Drone readiness index

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Background

• From the military drone to civil use.

• Drone use for good: land mapping, wildlife protection, crop monitoring, delivery of medical supplies, etc.
What factors contribute to drone success

• Need to identify the elements of the drone ecosystem and quantify how well countries are doing:
  – For governments, NGOs, commercial drone companies, etc. that want to take advantage of the drone technology.

• In the likeness of:
  – The networked readiness index\(^1\) (broader in scope)
  – The drone governance study\(^2\) (narrower in scope)

1: S. Baller et al, Technology report 2016, in WEF.
2: https://www.droneregulations.info/
Methodology

• Collect data on successful drone projects (Zipline blood delivery project in Rwanda, WeRobotics operations in Zanzibar):
  – Interviews and online sources.
• Identify key factors common across projects. (sub-indices)
• Identify indicators for each sub-index.
Components of the drone ecosystem

- Four components
- Nine subcategories (sub-indices)

Diagram:
- Environment
  - Regulations
  - Investment
  - Research and development
    - Local capacity
    - Communication and energy
    - Technology
- Readiness
- Usage
  - Drones’ projects
- Impact
  - Economic
  - Social
The drone readiness index (DRI)

- Equation (weighted utility function):

\[
DRI = k_1 \cdot U_{Reg} + k_2 \cdot U_{inv} + k_3 \cdot U_{R&D} + k_4 \cdot U_{cap} + k_5 \cdot U_{Com&En} \\
+ k_6 \cdot U_{Tech} + k_7 \cdot U_{Proj} + k_8 \cdot U_{Eco} + k_9 \cdot U_{Soc}
\]

- The weights \( k \) computed by swing weighting.
### Swing weighting

<table>
<thead>
<tr>
<th>Attribute swing from worst to best</th>
<th>Consequence to compare</th>
<th>Rank</th>
<th>Rate</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication and energy</td>
<td>All scores low except communication and energy</td>
<td>1</td>
<td>100</td>
<td>100/510 = 0.18</td>
</tr>
<tr>
<td>Regulations</td>
<td>All scores low except regulations</td>
<td>2</td>
<td>90</td>
<td>90/510 = 0.16</td>
</tr>
<tr>
<td>Investment</td>
<td>All scores low except Investments</td>
<td>3</td>
<td>80</td>
<td>80/510 = 0.14</td>
</tr>
<tr>
<td>Drones projects</td>
<td>All scores low except drones projects</td>
<td>4</td>
<td>80</td>
<td>80/510 = 0.14</td>
</tr>
<tr>
<td>Economic impact</td>
<td>All scores low except economic impact</td>
<td>5</td>
<td>60</td>
<td>60/510 = 0.11</td>
</tr>
<tr>
<td>Social impact</td>
<td>All scores low except social impact</td>
<td>6</td>
<td>60</td>
<td>60/510 = 0.11</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>All scores low except R&amp;D</td>
<td>8</td>
<td>40</td>
<td>40/510 = 0.07</td>
</tr>
<tr>
<td>Local capacity and facilities</td>
<td>All scores low except local capacity building and drone facilities</td>
<td>7</td>
<td>40</td>
<td>40/510 = 0.07</td>
</tr>
<tr>
<td>Technology</td>
<td>All scores low except technology in use</td>
<td>9</td>
<td>20</td>
<td>20/510 = 0.04</td>
</tr>
<tr>
<td>Benchmark (Worst Alternative)</td>
<td>all scores low</td>
<td>10</td>
<td>0</td>
<td>0/510 = 0</td>
</tr>
</tbody>
</table>

#### Weights values

![Bar chart showing weights values]
## Sub-indices and indicator scores

<table>
<thead>
<tr>
<th>Sub-index</th>
<th>Indicator</th>
<th>scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulations</td>
<td>Global Drone regulations database and civil aviation websites</td>
<td>0, 0.5, 1</td>
</tr>
<tr>
<td>Investment</td>
<td>Investment instances</td>
<td>0, 0.5, 1</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and development work instances</td>
<td>0, 0.5, 1</td>
</tr>
<tr>
<td>Local capacity</td>
<td>Gross enrolment ratio, tertiary (World Bank)</td>
<td>Percentage out of 1</td>
</tr>
<tr>
<td></td>
<td>Number of drone training schools</td>
<td>0, 0.5, 1</td>
</tr>
<tr>
<td>Communication and Energy</td>
<td>Mobile subscriptions/100 pop (ITU)</td>
<td>Percentage out of 1 (rounded to 1 for values greater than 1)</td>
</tr>
<tr>
<td></td>
<td>Quality of electricity supply (WEF)</td>
<td>Indicator normalized to range [0,1]</td>
</tr>
<tr>
<td>Technology</td>
<td>Availability of latest technologies (WEF)</td>
<td>Indicator normalized to range [0,1]</td>
</tr>
<tr>
<td></td>
<td>Government procurement of advanced technology (WEF)</td>
<td>Indicator normalized to range [0,1]</td>
</tr>
<tr>
<td>Drone projects</td>
<td>Number of commercial projects</td>
<td>0, 0.5, 1</td>
</tr>
<tr>
<td></td>
<td>Maturity of the projects</td>
<td>0, 0.2, 0.4, 0.6, 0.8, 1</td>
</tr>
<tr>
<td>Economic impact</td>
<td>Observed impact: job creation, etc.</td>
<td>0, 0.5, 1</td>
</tr>
<tr>
<td>Social impact</td>
<td>Observed impact: improvement of the people welfare, etc.</td>
<td>0, 0.5, 1</td>
</tr>
</tbody>
</table>
The drone readiness index applied to selected African countries

- Top performers:
  - Mauritius
  - South Africa
  - Tanzania and Rwanda
Conclusion & Future work

• Novel drone readiness index.
• Tool for Governments, NGOs, commercial drone companies interested in countries ranking as to their readiness for drones.
• Website documenting all assessed drone projects per country.

- Collect more data through crowd-sourcing.
- Using a finer granularity evaluating the sub-index scores.
- Apply the drone readiness index to more countries.
The drone readiness website

- https://drones-readiness-index.herokuapp.com