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XX Simpósio Brasileiro de Sistemas de Informação

Preliminaries on the State-of-the-Practice on Smart Cities Projects in Brazil

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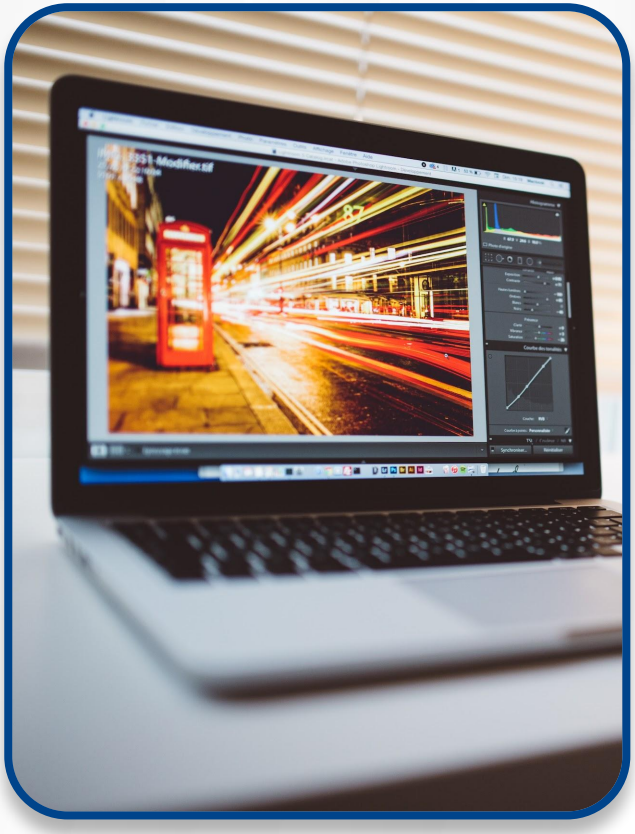
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Agenda

- Context
- Research Method
- Results
- Discussion



Context

- **Smart Cities** as means to achieve **UN Sustainable Development Goals**
- Information and Communication Technologies (**ICTs**) are the **drivers**
- We are aware of
  - **Initiatives in Brazil** (Curitiba, Rio de Janeiro, São Paulo, Aparecida de Goiânia)
    - Instituto Brasileiro de Cidades Humanas, Inteligentes, Criativas e Sustentáveis
    - CHICS: Cidades Humanas, Inteligentes, Criativas e Sustentáveis.
  - Several Literature Reviews => (**State-of-the-art**)

Context

- But what about the s**tate-of-the-practice**?
- What is currently the **status of the real projects in Brazil**?
- The **main contribution** of this work is to present **preliminary results of a survey research on smart city projects in Brazil.**

Research Method

- **Survey Research**
  - Planning
  - Execution
  - Analysis
  - Reporting

Research Method

- Survey Research
  - Planning
    - The **aim of this research** was to *explore the scenario of technologies related to Smart Cities in Brazil from the perspective of technology professionals*
    - Research Questions (RQs)
      - RQ1) What is the **geographic coverage** of Smart Cities distributed across the Brazilian territory?
      - RQ2) Which i**mplementations of technologies** related to the smart city concept are predominant in Brazil?
      - RQ3) What are the **potential challenges and difficulties** that technology professionals may face when implementing Smart Cities technologies in Brazil?

Research Method

- Survey research
  - Planning
    - **Target Audience** (Population Sample): **professionals** actively involved in technology, specifically those who work on **projects or research related to Smart Cities in industry or academia in Brazil**.
    - **Ethical issues**:
      - Free and Informed Consent Form (TCLE)
      - Circular Letter No. 17/2022 /CONEP/SECNS/MS, July 2022 and CIRCULAR LETTER No. 12/2023/CONEP/SECNS/DGIP/SE/MS3.
    - **Sampling planning**: a combination of incidental sampling with snowball sampling

Research Method

- **Survey Research**
  - **Execution**
    - Data collection from **December 15, 2023 to January 21, 2024**
    - Invitations *per convenience* to research groups and R&D teams + posts on LinkedIn
    - Not possible to estimate the response rate accurately
  - **Analysis**
    - Anonymized identity
    - Quantitative Analysis

Results

- **Demographics**: 21 people answered the survey
  - **7 states** and **4 different regions participated**
  - 14 of them completed or has ongoing PhD or master's degree
  - From **many different expertise areas**
    - Technology (61%)
    - Management (14%)
    - Electrical Engineering (4.76%), International Relations (4.76%), Mathematics (4.76%), Civil Engineering (4.76%), Physical Education (4.76%)

Results

- **Demographics**: 21 people answered the survey
  - 12 of them (57.14%) are involved in academic activities
  - 7 (33.33%) perform roles in Public Administration
  - 4 (19.04%) work in Private Institutions
  - 3 were students
  - Respondents varied from **22 to 50 years old**
  - **4 were women and 17 were men**

Results

- ***RQ1. Geographic Coverage***
  - Goiás (3)
  - Rio de Janeiro (2)
  - Rio Grande do Sul (6)
  - Maranhão (5)
  - São Paulo (2)
  - Paraná (2)
  - Rio Grande do Norte (1)



Results

- ***RQ2: Which implementations of technologies related to the smart city concept are predominant in Brazil?***
  - 7 participants (33.3%) said smart buildings
  - 7 (33.3%) => smart homes.
  - Smart grids were mentioned by 4 participants (19%)
  - 42.9% of them highlighted the implementation of smart traffic systems
  - 3 (14.3%) mentioned smart management systems
  - Smart health was mentioned by 5 participants (23.8%), as was smart governance
  - Electric vehicles were indicated by 4 participants (19%)

Results

- ***RQ2: Which implementations of technologies related to the smart city concept are predominant in Brazil?***
  - Autonomous vehicles were not mentioned by any participant.
  - Smart campuses were identified by 2 participants (9.5%), and
  - 1 (4.8%) of the participants mentioned the lack of implementations, lack of knowledge or the use of urban video surveillance.
  - Urban monitoring systems was mentioned by 12 (57.1%)
  - Renewable energies, smart mobility technologies and big data and data analysis were also mentioned, each with 8 respondents (38.1%).

Results

- ***RQ3: What are the potential challenges and difficulties that technology professionals may face when implementing Smart Cities technologies in Brazil?***
  - Dimensions
    - Infrastructure and connectivity
    - Financial
    - Cultural
    - Sustainability
    - Education and Training
    - Data management and privacy

Results

- ***RQ3: What are the potential challenges and difficulties that technology professionals may face when implementing Smart Cities technologies in Brazil?***
  - 11 participants (52.4%) highlighted challenges related to **infrastructure**
  - 8 participants (38.1%) highlighted the scarce **coverage of communication networks** as an obstacle
  - Limitations in **electrical grid infrastructure** were mentioned by 7 participants (33.3%).
  - 19 participants (90.5%) indicated **budget limitations**
  - 10 participants (47.6%) pointed out the **high cost of maintaining the implemented technologies**

Results

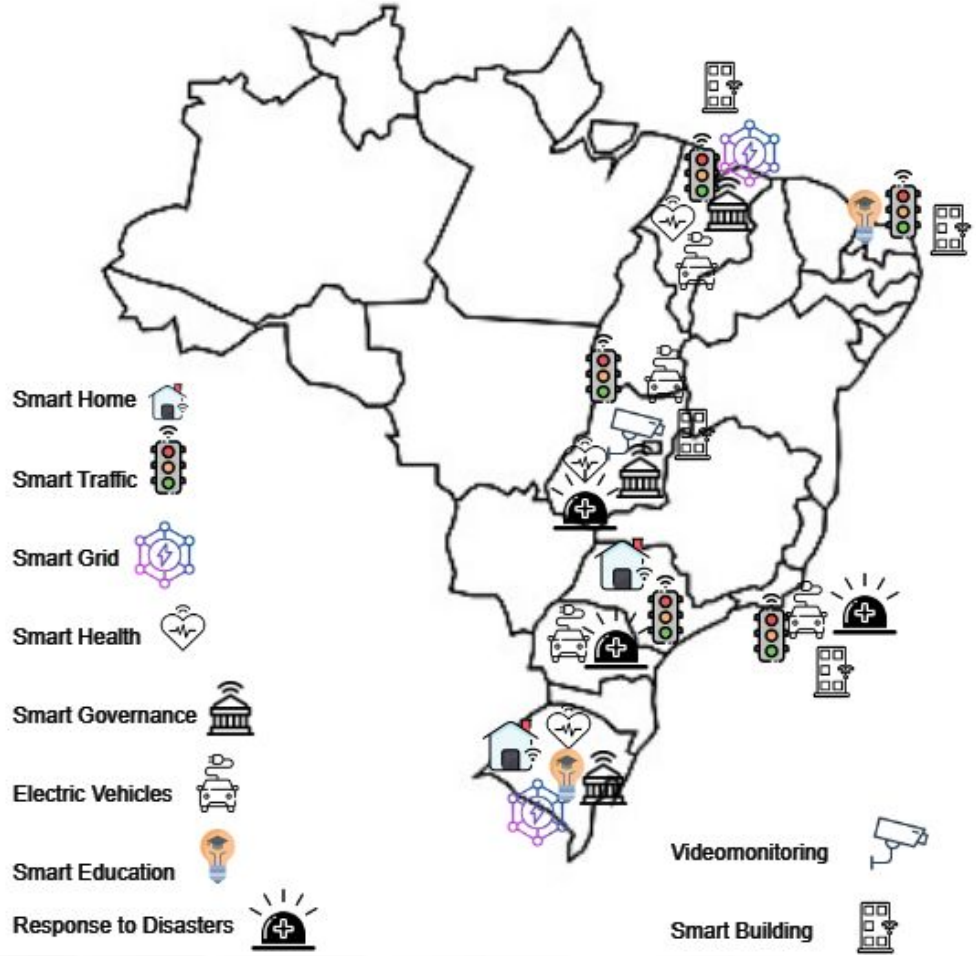
- ***RQ3: What are the potential challenges and difficulties that technology professionals may face when implementing Smart Cities technologies in Brazil?***
  - 13 participants (61.9%) pointed to a **lack of awareness about sustainable practices.**
  - 12 participants (57.1%) highlighted the **difficulty in implementing clean energy solutions**
  - 13 participants (61.9%) highlighted the **lack of educational programs on modern technologies**
  - The **difficulty in training local professionals** was mentioned by 11 participants (52.4%)

Results

- ***RQ3: What are the potential challenges and difficulties that technology professionals may face when implementing Smart Cities technologies in Brazil?***
  - 14 participants (66.7%) refer concerns about **data security and privacy**
  - **Difficulty in ensuring the application of privacy policies** was highlighted by 13 participants (61.9%)
  - 11 participants (52.4%) mentioned the **lack of professionals specialized in data analysis and management** as a challenge

Plus...

- *In what region/state is each*
- *technology deployed?*



Limitations and Threats

- Small sample (21 people)
- Relatively small coverage (~30% of the Brazilian states)
- Possibility of unawareness by respondents
- Possibility of relevant aspects not covered in the survey (not mentioned technologies, etc.)

Plus...

- *If you want to see more: https://qrco.de/bf5OP1*



Final Remarks

- **Preliminary results** of a survey research on the infrastructure of smart cities in Brazil
- **21 people involved in ICT projects on smart cities from 7 states and 4 different regions participated**
- **Results** reveal
  - smart cities projects are relatively well spread in the Brazilian territory (considering the modest numbers and sample of the study)
  - several technologies are already deployed in Brazilian cities
  - infrastructure is still the main challenge.
- **Future work** include expanding the research to other regions and including more of the collected data (such as, mapping each solution by state/city).

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Obrigado!

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