

## Tshwane Varsity Hackathon: PROBLEM STATEMENT

### 20 SEPTEMBER 2026

| Category                      | Problem description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| Energy and Electricity Supply | <p><b>Smart Outage Management Solution for the City of Tshwane</b></p> <p><b>BACKGROUND</b></p> <p>The City of Tshwane needs a <b>single, real-time system</b> to manage service outages from the moment they are reported until they are resolved.</p> <p>Currently, outage information can become outdated because customers, technicians, dispatchers and municipal teams do not always share information through one connected platform. This can result in delays, poor communication and difficulty tracking the progress of repairs.</p> <p><b>The Challenge</b></p> <p>Design and develop a <b>working prototype</b> that connects customers, dispatchers, technicians and municipal operations teams on one platform.</p> <p>The prototype should allow the City to:</p> <ul style="list-style-type: none"> <li>• <b>Report outages</b> – Capture the customer account number, location, contact details, type of outage and time reported.</li> <li>• <b>Detect duplicate reports</b> – Check whether the same or a similar outage has already been reported nearby.</li> <li>• <b>Prioritise outages</b> – Identify urgent outages based on severity, number of affected customers and service impact.</li> <li>• <b>Dispatch technicians</b> – Automatically notify the appropriate dispatcher or technician.</li> <li>• <b>Assign jobs intelligently</b> – Match outages with available technicians based on location, workload and duty status.</li> <li>• <b>Track repairs in real time</b> – Use GPS to monitor the technician's journey and progress.</li> <li>• <b>Keep customers informed</b> – Notify customers when the technician is travelling, nearby, on site and when the problem is resolved.</li> <li>• <b>Manage changes</b> – Record delays, postponements, reassignment and reasons for changes.</li> <li>• <b>Close jobs</b> – Capture the work performed, technician notes and completion time.</li> <li>• <b>Generate insights</b> – Provide data to help the City measure response times and identify recurring outage problems.</li> </ul> <p><b>What the Prototype Should Demonstrate</b></p> <p>The solution should demonstrate a <b>working end-to-end process</b>, rather than only showing screens or mock-ups:</p> <p><b>Report outage → Verify/Deduplicate → Prioritise → Dispatch → Assign technician → Track → Repair → Notify customer → Close → Analyse</b></p> <p>The aim is to demonstrate how a <b>connected, real-time outage management platform</b></p> |

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|                                 | <p>can help the City respond faster, improve communication with residents and make better use of municipal resources.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Climate Change (Water Scarcity) | <p><b>Climate Change Adaptation Challenge – Heat: Technology-Enabled Solutions for Vulnerable Communities</b></p> <p><b>BACKGROUND</b></p> <p>The City is bracing itself for the increasing impacts of <b>El Niño, rising temperatures and prolonged periods of extreme heat</b>. Conventional cooling measures, such as using water to cool homes and communities or relying on extensive tree planting, may not always be viable because <b>water is an increasingly scarce resource</b>, while many vulnerable communities do not have sufficient trees or other forms of natural shading.</p> <p>This creates an opportunity for students, innovators, programmers and technology enthusiasts to <b>rethink how communities can adapt to extreme heat using affordable, sustainable and locally appropriate solutions</b>.</p> <p><b>Challenge to Students:</b></p> <p>Can you design and develop a <b>technological, digital, programming, coding or smart solution</b> that can help vulnerable communities stay cooler and safer during periods of extreme heat <b>without placing additional pressure on scarce water resources?</b></p> <p>Students are encouraged to explore solutions such as:</p> <ul style="list-style-type: none"> <li>• Smart cooling technologies that use little or no water;</li> <li>• Low-cost sensors or IoT devices that monitor temperature, humidity and heat exposure and provide early warnings;</li> <li>• Mobile applications or digital platforms that identify and map community heat hotspots and available cooling spaces;</li> <li>• AI or data-driven solutions that predict extreme-heat conditions and recommend appropriate adaptive actions;</li> <li>• Smart shading systems that can automatically respond to temperature or sunlight;</li> <li>• Energy-efficient cooling solutions suitable for households with limited or unreliable electricity;</li> <li>• Innovative building materials, designs or retrofitting technologies that reduce indoor temperatures;</li> <li>• Community heat-mapping tools that identify vulnerable people, areas and infrastructure most exposed to extreme heat;</li> <li>• Digital platforms that combine technology with indigenous or traditional knowledge, identifying locally developed ways of keeping homes and people cool;</li> <li>• Nature-based or circular solutions that maximise cooling through vegetation, shade and locally available materials while minimising water consumption.</li> </ul> <p><b>THE CHALLENGE</b></p> <p>The challenge is <b>not limited to sophisticated or expensive technologies</b>. Students are encouraged to think creatively about how <b>coding, programming, artificial intelligence, sensors, data analytics, engineering, design and traditional knowledge</b> can be combined to develop practical solutions that communities can afford,</p> |

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|                                                | <p>maintain and use.</p> <p><b>The question is:</b> <i>If water is scarce, trees are limited and temperatures are rising, how can technology and innovation help vulnerable communities adapt to extreme heat?</i></p> <p><b>Students are challenged to move beyond identifying the problem and develop a practical prototype, digital solution, algorithm, application, device or proof of concept that could be tested in a real community.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p>Economic Development (Township Economy)</p> | <p><b>Affordable Delivery Services for Township Businesses</b></p> <p><b>BACKGROUND</b></p> <p>Townships in Tshwane have many small businesses selling products and services. These businesses need to move goods to customers, suppliers and other businesses. However, delivery services are often too expensive or unreliable for small businesses. This makes it difficult for entrepreneurs to reach more customers and grow their businesses.</p> <p>Many small businesses cannot afford traditional courier services or ride-hailing deliveries because of:</p> <ul style="list-style-type: none"> <li>• High delivery costs.</li> <li>• Limited delivery options in townships.</li> <li>• Delays and unreliable services.</li> <li>• Difficulty delivering goods to customers outside the township.</li> <li>• Lack of affordable, shared delivery services.</li> </ul> <p><b>THE CHALLENGE</b></p> <p>How can we use technology to make it cheaper, easier and more reliable for township businesses to deliver their goods?</p> <p>We want students to develop creative and practical solutions that help entrepreneurs move products from one place to another. Your solution could help businesses:</p> <ul style="list-style-type: none"> <li>• Deliver products to customers at lower costs.</li> <li>• Share delivery trips with other businesses.</li> <li>• Track deliveries in real time.</li> <li>• Connect with local drivers or delivery partners.</li> <li>• Use shared collection and delivery points.</li> <li>• Manage orders and deliveries through an app or website.</li> </ul> <p><b>What could you create?</b></p> <p>Think about solutions such as:</p> <ul style="list-style-type: none"> <li>• <b>AI-powered delivery pooling:</b> several businesses share one delivery trip to reduce costs.</li> <li>• <b>Community courier networks:</b> local drivers deliver goods for township businesses.</li> <li>• <b>Smart logistics hubs:</b> shared collection points where businesses can drop off</li> </ul> |

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|  | <p>and collect products.</p> <ul style="list-style-type: none"> <li>● <b>A delivery app:</b> entrepreneurs book affordable deliveries and track their goods.</li> </ul> <p><b>Your Mission</b></p> <p>Design a technology-based solution that helps township entrepreneurs deliver goods more affordably, reliably and efficiently.</p> <p>Your idea should solve a real problem, be practical to use and have the potential to grow across townships in Tshwane.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|  | <p><b>Using Digital Technology to Grow Township Businesses</b></p> <p><b>BACKGROUND</b></p> <p>Townships in Gauteng, including Tshwane, have many small businesses, entrepreneurs and talented young people who are creating jobs and earning a living.</p> <p>However, many township businesses still face challenges such as:</p> <ul style="list-style-type: none"> <li>● Not having enough customers or access to bigger markets.</li> <li>● Not being visible online.</li> <li>● Limited access to funding and business support.</li> <li>● Not having the right digital tools to run their businesses.</li> <li>● Difficulty connecting with government, investors and other organisations that can help them grow.</li> </ul> <p>The Gauteng Provincial Government and the City of Tshwane have plans to grow township economies, support small businesses and create more jobs.</p> <p>The City is also investing in township areas such as Marabastad, Mamelodi and Eersterust to improve facilities for informal traders and businesses.</p> <p><b>THE CHALLENGE</b></p> <p>How can we use technology to help township businesses grow and create more opportunities?</p> <p>We want young innovators to come up with practical digital solutions that can help township entrepreneurs:</p> <ul style="list-style-type: none"> <li>● Get their businesses noticed online.</li> <li>● Find more customers and access bigger markets.</li> <li>● Find funding and financial opportunities.</li> <li>● Access useful business tools and services.</li> <li>● Connect with other businesses, government and support organisations.</li> <li>● Improve and grow their businesses.</li> <li>● Create jobs and opportunities for young people.</li> </ul> <p><b>What are we looking for?</b></p> <p>Think beyond a basic website or app. Can you create a technology-based solution that solves a real problem faced by township businesses?</p> |

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|                          | <p>Your solution could be an app, website, digital platform, AI solution, marketplace, mapping tool, data solution, or another innovative technology.</p> <p><b>The goal: Use digital innovation to help township businesses become more visible, better connected, more competitive and ready to grow.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Municipal Infrastructure | <p><b>Predictive Municipal Infrastructure Maintenance</b></p> <p><b>BACKGROUND</b></p> <p>The City depends on a wide range of municipal infrastructure, including roads, traffic lights, stormwater systems, public buildings and other physical assets that support daily service delivery. These assets require continuous monitoring, inspection and maintenance to remain safe, reliable and operational. As infrastructure ages and usage increases, early identification of faults becomes increasingly important.</p> <p>Currently, infrastructure faults may only be identified after visible deterioration or complete failure has occurred. This reactive approach can result in service disruptions, higher repair costs, safety risks and inefficient use of maintenance resources. Limited access to real-time infrastructure condition data can also make it difficult to determine which assets require urgent attention.</p> <p><b>The Challenge</b></p> <p>Develop a predictive <b>maintenance solution</b> that supports proactive management of the City's infrastructure.</p> <p>The solution should allow the City to:</p> <ul style="list-style-type: none"> <li>● <b>Collect and analyse data</b> – Gather and process infrastructure data from municipal assets.</li> <li>● <b>Monitor asset condition</b> – Track the ongoing condition of roads, traffic lights, stormwater systems, public buildings and other assets.</li> <li>● <b>Detect early deterioration</b> – Identify early signs of deterioration before visible failure occurs.</li> <li>● <b>Predict possible failures</b> – Forecast faults so they can be addressed before they happen.</li> <li>● <b>Plan maintenance proactively</b> – Support proactive maintenance planning rather than reactive repairs.</li> <li>● <b>Prioritise critical assets</b> – Identify the assets that require urgent attention.</li> <li>● <b>Allocate resources efficiently</b> – Improve the allocation of municipal maintenance resources.</li> </ul> <p><b>What the Solution Should Demonstrate</b></p> <p>The solution should demonstrate a <b>working end-to-end process</b>, rather than only showing screens or mock-ups:</p> <p><b>Collect data → Monitor condition → Detect deterioration → Predict failure → Prioritise asset → Schedule maintenance → Repair → Analyse</b></p> <p>The aim is to demonstrate how a <b>predictive maintenance platform</b> can help the City move from reactive repairs to proactive planning, reduce costs and keep infrastructure safe and reliable.</p> |

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| Public Safety and Emergency Response | <p><b>Intelligent Public Safety and Emergency Response</b></p> <p><b>BACKGROUND</b></p> <p>Urban environments experience emergencies such as road accidents, fires, medical incidents and other public-safety events that require rapid and coordinated response. Effective emergency management depends on accurate information, fast communication and the ability to direct the appropriate emergency teams to the correct location.</p> <p>Currently, emergency information may come from different sources, and delays in confirming an incident's location, severity and available response resources can affect response times. Limited real-time coordination between emergency teams may also make it difficult to track incidents and deploy available resources efficiently.</p> <p><b>The Challenge</b></p> <p>Develop an <b>intelligent emergency response solution</b> that improves how the City manages public-safety incidents.</p> <p>The solution should allow the City to:</p> <ul style="list-style-type: none"> <li>● <b>Capture emergency incidents</b> – Record incidents as they are reported.</li> <li>● <b>Determine priority levels</b> – Assess the severity of each incident and rank it accordingly.</li> <li>● <b>Identify response resources</b> – Determine the appropriate emergency teams and resources for each incident.</li> <li>● <b>Coordinate in real time</b> – Support real-time coordination between emergency teams.</li> <li>● <b>Use smart technologies</b> – Apply technologies such as AI, geolocation and real-time data.</li> <li>● <b>Improve operational visibility</b> – Improve response time, resource allocation and overall operational visibility.</li> </ul> <p><b>What the Solution Should Demonstrate</b></p> <p>The solution should demonstrate a <b>working end-to-end process</b>, rather than only showing screens or mock-ups:</p> <p><b>Report incident → Verify → Prioritise → Identify resources → Dispatch → Coordinate → Track → Resolve → Analyse</b></p> <p>The aim is to demonstrate how a <b>connected, real-time emergency response platform</b> can improve response times, coordinate emergency teams and make better use of available resources.</p> |
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