-centric education system – linked across the University using: (1) adaptive learning programmes and learning portfolios for students, (2) collaborative technologies and digital learning resources to teach on and make use of (3) computerised administration, (4) better information on our learners (learner analytics) (5) online learning resources for academics and students studying at own pace, place and space, knowing that CPUT is an institution known for face-to-face teaching but makes use of a blended learning/ multi-modal approach to cater for the needs of different students and the aspirations of lifelong learning.

GOAL 2: Becoming the leading UoT in smart teaching and learning, and being on the forefront of creating smart learning environments that will provide excellent and relevant content in all learning environments of CPUT

Objectives	Strategies	Key performance indicators
OBJECTIVE 2.1		
Develop programmes that will prepare students for the future	Revise all our programmes in view of the 4IR demands, such as AI, robotics, cyber security, and big data, as well as key global challenges such as global health issues, climate change, environmental sustainability, and food security, to ensure all our programmes are relevant, high in demand and ensure the employability of CPUT graduates	Relevance and excellence of the academic products and services Employability of our students Work Tracer Studies Relationship and interactions with professional bodies and industry/ trendsetters

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GOAL 2: Becoming the leading UoT in smart teaching and learning, and being on the forefront of creating smart learning environments that will provide excellent and relevant content in all learning environments of CPUT

| Objectives	Strategies	Key performance indicators
Enablers Presence and ability of senior academic leadership to regularly review current programme offerings and to compare with future jobs and trends in the workplace Strategic thinking of DVC: Teaching and Learning and Deans to be on the cutting edge of new teaching developments and modes of delivery	Phasing out of programmes no longer relevant and in demand	
OBJECTIVE 2.2		
Review and adjust our teaching methodologies and curriculum approach, in line with the CPUT graduate attributes	Move away from lecturer-centric models to a student-centric approach and authentic learning through following a problem-based/ case study approach, authentic learning or methodologies that will best suit/ augment a specific discipline or the training of students. However, it should be a complete shift away from traditional teaching. Establish a smart university digital pedagogy Research Chair	The employability of CPUT graduates and the quality of our graduates Number of visionary proposals to enhance teaching and learning across the university Number of innovative ideas to modernised teaching and learning that will be relevant and transforming for students studying at CPUT Number of research outputs with teaching and learning innovations as focus Evidence of CPUT developing the Scholarship of Teaching and Learning embedded in a digital/ virtual pedagogy
OBJECTIVE 2.3		
Student readiness for the world of work **Enablers** Continuous scanning of the environment to ensure relevance of academic programmes Strong senior academic leadership, an enabling environment, and supported by efficient academic support services and infrastructure	Integrating CPUT graduate attributes in all programmes and teaching that will support graduate employability in the future world of work Building industrial linkages to ensure CPUT's programme content and education/ training are relevant Ensure Faculty Advisory Board and industry links are in place and functioning optimally	Increased employability of CPUT graduates Results of graduate tracer studies/ student satisfaction surveys Presence of industry leaders and professionals assisting in advisory capacity on faculty boards and development of new programmes

Figure 1 below illustrates and summarises the kind of Smart Learning and Teaching environment/ prefered future CPUT inspires to be. It is imperative for CPUT, as a collective, and for faculties to assess where they are and where they want to be. Acknowledging that not all faculties are equally ready to embrace the new norm of teaching and learning, faculties will have to ensure that by 2030 they will be relevant and delivering on a high standard with quality learning experiences. Equally important is for academic support structures and the Division of Student Affairs to share the same vision and to provide the necessary support to achieve this dream.

SMART: Definition & Objectives
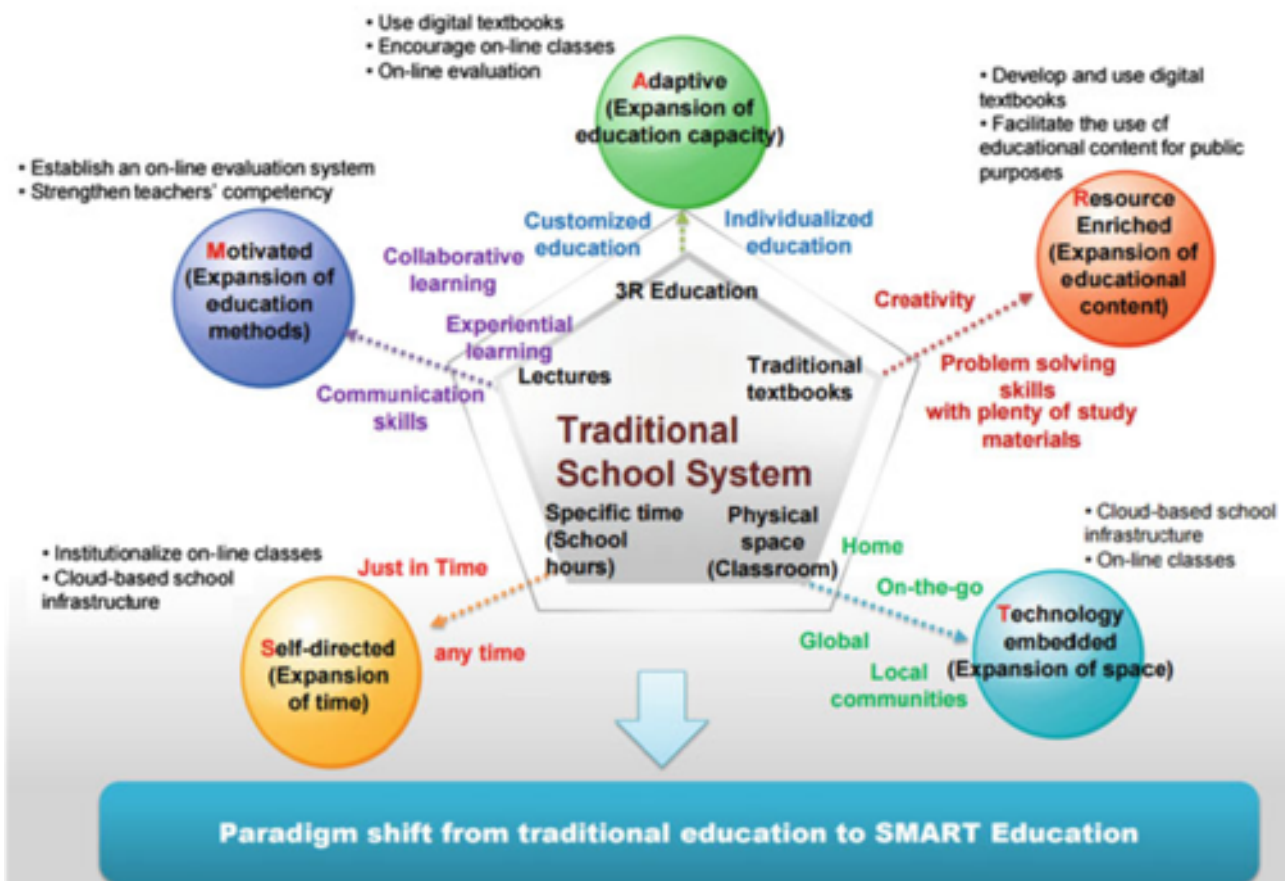
Source: Chun and Lee, 2015 (in Uskov, *et al*. 2017)

FOCUS AREA 3	SMART RTIP THAT IS RELEVANT AND EXCELLENT IN ITS KNOWLEDGE PRODUCTION

Smart RTIP ensures the relevance and excellence of the knowledge that CPUT produces through the development of a range of activities in line with the needs of industrial revolutions and circular economy developments. Smart RTI focuses on being innovative and relevant and focused on modes 2 and 3 knowledge production in support of research outcomes, whilst generating third income streams through innovations.

GOAL 3: To increase CPUT's trans-disciplinary focus on mode 2 & 3 knowledge production through strategic research initiatives to develop smart technology-driven solutions

Objectives	Strategies	Key performance indicators
OBJECTIVE 3.1		
Develop the research capacity of a future generation of scholars, and innovators, putting CPUT at the forefront of innovation in its broadest sense **Enabler(s):** Resources and expertise, based on structured mentorship programmes and formal training, exposure to world-class academics, universities, trend setters and industry leaders Strategic leadership of DVC: RTIP, supported by EM Leadership of Postgraduate Centre	Invest in the development and growth of research leadership on all academic levels through a supportive research culture and academic career path by providing opportunities for the four categories of researchers to cultivate the skills needed for successful discovery, application and impact focused Mode 2 and Mode 3 knowledge production Invest in CPUT research capability and state-of-the-art infrastructure to ensure that we have the skills, capacity, systems and approaches to generate a positive impact in industries and communities through our research and Mode 2 and 3 knowledge production Ensure greater external connectedness and reach for our research by basing our next generation of research strengths and opportunities in multiple disciplines across CPUT, with greater scale and end-user engagement Add a research component in the undergraduate curriculum from first-year level to build a strong awareness of research and scholarly inquiry	Increased visibility and international acclaim for CPUT research, technology and innovation

GOAL 3: To increase CPUT's trans-disciplinary focus on mode 2 & 3 knowledge production through strategic research initiatives to develop smart technology-driven solutions

Objectives	Strategies	Key performance indicators
OBJECTIVE 3.2		
Develop relevant research focus areas and strengths, with continuing emphasis on research uptake in Mode 2 and 3, and some Mode 1 where relevant **Enabler(s):** Presence of foresight to identify future trends to establish timely new research focus areas whilst phasing out of those who reach saturation or are dated Strategic Leadership of DVC: RTIP and DVC: Teaching and Learning as well as of Deans	Increase a new and innovative focus on building our unique integrated perspective of humanities and social sciences (HASS) with science, technology, engineering and mathematics (STEM), across our teaching and research practice. This focus should illustrate the connection between innovation and human behaviour, and strengthen the nexus, interconnection and interdependency of trans- and interdisciplinary collaboration and research, and indicate the dependency of the one on the other. Develop research programmes where HASS/ STEM integration is critical to creating new ways of tackling the challenges of our time Use leading-edge platform technologies and facilities to harness opportunities across key areas, including health, data science and sustainability in a multi-disciplinary approach Create new opportunities for all CPUT researchers, from research students to Distinguished/ visiting Professors, to work in collaboration with industry, business and communities, to develop commercialisation or other pathways for research impact Increase the diversity and scale of our research income by supporting our researchers to secure large, external research contracts, enhancing the academic profiles/ standing of our staff, and creating and leveraging strategic partnerships and collaborations that provide funding solutions on multiple fronts	Increased integration of human and technology-based research outputs Increased multi- and transdisciplinary research outputs Increased collaboration between researchers across faculties and departments
OBJECTIVE 3.3		
Strengthen the link between research focus areas, programme development/ development of future looking qualifications in both the undergraduate and postgraduate programme offering **Enabler(s):** Intellectual leadership and foresight to be future looking, based on research and data as exposed by DVC: RTIP and DVC: Teaching and Learning and Deans; budget allocations, supported by DVC: OPS, responsible for HC (talent recruitment and retaining of talented academics, researchers and scholars)	Regularly review job and work trends, and design programmes that will be high in demand in an increasingly technology driven world, e.g. Artificial intelligence (AI) Block chain applications, Quantum computing technologies, Virtual reality development, Simulation sciences, Robotics and manufacturing, Cyber psychology, Cyber consumer sciences, E-commerce, Energy capturing, storage and transmissions	Technology-focused and future-oriented research, technology and innovation outcomes that are relevant, excellent and that feed the nexus between teaching and research

FOCUS AREA 4	SMART HUMAN CAPITAL AND TALENT

Smart human capital and talent ensure that we remain focused on people as our most important resource. CPUT is a living system with smart people recognised and acknowledged, and having a passion and a curiosity for technology.

GOAL 4: Promote a culture of human-centricity and smart people of integrity, mutual respect, and excellence, who nurture collaboration, and are innovative in support of One Smart CPUT

Objectives	Strategies	Key performance indicators
OBJECTIVE 4.1		
Re-imagine the CPUT workforce performing in a technology-driven and inspired environment, with skill sets, attitudes and ability to adjust to the notion of One Smart CPUT **Enabler(s):** The ability of senior leadership to be decisive in terms of the profile of future employees, adjustment of recruitment, selection and induction practices to appoint the most appropriate employees Staff that will be empowered by the University's policies and practices	Take a phased approach to developing our workforce of the future Determine how the future of work at CPUT, and in the university sector more broadly, will inform new models of working, recognising the opportunities created by technology Determine how the future of work at CPUT, and in the university sector more broadly, will create new kinds of jobs, job titles, requirements for jobs; and shape recruitment, placement and career development practices Assess our organisational capability, as well as core competencies, and identify the changes required to enable the effective implementation of CPUT V2030 Strategy Create a new framework for staff development that is personalised and structured by supporting and enabling greater capability and efficiency in the use of digital technology for teaching and learning, research, engagement, administrative tasks and business processes Develop a reward and recognition framework that accommodates flexibility around career opportunities, and enables different career paths and options that are aligned with CPUT's Vision 2030 Promote and reinforce behaviours that instil a workplace culture of excellence, collaboration and innovation Establish an online Staff Develop Academy Decommission outdated, ineffective HC systems/ practices so that staff can spend time learning and engaging with technology-enhanced integrated systems Active recruitment of value adding Adjunct Professors and Scholars for junior staff mentorship and postgraduate supervision	Evidence of cross-university/ faculty/ divisional teams play a role in creating oneness in the realisation of our vision of One Smart CPUT Matrix to establish staff technology capabilities Existence of a university-wide mentoring framework and developmental programme (e.g. including a lateral (peer), vertical (senior staff supporting junior colleagues) and mentoring up (junior staff acting as mentors for senior staff) programme. Staff retention figures Outcome of staff satisfaction and campus climate surveys Evidence of addressing issues raised in staff surveys

GOAL 4: Promote a culture of human-centricity and smart people of integrity, mutual respect, and excellence, who nurture collaboration, and are innovative in support of One Smart CPUT

Objectives	Strategies	Key performance indicators
OBJECTIVE 4.2		
Create a smart CPUT community that identifies with the CPUT collective of unity, mutual respect, diversity and transformation **Enabler(s):** Leadership Programme initiatives to support CPUT to create a sense of belonging and to become an employer of choice Healthy HC practices	Focused approach to CPUT culture and shared values, and a strategy of measuring culture change: Staff wellness programmes Constructive and value adding dialogue on campus Celebration of staff's accomplishments and talents Awards for excellence in the workplace Acknowledgement of staff innovation to create One Smart CPUT	One Smart CPUT as a learning organisation with a shared memory, shared experiences and a shared vision Outcomes of campus climate studies Outcomes of staff satisfaction surveys Staff turnover %

FOCUS AREA 5	SMART INTERNATIONALISATION

An internationalised university is characterised by the development of a multi-cultural ecosystem to provide an educational experience that prepares our staff and students at all levels, for a global environment.

GOAL 5: To develop a unique CPUT multi-cultural community/global academic community by building capacity in our teaching and learning, research, innovation and engagements, that will ensure students and staff can act as global scholars, employees and employers

Objectives	Strategies	Key performance indicators
OBJECTIVE 5.1		
Create a multi-cultural environment at CPUT, South Africa in recognition of our place in Africa and the world **Enabler(s):** A curriculum focusing on the importance of internationalisation Well trained staff Stable IT Platform	Unlock opportunities for partnering with the best institutions and academics in South Africa, the rest of Africa and the world Develop active strategic partnerships across the globe that will enhance CPUT's footprint and stature as a cutting edge UoT and as a smart university	Events to celebrate diversity and unity in diversity Events to celebrate internationalisation success, be in real time or on digital platforms Ability to attract international and national experts to participate in online events such as webinars, (online) conferences, (online) public lectures, (online) debates, (online) lectures

GOAL 5: To develop a unique CPUT multi-cultural community/global academic community by building capacity in our teaching and learning, research, innovation and engagements, that will ensure students and staff can act as global scholars, employees and employers

Objectives	Strategies	Key performance indicators
OBJECTIVE 5.2		
Strengthen CPUT's international profile and visibility **Enabler(s):** Analysis/exercise to determine who will be our best partnerships Funding to visit these partners regularly as we established strong partnerships Funding arrangements for students, postdocs and academics A stable campus environment	Align international relationships with Research Focus Areas Increase number of active international research partnerships Increase number of international students at postgraduate levels Active recruitment of postdoctoral fellows in strategic research areas Attract international research fellows, eminent scholars (e.g. Fulbright Fellows), visiting professors	Number of active international partnerships and research collaborations Number of staff as co-authors of international publications Outcomes of impact assessments % of international students % increase in postdoctoral fellows Number of awards and prizes for academic and research achievements Increase in CPUT rated scientists
OBJECTIVE 5.3		
Attracting smart international students and staff **Enabler(s):** Financial resources to market CPUT as South Africa's UoT of choice for students to not only obtain a world class qualification but also an experience in real world problems and the opportunities to become responsible global academic citizens	Develop a shared vision and ownership of the university's internationalisation strategy across all faculties and divisions Provide a distinctive experience for international students at CPUT that delivers high-quality support to students across all their academic and non-academic needs Train all CPUT academic and professional staff to use best practice in the teaching, supervision and care of international students, including the development of course structures and curricula that enable all students to engage in international activities at CPUT, SA and elsewhere (be it internationalisation through the curriculum, research projects, at "home" or "abroad" through technological advancements Creating opportunities for international academics to become visiting academics/ professors and researchers at CPUT, e.g. attracting eminent international scholars, investing in staff and student exchange programmes Consider dual/ joint degrees with selected strategic universities (be it nationally, on the African continent and globally/ internationally)	Presence of a robust alumni in selected international locations The outcome of international student satisfaction surveys A reputation of an internationalisation strategy that embraces the advantages of technology Number of visiting scholars Number of staff and student exchange programmes, be it through contact or virtual teaching and learning Number of joint/ dual degrees offered with strategic partners

FOCUS AREA 6	**SMART ENGAGEMENT AND STRONG LINKS WITH QUINTUPLE HELIX PARTNERS**

In a smart university, there is collaboration and engagement with external stakeholders across all research and teaching activities, with the results of research integrated into a technology orientation. Stakeholder relationships and strategic partnerships are key to driving innovation. As One Smart CPUT, we are committed to collaboration and knowledge exchange with industry, society and the public sector, and to partnerships and relationships with a wide range of stakeholders in respect of the quintuple helix concept. There must be strong links and dynamic exchanges with business incubators, science parks and other initiatives related to innovation and technology activities, involving staff and students with industry and business.

GOAL 6: Ensure the relevance and excellence of CPUTs academic and research programmes through the development of linkages in the quintuple helix environment

Objectives	Strategies	Key performance indicators
OBJECTIVE 6.1		
Develop a 4x4 engagement strategy with our four primary communities (civil society, industry, government and academia) **Enabler(s):** Strategic thinking skills and vision, enhanced by already strong partnerships, establishing new ones	Develop a 4x4 matrix of engagement Establish an engagement oversight forum Develop an online showcase that demonstrates our engagement activities across the 4x4 matrix Increase number of active partnerships with industry and government Develop at least 2 flagship community engagement programme	Oversight forum established and tracking actions against the 4x4 matrix Online showcase active
OBJECTIVE 6.2		
Champion social, cultural and economic growth in our region **Enabler(s):** Strong partnerships and good relationships, based on trust, good reputation, branding and evidence of impact	Undertake a mapping exercise to identify the enterprises engaged in social innovation	Mapping complete and key actions identified Number of successful and active projects Impact assessment
OBJECTIVE 6.3		
Ensure the relevance and excellence of CPUTs academic and research programmes through the development of linkages in the quintuple helix environment **Enabler(s):** Strong partnerships and good relationships, based on trust, good reputation, branding and evidence of having impact with all partners	Develop a plan that will ensure strong links and dynamic exchanges with business incubators, science parks and other initiatives related to innovation and technology activities, involving staff, students, industry and government	Number of successful projects with impact % increase in third stream income generation Impact studies Work tracer studies

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FOCUS AREA 7	SMART STUDENT ENGAGEMENT AND LEARNING EXPERIENCES

A smart university provides a learning environment that does not only enable learners with access to digital resources and interaction with learning systems in any place and at any time, but also actively provides the necessary learning guidance, hints, supportive tools, or learning suggestions to them in the right place, at the right time, and in the right form.'
(Hwang, 2014).

GOAL 7: A smart, holistic CPUT student experience

Objectives	Strategies	Key performance indicators
OBJECTIVE 7.1		
Build the capacity of students to engage in a CPUT student experience in ways that are both individually transformative and that build the social capital of CPUT and its broader community	Embedding pre-university support to prospective students to assist in preparing them for higher education studies and develop a more rigorous first-year and retention framework	Pre-university engagements through summer schools, online pre-training
	Ensure the ongoing CPUT curriculum review considers and implements best practice approaches to enabling access to higher education and the academic development needs of our students	Evidence of institutional well-being framework and mental health strategy for students
		Evidence of documented first-year experience framework
Enabler(s):	Embed a diverse range of student well-being and equity initiatives that promote quality engagement and facilitated connections	
A well thought through co-curricular programme for students that are rewarding and meaningful	Strengthen mechanisms to undertake preventative education, cultural change, reporting, monitoring and response to incidents of harassment and assault	
First-year experience programme	Continue to improve and embed a model for the coordination and delivery of orientation that is appropriately nuanced to a diverse student cohort, and discipline and educational needs	
Pre-university programmes		
A well-structured student wellness programme		
OBJECTIVE 7.2		
Embed a suite of comprehensive and quality services for students that are integrated, responsive and focused on supporting students' holistic well-being and academic success, and supported by smart technologies	Embed consistently high standard of service provision across all institutional services and facilities	Evidence of annual schedule of approved student surveys and mechanisms for analysis and action through Student Affairs

GOAL 7: A smart, holistic CPUT student experience

Objectives	Strategies	Key performance indicators
OBJECTIVE 7.3		
Support a dynamic student community through the provision of high quality learning and social environments and experiences **Enabler(s):** Quality student orientation/ induction and ongoing development programme	Ensure consideration and prioritisation of the student experience is explicitly included and documented in capital investment and campus space planning as we become a smart university Enhance and strengthen the promotion of CPUT's residential culture and its role in contributing to the vibrancy of the broader CPUT environment Embed a diverse range of quality engagement opportunities for students, which facilitates peer connections, including social events, sports and recreational experiences	Student feedback Campus stability Feedback from industries and workplaces Achievements of our students and recognition for our student engagement programmes
OBJECTIVE 7.4		
Facilitate rewarding and high impact experiences that enrich and extend students' programme of study/ academic journey, including leadership, international exposure through smart technologies, work based learning, and civic engagement **Enabler(s):** Quality student orientation/ induction and ongoing development programme Progressive policies to support and acknowledge student engagements in a variety of contexts	Enhance opportunities for work integrated and experiential learning experiences within the University and broader community, and strengthen the University's framework for defining, coordinating and promoting the range of experiential and work based learning opportunities for students Ensure students are recognised for participating in high impact experiences that build and evidence graduate capabilities, including leadership, peer learning and volunteering opportunities Expand internationalisation opportunities – be it at home and through the use of smart technologies that are complementary to and embedded in curricular	Evidence of work integrated and experiential learning framework and database development and implementation Track of all forms of internationalisation activities and exposure
OBJECTIVE 7.5		
Encourage and strengthen the partnership between students and the University through constructive smart conversations, co-creation and celebration **Enabler(s):** An institutional culture that embraces difficult dialogues and conversations that will strengthen relationships between students, Management and academics in the interest of the well-being of CPUT	Provide multiple mechanisms and opportunities for students to provide constructive feedback on their university experience, ensure outcomes are widely promoted to students and stakeholders, and that they impact on institutional decision making Develop a student experience dashboard Ensure that student representation in university governance is meaningful, effective and informed to ensure high impact on strategic decisions Develop a professional development and training package, including exposure to international trends and best practices for student representatives to assist them to prepare for and effectively contribute to governance structures	Implement surveys available on the website to increase visibility of results and outcomes Evidence of student representation on Council, and leadership training programmes Campus stability

5 A financial enabling environment

The need for financial sustainability of any university is a given, and it was not identified as a specific strategic focus area in this plan, but rather as an enabler. In order for CPUT to become One Smart CPUT and to achieve the goals set in V2030, the financial sustainability of the University will be critical. Once this plan is approved, an analysis will be done to identify the cost to drive V2030, per each Executive Manager's portfolio. The 10-year costing model will be presented to Council. CPUT, through its Advancement Office and networks, will identify the goals and objectives that could be of interest to potential donors and foundations, and will keep on pursuing different avenues to achieve its preferred destination, that of becoming One Smart CPUT – Africa's MIT that will be recognised throughout the world.

6 Roll out plan

ACTIVITY	WHY	WHO	TIME FRAMES
Council approval	To position CPUT as One Smart CPUT	VC Relevant structures	November 2020
Consensus of how One Smart CPUT will look by 2030 (our dream and preferred future)	To ensure we all know what our preferred future will look like, and what we all will be aspiring towards	ED: OVC	End of 2020
Assessment of our technological smartness readiness level, and if we are falling behind, in which areas	To ensure that we understand our institutional readiness to become One Smart CPUT; where are we now, where do we want to go, what needs to happen and how much it will cost	ED: OVC, with Senior Director ICT and ED: Finance	Preferably end of 2020
Assessment of faculties and all other departments/ entities to move to a smart university in terms of digital capabilities, processes that can be smoothed by technology and overall institutional efficiency levels	To ensure we have a thorough understanding of CPUT's strengths and weaknesses to become One Smart University of Technology (CPUT)	ED: OVC with identified portfolios	As soon as possible and agreed upon
Costing of V2030	To ensure V2030 will be backed up with the necessary finances, understanding our financial realities. If needed, costing should lead to a phased-in approach, starting with the fundamentals of building an architecture for a smart university	ED: OVC with identified portfolios	End of 2020 and regular assessments afterwards
Alignment from all faculties and divisions/ departments with V2030	Each and every entity/ faculty to align themselves with V2030; breaking it down into faculty/ divisional plans, and according to short- medium- and 10-year plan(s).	To be overseen by ED: OVC	End of 2020
Determining monitoring and evaluation cycle(s)	Each year to be broken down into a cycle of (1) finalising the specific year's planning, activities and time frames, indicating progress made to achieve V2030, as well as what will be assessed every term/ quarter/ year	To be overseen by ED: OVC	End of 2020

7 Performance and accountability

CPUT considers its key risks in its strategic, operational, project and financial planning processes, and will utilise CPUT's Enterprise Risk Management Framework and its Combined Assurance Framework to assess the implementation of V2030. In order to ensure that One Smart CPUT retains its relevance and excellence as a smart university, annual reviews will be reported to the ISPC, and a five-year and mid-term review on performance and culture will be conducted.

8 Acronyms

4IR	4th Industrial Revolution	SATN	South African Technology Network
AI	Artificial Intelligence	SDGs	Sustainable Development Goals
CPUT	Cape Peninsula University of Technology	STI	Science Technology and Innovation
HE	Higher Education	UoT	University of Technology
HEI	Higher Education Institution	WC	Western Cape
NDP	National Development Plan	WIL	Work Integrated Learning

9 Glossary

9.1 Smart Lecturers:

"A smart campus depends on an overarching strategy involving people, facilities, and ongoing faculty support as well as effective use of technology…. A smart campus/university deploys smart lecturers and gives them smart tools and ongoing support to do their jobs while assessing their pedagogical effectiveness using smart evaluation forms". (Abueyalaman, 2008).

9.2 Smart Learning Communities:

"The requirements of the smart community applications are the following: (1) sensible – the environment is sensed by sensors; (2) connectable – networking devices bring the sensing information to the web; (3) accessible – the information is published on the web, and accessible to the users; (4) ubiquitous – the users can get access to the information through the web, but more importantly in mobile any time and any place; (5) sociable – a user can publish the information through his social network; (6) sharable – not just the data, but the object itself must be accessible and addressable; (7) visible/ augmented – make the hidden information seen by retrofitting the physical environment" (Adamko *et al.* 2014).

9.3   Smart Classrooms:

"Smart classrooms integrate voice-recognition, computer-vision, and other technologies, collectively referred to as intelligent agents, to provide a tele-education experience similar to a traditional classroom experience". Combining the IoT technology with social and behavioral analysis, an ordinary classroom can be transformed into a smart classroom that actively listens and analyses voices, conversations, movements, behavior, etc., in order to reach a conclusion about the lecturers' presentation and listeners' satisfaction" (Glicoric, *et al.* 2012).
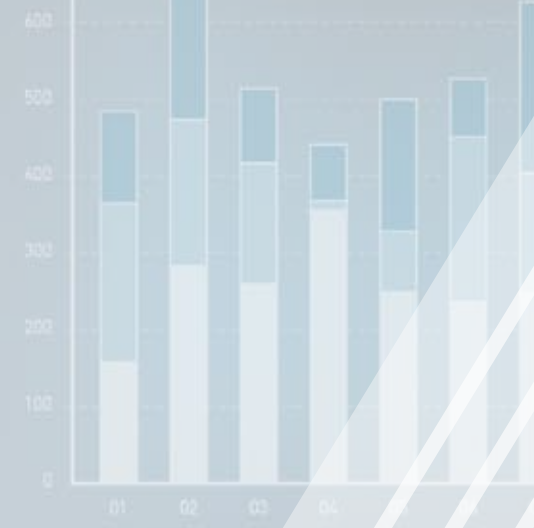
9.4   Smart Pedagogy

are focused on various innovative technology-based student-cantered learning and teaching approaches such as (1) learning-by-doing (including active use of virtual labs), (2) collaborative learning, (3) adaptive teaching, (4) serious games- and gamification-based learning, (5) flipped classrooms, (6) learning analytics and academic analytics, (7) context-based learning, (8) e-books, (9) personal enquiry based learning, (10) crossover learning, and other innovative strategies (Uskov *et al.* 2017).

9.5   Smart Campus:

"On smart university campuses aspects such as the following are critical: (1) E-Communication; (2) E- and social interaction; (3) Transport; (4) Management (administration); (5) Wellness (safety/security control/ surveillance and health); (6) Governance; (7) Energy management; (8) Data storage and delivery; (9) Knowledge sharing; (10) IT infrastructure; (11) Asset management; (12) HR processes; (13) Procurement and Financial processes; (14) Marketing; (15) Student life and residences; (16) Libraries; (17) Smart building and fleet management" (Uskov *et al.* 2017).

10 References

Abueyalaman, ES *et a*l., 2008. Making a smart campus in Saudi Arabia. EDUCAUSE Q. 2, 1012.

Adamko, A, Kadek, T & Kosa, M, 2014. Intelligent and adaptive services for a smart campus: visions, concepts and applications. In: Proceedings of 5th IEEE International Conference on Cognitive Info Communications, 5–7 November 2014. Vietri sul Mare, Italy, IEEE.

Benneworth, P & Charles D, 2005. University spin-off policies and economic development in less successful regions: Learning from two decades of policy practice. European Planning 13(4): 537–557.

Chun, S & Lee, O, 2015. Smart education society in South Korea. In: GELP Workshop on Building Future Learning Systems, Durban, South Africa. 19–21 April 2015. http://gelpbrasil.com/ wp-content/uploads/2015/05/smart_education_workshops_slides.pdf

Drucker, J & Goldstein, H, 2007. Assessing the regional economic development impacts of universities: a review of current approaches. International Regional Science Review 30(1): 20–46.

Gligori, N, Uzelac, A & Krco, S, 2012. Smart classroom: real-time feedback on lecture quality. In: Proceedings of 2012 IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOM Workshops), pp. 391–394, 19–23 March 2012. Lugano, Switzerland, IEEE. doi:10.1109/PerComW.2012.6197517

Hwang, GJ, 2014. Definition, framework and research issues of smart learning environments – a context-aware ubiquitous learning perspective. Smart Learn. Environ. 1(4). Springer.

Korsakova, TV, 2019. Higher education in VUCA world: New metaphor of university. European Journal of Interdisciplinary Studies. 5(2): 31–35.

Uskov, VL, Bakken, JP, Howlett, RJ & Jain, LC, 2017. Smart Universities, Concepts, Systems and Technologies. Springer.

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