

Innovation Challenge Fund (ICF)

Concept Note Template

1.	Name / Organisation	Nitin Auluck (Indian Institute of Technology Ropar)		
2.	Email address / Phone number	<u>nitin@iitrpr.ac.in</u>, 9501033660		
3.	Title of Project	The “Living” Campus: Designing Safe and Resilient Higher Education Spaces		
4.	Application for ICF Cluster	AI/Data Science, Karnataka		
5.	Co-Members of the Consortium * <i>(Type – Indian Academia, Indian Business, International Academia, International Business, Indian non-commercial organisation, International non-commercial organisation, Other - specify)</i> * Information not mandatory for the concept note stage.	#	Organization	Type
		1.	School of Planning and Architecture New Delhi, India	Indian Academia
		2.	Cardiff University, UK	International Academia
		3.	Infrastructure Development Corporation (Karnataka) Limited (IDeCK)	Indian Business
		4.	TBC	Start-up/SME
6.	If you do not already have agreed consortium members, please indicate here the kind of partners you would like to hear from.	We have listed 3 partners and would be looking for a start-up based in Bangalore/Karnataka that works on AI/Security systems/ Computer vision		
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)	<i>Total: 220k</i>		
9.	Co-funding provided (if any) and source	No		
10.	Please summarise your Innovation Challenge Fund research project in one sentence. <i>350 character limit</i>	Develop an innovative evidence-based planning and management tool that enables smart, safe, mobile and dynamic campuses and public spaces by combining cyber-physical systems and spatial behavioural theories.		
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? <i>2500 character limit</i> Overview: To develop a “smart and resilient” campus, rooted in the idea that design, technology and social interactions need to be better understood and synchronised, to limit spread of Covid-19 or other			

	<p>pandemics in a campus environment. A campus replicates many urban features but allows us to work at a scale to robustly test our approach.</p> <p>Background: Educational campuses are critical for development and dissemination of knowledge and are a microcosm of interactions in human settlements. The physical and social patterns of a campus environment are an ideal setting to understand movement and behaviour changes in society, as the occupants of campus are both early adaptors of technology and flexible, creative users of them.</p> <p>Problem: To re-imagine the high staff and student mobility in University and higher education campuses to limit the impact of Covid-19 or similar pandemics. The project will use innovative data-driven, privacy-preserving approach to understand people flows, spatial occupancy and co-presence alongside spatial behavioural theories. A campus therefore becomes a “living lab” that can be dynamically re-designed to improve well-being. Different mobility patterns and information needs of everyday campus users can be captured using specialist sensors to detect people, groups, density in space and directions of movement. AI-based algorithms that can interpret this data will enable modelling of campus-relevant scenarios to support managers. This project will support other approaches such as “Track and Trace” apps. that are now widely used globally, along with on-campus testing services. Specialist sensors and human stewards can be used at identified on-campus hotspots for additional monitoring e.g. thermal scanners.</p> <p>Beneficiaries: Users and campus managers, healthcare professionals and city planners.</p> <p>12 month KPIs: 1. Instrumented campus environments (at least one within the duration of the project) 2. Demonstrator to show how people flow & movement influence campus design and 3. Data on people's perceptions of health risk and mobility on campus.</p> <p>Moving to markets: promotion of results with public and private partners that demonstrates the utility of a sensor and behaviour-led approach to mobility to reduce health risks. The sensors and development of scenarios for reimagining buildings and spaces will be of interest to design professional, Higher Education, Epidemiology/Healthcare & IT specialists.</p>	
12.	<p>What is ‘technological’ about your proposed solution and why might this be appropriate to the challenge areas?</p> <p><i>1000 character limit</i></p>	<p>This project has two technological aspects: (i) data capture and analysis using AI-based data stream processing; (ii) sensors able to instrument a campus to improve design and limit disease spread. This includes IR sensors able to detect people presence (preserving privacy) and direction of movement through key spaces (using time series data). The AI-based data stream processing algorithms would learn from the mobility patterns and combine it with social behavioural theory to predict future hotspots. Such hotspots can be identified as potential areas for close monitoring and management by campus administration. Data capture will be integrated with edge computing devices (e.g. combination of NVidia GPUs and Raspberry Pi nodes) which are located on campus (limiting how much data is transferred off-campus). Data regarding infected cases will be processed by edge devices located in proximity to the sensors. This will ensure sub-second response times, and timely action. Data from the sensors will be fed into a real time campus visualisation for facilities manager.</p>
13.	<p>Is your proposed solution a response to the impacts of COVID-19, or an effort to contain the pandemic? If so, please explain.</p> <p><i>1000 character limit</i></p>	<p>Higher Education (HE) institutions are potential Covid-19 hotspots because the staff and students from different parts of the city, nation (if not world) converge, occupy and move around shared space on campus. Potentials and</p>

		<p>limitations of on-line and limited on-campus activity, could result in negative learning experience and in some subjects (e.g. laboratory-based) impossible. For positive engagement small group teaching remains important. Developing new ways of teaching and opening the campus remains a challenge globally. As many HE campuses are integrated within urban areas and some may involve satellite sites spread throughout the city, this has wider impact on cities. Therefore, coordinating mobility campus is an important challenge to contain the pandemic among the student population, staff and neighbouring communities. Identifying the most widely used areas on campus, spaces with limitations on social distancing, and formal and informal use of space can also help position preventative and monitoring measures (e.g. thermal scanners).</p>
14.	<p>Does your proposed solution contribute to combatting climate change or promoting a greener planet? If so, please explain.</p> <p><i>1000 character limit</i></p>	<p>Covid-19 is forcing citizens, city planners and health professionals to think in new ways about mobility. For our project this has two important consequences for promoting a greener planet. First, we want to better understand student and staff perceptions of public and private forms of mobility in getting to the campus and how those may have changed because of Covid-19. This will have implications for campus redesign. For example, how might campus bus stops better promote social distancing to reduce people’s perceptions of risk? Second, on campus how can active mobility be encouraged while minimising health risks? This will involve sharing spaces between pedestrians and bicycles, redesigning cycle storage spaces and rethinking their locations. In this way, we can provide positive health and environmental messages to staff and students.</p>
15.	<p>How is your proposal relevant to the development challenges of India?</p> <p><i>1000 character limit</i></p>	<p>One of the strongest challenges that India faces in the Covid scenario is to find effective ways to resume and normalise operations of the education sector. Improved campus environments would address problems of severely restricted learning conditions for the vast youth population of India’s which if not addressed, would convert India’s demographic dividend to a liability. With a diverse range of educational campuses (almost 40000 colleges and over 900 universities) in small, medium and metropolitan cities as also the digital inequity that confronts our social reality, the need to create safe, accessible, productive environments of learning are paramount. The cyber-physical systems approach proposed here can be readily extended to other key development challenges in India</p>

		such as safety in public space, waste management. e.g. a system using smart bins and tracked waste collection vehicles once optimised would lead to less vehicle trips, reduction air pollution/congestion and cost of services.
16.	<p>What consideration have you made of gender in developing your concept? Could your project address gender inequality or other kinds of inequality?</p> <p><i>1000 character limit</i></p>	<p>Our project recognises and tries to address some of the gender inequalities amongst students and staff in their due to actual and perceived safety in campus as well as the differences in perception of health risks and mobility on campus. Urban space is highly gendered and so too we would expect campus space to be. The security of women in public spaces is an important public policy issue. The project will provide a better understanding of how women are using space on campus, their perceptions of safe and unsafe spaces, and how they adapt their mobility behaviour. We need to better understand how women (and men) perceive data on safety and health when redesigning campus spaces so that women are enabled to feel safer. It is important to provide equal and safe access to all educational infrastructure as it can have significant impact on academic performance and therefore future career and social mobility.</p>
<p><i>Notes:</i></p> <p><i>Please be kindly reminded of the primary criteria: relevance to the environmental and/or C19 agenda. See boxes 13 and 14.</i></p> <p><i>Except box 5, all boxes require mandatory response.</i></p> <p><i>In the interests of fairness, proposals that exceed the character limits will not be considered.</i></p>		