# Innovation Challenge Fund (ICF)

# Concept Note Template

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| 1. | Name / Organisation  | Dr Madhushankara M, Associate Professor, Manipal School of Information Sciences, Dr Venkataraja Aithal U, Professor, Speech and Hearing, Manipal College of Health Professions, Manipal Academy of Higher Education, Karnataka |
| 2. | Email address / Phone number | **madhushankar.m@manipal.edu, vrajaithal@manipal.edu**  |
| 3. | Title of Project | Speech Enhancer for Laryngectomized Patient under Alaryngeal Condition |
| 4. | Application for ICF Cluster | AI/Data Science, Karnataka |
| 5. | Co-Members of the Consortium \**(*Type – *Indian Academia, Indian Business, International Academia, International Business, Indian non-commercial organisation, International non-commercial organisation, Other - specify)*\* Information not mandatory for the concept note stage. |

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| 6. | If you do not already have agreed consortium members, please indicate here the kind of partners you would like to hear from.  | **Any organization specializes in the field of embedded systems with artificial intelligence.** |
| 7.  | Are you content for us to publish your concept note on our web platform in order to encourage potential consortium members to reach out to you?  | **Yes** |
| 8. | Funding Requested (up to £250k) | £206k\* |
| 9. | Co-funding provided (if any) and source | **No** |
| 10. | Please summarise your Innovation Challenge Fund research project in one sentence.  *350 character limit* | A facemask acts as a face shield and enhance the speech of laryngectomized patient who uses an electrolarynx as alaryngeal mode of speech. It consists of trained artificial neural network to convert and amplify the electrolaryngeal speech. |
| 11. | Please describe your project further. What problem does your pilot seek to address? Who are the potential beneficiaries and other stakeholders? What are the inputs and activities, and what are the outputs? What does success look like after 12 months of funded research? How will your solution reach the market place? *2500 character limit*Covid-19 pandemic made humans to wear a face mask in public life. The problems with the mask are muffled voice, no lip reading, and creates a sound barrier. The social distancing further worsens the quality of speech. The communication situation is worse in the case of people without larynx. The alternative methods of speech/ communication for laryngeal cancerous patients is considered to be less efficient due to low voice quality and magnitude, this pandemic has worsened their problems.The larynx of a throat cancer patients is either partially or totally removed by surgery. The patients are dependent on oesophageal, tracheoesophageal, or electrolaryngeal methods for their verbal communications.The solution is provided with the help of face mask which is inevitable to be worn during the current pandemic situation which will also possess mechanisms to enhance the speech. In this solution of speech enhancing system, the speech is picked up, pre-processed, analysed, voice corrected and amplified. The speech segmentation is done so that it is correctly recognized and the features are extracted. The use of data science with the help of training data base set, the speech is corrected and amplified.The role of Speech language pathologist is to provide the database to be used in the system. They can also advice and prescribe such speech enhancer built in face mask to their laryngectomy patients. Device will be made to reach the market as over the counter device with the permission from the governing body. |
| 12. | What is ‘technological’ about your proposed solution and why might this be appropriate to the challenge areas?*1000 character limit* |  The technology involved here is artificial intelligence to correctly identify and provide corresponding speech of a person without losing the individual characteristics. The pre-filtering process will remove the noise associated with the alaryngeal methods such as electrolarynx. Speech segmentation is a way of speech perception technique and an important aspect in speech recognition. Several algorithms are being applied in the process of feature extraction of speech signals. The artificial neural networks are based on the concepts of how the neural network functions in the human brain. They process one set at a time, and learn by comparing their classification of the set. The errors from the initial classification of the first set is fed back into the network, and used to modify the networks algorithm for further iterations. A tiny speaker will be used to amplify the clear speech from the network. |
| 13. | Is your proposed solution a response to the impacts of COVID-19, or an effort to contain the pandemic? If so, please explain. *1000 character limit*  | The proposed solution is a response to the impacts of COVID-19 on verbal communications. The nonverbal communication with the help of technology, such as text to speech systems have limitations to express individual’s emotions. Achieving effective communication through verbal means maintaining safety measures becomes vital but more challenging for individuals with speech disability especially in case of laryngectomy patients. Further, such device can be used in many other compromised communication environment as in noise situations eg. public transports, social gatherings maintaining physically safe distance. In addition such speech enhancing system can be an option for professional voice users such as teachers in various training centres and schools.  |
| 14. | Does your proposed solution contribute to combatting climate change or promoting a greener planet? If so, please explain. *1000 character limit* | NA |
| 15. | How is your proposal relevant to the development challenges of India? *1000 character limit* | Most of the patients with speech disability / communication impairment in India are sacrificing their professional carrier and become dependent on their spouse or care taker failing to meet the communication demands. Speech therapists or laryngologists are unable to find indigenous and affordable solutions to Indian patients with communication disability as most of these devices are imported. Hence, improving voice related quality of life is yet challenging in Indian scenario. The biggest challenges here are skill development, socioeconomic culture, and a healthy and sustainable future. The data science and artificial neural network being an upcoming technology, any skill related to it will be good opportunity in terms of professional and personal wellbeing. |
| 16. | What consideration have you made of gender in developing your concept? Could your project address gender inequality or other kinds of inequality? *1000 character limit* | Anyone with the knowledge of artificial neural network and basic knowledge on speech acoustics will be able to develop this project. The solution will also be intended for all genders by considering their speech characteristics.  |
|  | *Notes:* *Please be kindly reminded of the primary criteria: relevance to the environmental and/or C19 agenda. See boxes 13 and 14.* *Except box 5, all boxes require mandatory response.**In the interests of fairness, proposals that exceed the character limits will not be considered.*  |