

# AFRETEC NETWORK IDT RESEACH FUNDING PERIODIC NARRATIVE REPORT

## Report Submitted By

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## INSTRUCTIONS

**Partner:** Please refer to 1- the original Inclusive Digital Transformation Africa Research Proposal when answering these questions, as relevant. Upon completion, please email this report to CMU-Africa at [afretec@andrew.cmu.edu](mailto:afretec@andrew.cmu.edu).

## GENERAL INFORMATION

Organization Name:

Reporting Period: 2023

☐ January- June

☒ July- December

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## 1. REPORTING PERIOD SUMMARY

### 1.1 Activity Achievements

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Outline your key achievements that occurred during this reporting period. What factors do you think contributed to these achievements? Please consider and include achievements that touch on inclusion.

Achievements:

Launch of the project website [www.cssr4africa.org](http://www.cssr4africa.org)

Completion of a comprehensive 88-page [work plan](#)

Completion of eleven [deliverables](#)

[D1.2 Rwandan Cultural Knowledge, version 1](#)

[D2.1 Use Case Scenario Definition, version 1](#)

[D2.2 Robot Behavior Specification, version 1](#)

[D2.3 Visitor Behavior Specification, version 1](#)

[D3.2 Software Engineering Standards Manual](#)

[D3.3 Software Installation Manual](#)

[D3.4 System Integration and Quality Assurance Manual](#)

[D7.1 Online Presence](#)

[D7.3 Open-Source Software Repository](#)

[D8.1 Progress Report](#)

[D8.2 Expenditure Report](#)

Organization of a [workshop](#) on Culturally Sensitive Social Robotics for All at the 21st International Conference on Advanced Robotics (ICAR 2023), Abu Dhabi, UAE.

Publication of four [papers](#)

A. Akinade, Y. Haile, N. Mutangana C. Tucker, and D. Vernon, "Culturally Competent Social Robots Target Inclusion in Africa", Science Robotics, 2023. Preprint available [here](#).

D. Vernon, 2023. “Culturally Competent Social Robotics for Africa: A Case for Diversity, Equity, and Inclusion in HRI”, 2nd Workshop on Equity and Diversity in Design, Application, Methods, and Community at the Human-Robot Interaction conference (DEI HRI 2023), March 13. Preprint available [here](#).

P. Zantou and D. Vernon, “Culturally-Sensitive Human-Robot Interaction: A Case Study with the Pepper Humanoid Robot”, Proc. IEEE Africon, Nairobi, Kenya, September, 2023. Preprint available [here](#).

P. Zantou and D. Vernon, “Inclusion Drives Sustainable Development: The Case of Social Robotics for Africa”, Poster Presentation, ACM SIGCAS/SIGCHI Conference on Computing and Sustainable Societies - COMPASS, August 2023. Available [here](#). Video available [here](#).

### Factors of Success:

Careful, thorough planning (cf. the work plan above).

The involvement of dedicated research assistants at CMU-Africa: Adedayo Akinade, Deogratias Amani, Eyerusalem Birhan, Kleber Cabana, Yohannes Haile, Mihiretab Taye Hordofa, Natasha Mutangana, and Pamelý Zantou, all of whom were given intensive training.

Hands-on project management, with adjustment of the work plan, when appropriate.

## 1.2 Activity Learnings

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What key lessons did you learn during this reporting period (e.g. through the process of design and implementation of Activities). Include learnings that touch on inclusion. Outline 3 key lessons that emerged during this reporting period. *Add rows as needed.*

Lesson 1: A detailed, comprehensive work plan is essential.

Lesson 2: Weekly research assistant group meetings work well; weekly individual meetings work better.

Lesson 3: Delays are inevitable: the best laid plans cannot account for all eventualities, e.g., the failure of the Pepper robot, and contingency plans are essential (we are planning on purchasing a second Pepper robot).

Lesson 4: It takes time for research assistants to transition from a group-work mentality to a team-work mentality, in which responsibility is shared.

Lesson 5: It takes time for research assistants to understand and embrace the rigors of professional practice.

## 1.3 Progress & Impact

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Use the tables below to report numerical targets, results, and relevant explanations or comments. If any internal or external factors may influence progress, please explain. All quantitative indicators should be disaggregated by gender, and where possible and relevant, by age groups, disability status, rural/urban, degree program, etc.

**1.3.1: Progress Reporting (Outputs):** Progress reporting shows the outputs of the Activity. In the table below, please provide updates on your progress of funded Activities. Examples of progress indicators include the gender representation of students/ learners/ faculty receiving support, number of Afretec and non-network universities partnered with, or share of participants who successfully completed training or education out of the total target. *Add rows as needed.*



Progress Reporting	Indicators (quantitative or qualitative)	Target	Results to date (include gender & other disaggregation as relevant)	Comments on progress (any insights, opportunities to adapt, etc.)
Deliverables	Submission to website	16 deliverables	11 delivered	The remaining five deliverables are delayed by approx. two months due to unforeseen software and hardware problems with the Pepper robot
Diversity	Balance of female/male research assistants	Equal balance	Two of eight RAs are female	The achievable balance reflects the balance of CMU-Africa students
Collaboration	Meetings	Weekly	Approx. 60% of weekly meetings here held	Pressure from other commitments sometimes precludes meeting

Please describe any above-mentioned qualitative indicators that show progress. Examples of qualitative progress indicators are development of a training curriculum, signing of an agreement, etc.

**1.3.2: Impact Reporting (Outcomes):** Impact monitoring shows the changes or outcomes that occur partly or fully due to the Afretec collaboration and program investment. In the table below, please provide updates on outcomes and/or emerging outcomes. Examples of outcomes include: level of student preparedness for and interest in pursuing graduate education in ICT, assessment of faculty engagement in professional development that enhances their teaching, or evidence of increased collaboration with universities or industry locally and regionally. *Add rows as needed.*

Outcomes should relate specifically to the Afretec Network Principles [**Network-Based, Leveraged, Collaborative, Diverse & Inclusive, Transformative and Evidence-Based**] (see Principles section of Afretec Action Plan). Include in Comments to which Principle the outcome is related.

Main changes or outcomes (indicate the level the activity is focusing on— learner, student, faculty, institution, industry, country or region)	Indicators (quantitative or qualitative)	Target	Results to date/contribution to impact (include gender & other disaggregation as relevant)	Comments on impact (any insights, opportunities to transform)
Professionalism	Research assistant productivity	8 RAs trained	8 RAs trained	Comprehensive training material and a period of induction are essential
Technical knowledge & skills	Ability to acquire new technical skills and overcome unforeseen technical problems	Independent learning	Clear evidence of independent learning, varying from moderate to outstanding, depending on the research assistant	It is essential to assign individual responsibilities to encourage the acquisition of new knowledge and skills, and to make it transparently obvious when these skills have been acquired, and the degree to which they have
Diversity	Ability to work with people from different cultural and professional backgrounds	100% cohesion in the team	Most RAs work well together	Diversity adds value as it exposes RAs to different standards and expectations regarding both professionalism and technical competence.

Describe any emerging effects or changes that are not captured quantitatively. Include both positive or negative changes that were either intended or unintended.

**1.3.3. Ripples of Impact:** Your intervention may have ripple effects beyond the level identified above. For example, a program targeting young women or men to pursue education or entrepreneurship opportunities may have an impact on their households or communities. A program targeting university- industry relationships may have an impact on recent graduate job placement. Multi-university knowledge creation projects may impact the visibility of African research collaborations to global funding organizations.

We hope to capture the full range of potential ripples of impact and broader changes of Afretec programs, so we may potentially follow up with impact assessments. Please note if any programs that targeted one level (e.g. learner, student, faculty, institution, industry, country or region) are showing ripple effects on other levels:

It is probably too early in the project to expect any significant ripple effect. However, two events stand out that highlight the merits of the research.

First, we organized a [workshop](#) on Culturally Sensitive Social Robotics for All at the 21st International Conference on Advanced Robotics (ICAR 2023), Abu Dhabi, UAE. This acted as a catalyst for some work in Work Package 1, but also attracted interest in the broader community. As a result of this workshop, the PI and an invited speaker, Prof. Barbara Bruno, have started working together on writing a new research proposal and we are discussing the possibility of re-running the workshop at RO-MAN 2024.

Second, we published an article in a high-profile journal, drawing people's attention to the robotics research and education activities at CMU-Africa; see A. Akinade, Y. Haile, N. Mutangana C. Tucker, and D. Vernon, "Culturally Competent Social Robots Target Inclusion in Africa", Science Robotics, 2023. Preprint available [here](#).

**1.3.4: Additional data collection:** Please describe any additional quantitative and qualitative data collection efforts utilized (e.g. key interviews and focus group discussions, pre and post program knowledge assessments, attitudes and practices (faculty or collaboration partner surveys, etc.)). This may help identify opportunities to deepen how we capture the impact of this partnership. These efforts could include data collection described in your proposals or any other relevant data collection.

Not applicable in this period.

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## 2. PARTNERSHIP UPDATES

### 2.1 Partnership Changes

Have there been any key changes (changes with significant impact on partnership or activity success) to any of the following items? ☐ Yes ☒ No

Items: context, outputs/deliverables; key activities; inputs/resources; monitoring, evaluation, research and learning plan; communications approach; team structure (including staffing), etc.

If yes, please describe:

### 2.2 Collaboration Update

Please provide an update of your engagement and collaboration with partnership stakeholders (e.g. academic institutions, private sector organizations, government organizations, community groups, civil society organizations, etc.) during this reporting period.

The main unplanned engagement and collaboration arose as a result of the [workshop](#) on Culturally Sensitive Social Robotics for All at the 21st International Conference on Advanced Robotics (ICAR 2023), Abu Dhabi, UAE. We hope that the collaboration with the invited speaker, Prof. Barbara Bruno, will develop over the coming year. We have a first meeting planned for 9 January 2024.

### 3. COMMUNICATIONS UPDATE

#### 3.1 Communications Activities Update

Please describe the marketing and communications outreach that occurred during this reporting period as well as any relevant media links.

The principal marketing and communications outreach activity during this period was the creation of a new [research page](#) dedicated to AI & Robotics, featuring the work in this project, on the CMU-Africa website.

As noted above, we also published an article in a high-profile journal, drawing people's attention to the robotics research and education activities at CMU-Africa; see A. Akinade, Y. Haile, N. Mutangana C. Tucker, and D. Vernon, "Culturally Competent Social Robots Target Inclusion in Africa", Science Robotics, 2023. Preprint available [here](#).

Other publications are listed in Section 1.

### 4. RISK UPDATE

#### 4.1 Risk Update

Please provide an update to the risks, either new, as previously identified in the Proposal or previous Periodic Reporting Template. Consider partnership and activity-level (e.g. capability, capacity), and organizational-level (e.g. affecting management, governance, personnel essential to the functioning of the organization).

Risk	Likelihood	Risk Impact	Risk Mitigation Plan
Inadequate funding for research assistants	High	High	Pay RAs from alternative funds, e.g., Research Professorship Start-up Fund; agreement has this has already been agreed.
The Pepper robot dies again	Moderate	Catastrophic; indeterminate delays.	Purchase a second Pepper robot. A quotation has already been obtained and agreement for the purchase has been agreed, paid for by central CMU-Africa research funds.
Unable to resolve an ongoing control problem requiring termination of the inbuilt autonomous life mode on the Pepper robot	Moderate	High	Work with the vendor to identify the problem.
African cultural knowledge are not effective in use cases	Low	High	T6.2 produces a set adjustments which are mented in T1.4.
Implementation of the system architecture for use cases is insufficient	Low	High	T6.2 produces a set adjustments which are mented in T3.5.
Robot sensing and analysis does not perform adequately	Low	High	T6.2 produces a set adjustments which are mented in T4.4.
Robot behaviors do not perform adequately	Low	High	T6.2 produces a set adjustments which are mented in T5.6.
T6.4 Use case evaluation does not achieve sufficiently high user ratings in the evaluation	Moderate	Moderate	T6.2 identifies adjustments; these are implemented in T1.4, T2.4, T3.5, T4.4, and T5.6.

## 5. NEXT REPORTING PERIOD

### 5.1 Plans for Next Reporting Period

Based on the Afretec Action Plan and progress updates thus far, please outline your key activities for the next reporting period.

Our priority in the next reporting period is to complete the remaining tasks that were planned for completion in the current period.

Task 1.1	South African Cultural Knowledge Survey
Task 1.2	Rwandan Cultural Knowledge Survey
Task 4.1	Sensor Tests
Task 4.2.1	Person Detection and Localization
Task 4.2.2	Face and Eye Detection and Localization
Task 4.2.3	Sound Detection and Localization
Task 5.1	Actuator Tests
Task 8.4	Consortium Agreement
Task 8.5	Gender Action Plan

We expect this to take approximately two months.

The other priority tasks are as follows (see the [work plan](#)).

Due for completion in the next reporting period:

Task 1.3	African Modes of Social Interaction
Task 1.4	Africa-centric Design Patterns
Task 3.1	System Architecture Design
Task 3.4	System Integration & Q.A. Manual (already completed)
Task 5.2	Animate Behavior Subsystem
Task 5.4.2	Scenario Script Language
Task 5.5.2.1	English Text to Speech Conversion
Task 5.5.2.2	isiZulu Text to Speech Conversion
Task 5.5.2.3	Kinyarwanda Text to Speech Conversion

Due for completion in the subsequent reporting period:

Task 4.2.4	Robot Localization
Task 4.3.1	Tablet PC Event
Task 4.3.2	Speech Event
Task 5.3	Attention Subsystem
Task 5.4.1	Cultural Knowledge Ontology & Knowledge Base
Task 5.4.3	Scenario Script Interpreter
Task 5.5.1	Gesture Execution
Task 5.5.2.4	Integrated Text to Speech Conversion
Task 5.5.4	Robot Navigation

## 6. ADDITIONAL INFORMATION

### 6.1 Additional Information

Please describe any additional information that the Director of the Afretec Network should be aware of.

*NOTE: THE FOLLOWING SECTION IS FOR INTERNAL USE AT CMU-AFRICA ONLY.*

*Associate Director of Impact to complete this section following submission of the Periodic Narrative Report by the Afretec Partner.*

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## **7. REVIEW**

### **7.1 Associate Director of Impact Comments**

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Please describe any key issues and/or follow-up items and provide a summary of discussions that occurred with partners during this reporting period.