



DUT RESPONSE TO ASSISTING GOVERNMENT TO FIGHT COVID-19 IMPLICATIONS

DUT as one of the leading Universities of Technology located in KwaZulu-Natal is able to support our students, staff, local communities within our region and government to fight against COVID-19. Due to the potential exceptional impact of the virus on the health care system in terms of the availability of face masks and equipment on the one hand and the social support for the well-being of vulnerable communities on the other, a number of DUT Units, Centers, Faculties and one Technology Station are in a position to support and work with our government and other institutions to contribute to areas where help is needed. Additionally, the role of social science research must not be underestimated and here DUT through its Urban Futures Centre is able to assist and work with the City and Local Government on helping vulnerable communities. We believe that impactful contributions can be made to address the impact of COVID-19 through a raft of measures that also include a multidisciplinary effort of local experts and collaborators, including partners from other universities, industries and government.

Key Priority Areas To Address COVID-19 Impact

1. Analysis of Epidemiological Data to Inform Strategic Planning and Targeted Interventions

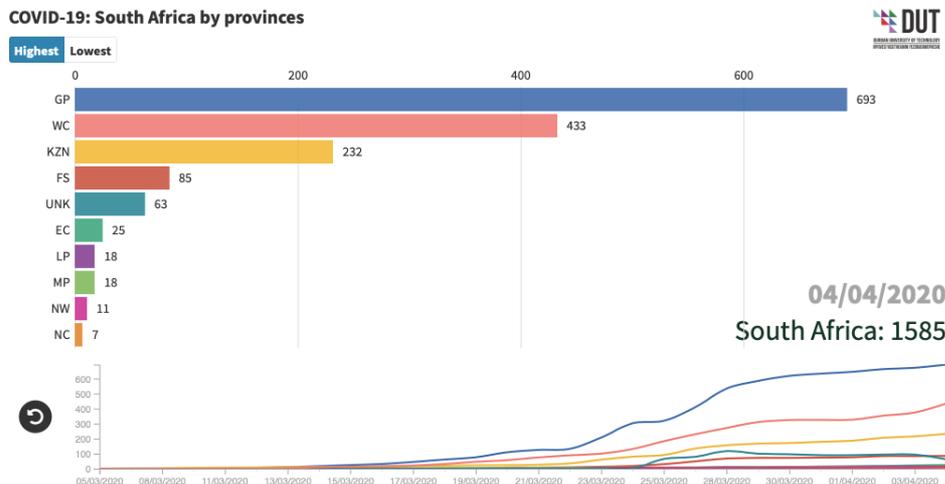
DUT is part of an existing project with the South African Medical Research Council (MRC) and the KZN Department of Health. This project is focused on analyzing epidemiological data specifically pertaining to the notifications of diseases and that of the District Health Information Systems (DHIS). It includes those who are positive with Covid-19.

The team is offering its info-epidemiological Big Data analytics capacity to USAf, NICD and the national and provincial Health Departments. There is both the technical (hardware and software) capacity as well as the epidemiological / bio-statistical capacity to monitor trends in the epidemic as we move towards a full blown epidemic. Additionally, there is capacity to evaluate and develop the responses to inform the Public Health system; Educational and Training institutions and assist with how we communicate Public Health messages and inform the public.

This DUT team involves Professors Nokuthula Sibiyi, Noddy Jinabhai and Dr Colin Thakur.

Data Analytics Site & Proof of Concept by Mr Yaseen Khan, PhD Candidate:

<https://public.flourish.studio/visualisation/1690495/>



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2. Lessening the Social and Economic Impact of COVID-19

DUT's Urban Futures Center (UFC) is actively engaged in activities that aim to lessen the impact of Covid-19 on the City's most vulnerable communities, particularly, the homeless and those who use drugs. Staff members from the UFC are currently part of the Deputy Mayor's Task Team on Homelessness. It is this task team which has led the City's response to homelessness which is undoubtedly the most comprehensive city response in the country. The centre has established 9 safe living spaces for homeless people in the CBD. This has involved a massive operation involving security, feeding, health and hygiene, amongst other things. The UFC has been part of every aspect of the planning of this intervention from the outset.

In particular, the UFC has played a lead role in developing an intervention for dealing with mass withdrawal from drugs for people who are now in safe spaces, but removed from the illicit drug market. The UFC has been integral in putting together a team of medical and psycho-social professionals to run an intervention that reduces the suffering and trauma associated with opioid withdrawal. This has been done in consultation with the Department of Health at City, Provincial and National levels. Throughout this planning process, the UFC has been the lead actor in linking with harm reduction teams in other cities, most particularly Cape Town and Pretoria. This work is path breaking in developing protocols and standard operation procedures (SOPs) for dealing with withdrawal in emergency situations. Our

expertise in running South Africa's first low threshold Opioid Demonstration Therapy Programme has meant that we are viewed as having the expertise to lead this process. In addition to this, staff from the UFC have been contacted by the press for radio, television and press media interviews. These have been in regard to the homeless during lockdown, but also the role of the security services in urban spaces during Covid-19. Hence DUT is in a position to continue to work with the City and Government to address the socio-economic impact of Covid-19.

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3. 3D Printing Technology

The concept of 3D printing refers to a process of additive manufacturing of three-dimensional real-world objects from a digital file. The process allows for the production of complex solid shapes using less material than the traditional manufacturing methods. Industries worldwide have proposed the application of 3D printing to curtail the pervasive outbreak of Covid-19 through the massive production of equipment such as face shields, Venturi valves, masks, gowns and respirators. These essential medical devices are currently in short supply as the health systems across the world are scrabbling for such equipment to safeguard human lives against the pandemic. It is widely anticipated that 3D printing technology can provide an alternative way to deliver essential medical equipment into the hands of the doctors and patients as curative or preventive measures.

DUT has a high specification 3D printing laboratory situated on Ritson Campus, which has 12 high quality 3D printers that could be commissioned to print essential supplies like face masks, oxygen connectors, oxygen splitters and other parts that may be needed to safeguard human life. In addition to the 12 3D printers, the university has two industrial Resin printers that could be used to print moulds to support large scale manufacturing processes. DUT currently has a stock of raw materials to immediately commence printing to contribute to its quota to mitigating the effects of Covid-19 on the society. The stock comprises of about 80 high quality reels of filament and resin, each reel costing approximately R500. Moreover, additional raw materials can be sourced from the local suppliers and internationally through our Chinese partners. China already has the experience on how to repurpose this equipment to combat COVID-19. There are many open source model files for medical components that have been accepted by the United State food and drug administration agency(FDA) and other medical agencies that can be used. The costs to print will be determined by the items being printed and the exact costs can only be determined once a prototype has been produced. At this stage of writing the submission the University is still consulting with relevant partners on what the areas of focus for KZN will be in order to estimate the relevant budgets and materials required.

The DUT Team involves a team of Mechanical Engineers, Health Sciences Staff, Accounting and Informatics Staff and the DUT Technology Station on Reinforced and Moulded Plastics

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4. Use of Technology e.g. Drones and Internet of Things to Support Data Collection, Monitoring and Evaluation

Drones are unmanned aerial vehicles that are self-piloted for performing a wide range of assignments, including military operations, surveillances, package delivery and remote data harvesting. The operations of drones are managed by internet of things (IoT) technology, which is a novel paradigm for equipping real world heterogeneous objects, such as drones with embedded sensors, actuators, transceivers and microcontrollers connected to the internet to solve practical problems affecting humans and other objects. IoT technology has the capability to perform drone operations from a personal computer connected to the internet. In China drones are used to contain the outbreak of Covid-19 in precisely three main ways. Disinfecting the public spaces using drones to spray aerial disinfectant in potentially affected areas to kill the virus in the public arena. Moreover, drones are used to transport medical samples to significantly minimize unnecessary human contact and to deliver items to ensure that people have access to food in the quest of the persistent lockdown.

DUT has a set of three high specification, intelligent drones that can be explored in data science study to harvest data from the surrounding atmosphere and deep rural areas of rapid air pollution analysis. Moreover, our drones can be modified to spray disinfectant on areas specified by public authorities, usually the public places, roads, hospital areas, government offices and buildings. Drones could be used to supplement the police and defence force activities by quickly identifying high risk illegal gatherings and noncompliance to lockdown conditions. The deployment of drones can be a game changer in the fight against Covid-19 infection. Some reports have suggested that China deployed drones with thermal imaging to check for symptoms like fever. Besides, drones can be used in quick delivery of testing kits and emergency supplies to Covid-19 hotspots.

DUT has state-of-the-art IOT equipment that can be commissioned to harvest data by using sensors together with application driven technologies in order to minimize the spread of the virus. For instance, an access control system can be specially designed by using an intelligent infrared camera to read, measure and record the body temperature. This has the benefits of a system that has fast measurement with high accuracy and an uncomplicated setup. A unit like this can be developed to be very flexible, adapted and configured for different campus access areas, public entrance areas, airports, taxi ranks, shopping centers amongst others.

Data could be collected in real time from these devices, analyzed and rapidly generate response to potential dangers.

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Costs & Funding

Costs will vary per project and partnership types and can only be determined once needs are identified and prototypes developed. Each team leader with their team will be required to work out approximate costs for scaling up.

Co-funding will be required in order to scale up these projects and in particular around the 3D printing. Also there would be a need to procure more material for printing. The University is trying to ensure key and relevant partnerships are secured so that the quality and technical issues are dealt with together with the market demands. We will then be able to submit these once those processes are concluded. In the meantime the first two projects on the **Analysis of Epidemiological Data to Inform Strategic Planning and Targeted Interventions and on Lessening the Social and Economic Impact of Covid-19** are active and would just need scaling up appropriately depending on identified areas of need.

Conclusion

A coordinated effort is required by all entities to beat this pandemic and to return to some state of normality. DUT with its expertise, resources, infrastructure and management support can contribute tremendously to the huge challenges the Province and Country faces at large. The impact on education and small businesses is tremendous and whilst we have not touched on these areas here, the University has been actively involved in ensuring our academics, researchers and entrepreneurs are introduced to online tools to ensure there is continuous teaching, learning and development. DUT is also aware of the need to collaborate especially in the 3D printing areas with other key partners. We are also strongly supported by Huawei and the Confucius Institute to draw on any Chinese partnerships that have already been instrumental in helping their institutions fight the pandemic and hence are open to any further collaborative efforts to help our government.

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