



IMPACT ASSESSMENT REPORT

GLOBAL CENTER OF EXCELLENCE

AFFORDABLE AND CLEAN ENERGY
PROJECT



PREPARED FOR:

Honeywell



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We will fail in our duties if we do not thank all the stakeholders, with our hands folded, for patiently withstanding the long interview sessions in all project locations.

Disclaimer: The images included in this report are sourced from fieldwork.

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List of Abbreviations, Tables and Images

Abbreviations

ACE	Affordable Clean Energy
GCoE	Global Centre of Excellence
IDI	In- Depth Interview
KII	Key Informant Interview

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Executive Summary

Background of the Study

India is rapidly expanding its renewable energy capacity, especially in solar and wind, to meet growing demands. Innovations in green energy technologies are crucial, and incubators like the Global Centre of Energy Excellence (GCoE) play a key role in accelerating their development and market readiness. During FY 2021-22, Honeywell Hometown Solutions supported the establishment of the Global Center of Excellence in Affordable and Clean Energy (GCoE-ACE) at IIT Dharwad and the Catalyse incubation program to foster clean energy innovation.

Assessment Objectives

- Evaluate the infrastructural support at IIT Dharwad and its impact on stakeholders.
- Assess the efficiency of upskilling and supportive structures implemented by HHSIF.
- Understand stakeholder perceptions and the effectiveness of Honeywell's intervention measures.

Research Design

The study employed a qualitative research approach to explore the activities, outputs, and outcomes of the intervention. A combination of purposive and snowball sampling was used. Seven In-Depth Interviews (IDIs) and two Key Informant Interviews (KIIs) were conducted with professors at IIT Dharwad who utilized the GCoE, and the implementation partner. Additionally, four IDIs were conducted with innovators involved in the Catalyse project. The data collection involved a mix of face-to-face and telephonic interviews.

Main Findings

The study evaluated the impact of the Global Center of Excellence (GCoE), the Catalyse incubation project, and stakeholder experiences.

GCoE Project: Supported by HHSIF, the GCoE significantly enhanced students' skills and awareness of green technologies **through 20 training sessions, benefiting over 1,500 students.** The center facilitated **rapid prototyping and hardware validation with advanced machinery and expert guidance** and contributed to research with three publications in progress. **Participants were highly satisfied with the infrastructure, and professors valued the flexibility in selecting machinery.**

Catalyse Project: The Catalyse initiative supported **17 clean energy innovations with expert guidance, technical and entrepreneurial upskilling, financial aid, and lab resources.** This support advanced product development, with participants praising the **training and expert support that boosted their hands-on knowledge and entrepreneurial skills.**

Key Recommendations:

- Expand the focus beyond solar energy to include wind and biomass energy.
- Prioritize entrepreneurial upskilling and market awareness alongside technical training to maximize the effectiveness of incubation programs.

These findings and recommendations aim to improve the implementation of future green energy innovation projects, ensuring wider impact and success.





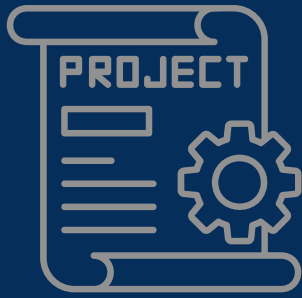
Introduction

India has experienced a surge in energy demand over the past 25 years due to its population growth and increased developmental activities. This rise in consumption has outpaced energy production and positioned India as the world's third-largest energy consumer by 2022. However, despite this high demand, over 80% of India's energy production is still reliant on three non-renewable resources: coal (58%), oil (27%), and natural gas (7%) (Sharma et.al, 2021).

This continued dependence on fossil fuels has led to elevated levels of greenhouse gas (GHG) emissions. To address these emissions while meeting the growing energy demand, India needs to triple its solar and wind capacity, aiming for over 500 GW in renewable power generation within the next decade (Verma, 2023).

Among renewable energy sources, solar energy holds the greatest potential, accounting for 68% of the total, followed by wind energy at 28%. However, significant technological advancements are necessary to fully harness these resources and increase their market penetration. This includes reducing costs and enhancing the performance of current technologies and those in early development stages. Furthermore, research has shown that it takes about 20-70 years for new energy technologies to progress from the prototype to achieving materiality (reaching 1% of a national market) (IEA, n.d).

The need for new technology and the time required for the market penetration of energy technologies underscores the importance of incubators like the Global Centre of Energy Excellence (GCoE). These incubators are essential for developing, nurturing, and scaling new technologies, which are crucial for advancing the renewable energy landscape in India.



Project Brief

Honeywell is a Fortune 500 technology company known for delivering industry-specific solutions worldwide. Through the Honeywell Hometown Solutions India Foundation (HHSIF), a not-for-profit organization, Honeywell implements its corporate social responsibility (CSR) initiatives across three key areas: education, skill & research, sustainability & community development, and humanitarian relief activities.

Under the umbrella of education and skill development, and with the mission of making affordable and clean energy a cornerstone of India's development, HHSIF supported the establishment of the Global Center of Excellence in Affordable and Clean Energy (GCoE-ACE) at IIT Dharwad in FY 2021-22. The GCoE-ACE was founded with the following primary objectives:



Platform Creation: To design and engineer affordable, energy-efficient, and renewable energy-powered products that enhance the lives of the underprivileged.



Adoption of Affordable Clean Energy (ACE): To systematically identify avenues for the widespread adoption of ACE to create better livelihood opportunities for the poor that are both socially and environmentally sustainable.



Innovation Mentorship and Incubation: To mentor and incubate innovative ideas with national and global relevance.



Energy Efficiency Improvement: To improve the efficiency of appliances that use on-grid energy.

In consultation with professors at IIT Dharwad, HHSIF planned to implement the project in three phases over three years (FY 2021-FY 2024), with the potential for an additional year at the company's discretion.



Phase 1: This phase focused on procuring equipment and establishing laboratories within the GCoE to support research and development (R&D) in affordable and clean energy and related technology domains. This included setting up a fabrication laboratory, a skill development laboratory, and an R&D laboratory.



Phase 2: In this phase, additional equipment was installed to further enhance the project's infrastructure, and the Catalyse project was officially launched. The Catalyse project is an incubation initiative where grassroots innovators from various colleges were invited to present their green innovations. From the ideas presented, approximately 24 solutions were shortlisted. The selected innovators received further upskilling and were evaluated for their potential to scale.



Phase 3: The final phase was intended to focus on incubating and scaling 17 selected solutions in the nearby Garag village, followed by an assessment of their impact on the lives of the beneficiaries.

To facilitate the program, HHSIF donated ₹2.4 crore in FY 2021-22 and ₹2.5 crore in FY 2022-23 to complete Phases 1 and 2 of the project. However, due to the inability of IIT Dharwad (the on-ground partner) to meet Phase 2 targets, both HHSIF and the on-ground partner have mutually agreed to discontinue Phase 3.



3. Research Objectives

GCoE-ACE played a critical role in advancing sustainable energy solutions supported by HHSIF. This study thus focused on the impact created by the Global Center of Excellence, particularly on the current and completed projects that have utilised its infrastructure. Additionally, the study examined the incubation project (catalyse) and its effectiveness in incubating and developing projects within the Global Center of Excellence. The major objectives of the study are as follows:

1. Infrastructural support and its Impact on Stakeholders

- To assess the alignment between project's objectives and broader goals, focusing on the infrastructural support and the impact it had on the long-term functioning of the institution.
- To examine the GCoE's staff experience with HHSIF and provide recommendations for future support.

2. Upskilling of Innovators and its impact

- To assess efficiency and efficacy of the training and other support structures received from IIT Dharwad in association with the HHSIF foundation.
- To further give recommendation on the project design and its support system.

3. Impact and Effectiveness:

- To understand the perceptions of various stakeholders regarding incubation project.
- To identify project strengths, weaknesses, and areas for enhancement to provide actionable recommendations for scalability and sustainability.



4. Research Design

4.1 Assessment Framework

KIRK Patrick Model

First developed by Donald Kirkpatrick in 1959, the Kirkpatrick model has four levels of evaluation is a widely recognized framework for evaluating the effectiveness of training and skill upgradation projects.

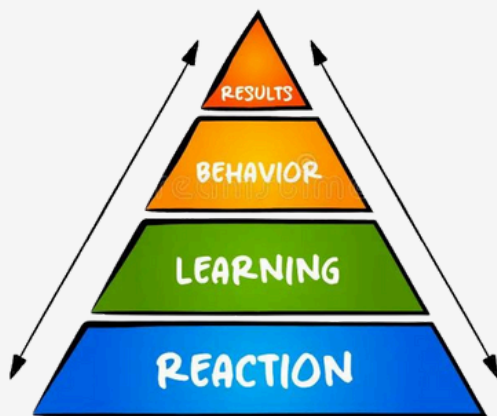


Figure 1: Kirk Patrick Model

- **Level 1: Reaction:** At this level, we measure the participants' experience of the upskilling and training project.
- **Level 2: Learning:** During this level, the knowledge upgradation, and upskilling that trainers have gained from the training project are assessed.
- **Level 3: Behaviour:** Examines how the participants have applied their learnings to product development.
- **Level 4: Results:** At this stage, we assess how the project has contributed to the overall development of the product/innovations (Kurt S, 2018)

4.2 Data Collection Techniques

A qualitative approach was chosen for data collection to gain deeper insights into the activities, outputs, and outcomes of the intervention. Qualitative methods provide a rich understanding of complex phenomena and help construct a comprehensive narrative of the implementation process and its impacts.

Secondary Data Collection

Secondary data collection involved reviewing various reports and documents created as part of the project. This included examining photographs, scientific articles related to energy consumption in India, acknowledgment and handover letters provided to the organisation, and annual reports from IIT Dharwad to HHSIF. These documents were then analysed to gain a deeper understanding of the area of intervention and implementation process. Post that, study was re-designed.

Primary Data Collection

Primary data collection was collected using qualitative methods like Key Informant Interviews (KIIs) and In-depth Interviews (IDIs) . Data was gathered from various stakeholders to assess the impact of the project intervention. In situations where face-to-face interviews with stakeholders and partners were not possible due to unavailability, the researcher explored the feasibility of conducting audio or video interviews virtually.

4.3 Sampling Plan

The study has employed purposive and snowball sampling methods for the sampling strategy.

4.4 Sample Size

Semi-structured interview schedules were developed to gather data from various stakeholders based on their involvement in the project. A total of 1 Key informant interview (KII) and 11 in-depth interviews were conducted, utilizing a combination of direct face-to-face interactions and telephonic interviews depending on the convenience of the participants.

NO.	PARTICIPANTS	DATA COLLECTION TOOLS	SAMPLE SIZE
1	Project Head (Professor)	Key Informant Interview	1
2	Professors	In-depth Interview	7
3	Innovators	In-depth Interview	4
4	Implementation Agency (HHSIF)	Key Informant Interview	1

Table 1 : Sample Size

4.5 Data Analysis

The data, including field notes, were thoroughly transcribed to ensure that no detail was overlooked. Key codes were identified and merged to exhibit dominant themes, using the Atlas Ti software. These prominent themes were then synthesized into key insights, which were subsequently aligned with the predetermined objectives of the study.

4.6 Data Quality Assurance

Fieldwork quality was maintained through a rigorous monitoring process. A senior researcher monitored the performance of data collection team to ensure accuracy and consistency. Necessary comments or corrections were provided promptly to improve data collection procedure.

4.7 Ethical Consideration

The study followed standard ethical guidelines for social research.

- Explicit consent was obtained from all participants before conducting interviews and recording their voices.
- For participants who did not consent to voice recordings, field notes were used as the main data source for analysis.
- Confidentiality was strictly maintained, protecting participants' identities and personal information.
- Participants were informed of their right to withdraw from the study at any time.

The research adhered to the UNICEF Procedure on Ethical Standards in Research, Evaluation, and Data Collection and Analysis (2021).

4.8 Limitations of the Study

Availability of Participants and Professors

The impact assessment was conducted two years after the project's implementation, which affected participant responsiveness. Over time, many of the innovators involved had moved out of IIT Dharwad after graduation, making it difficult to reach them and obtain their consent for participation in the study.

Lack of Connection with the Honeywell Team

There was a lack of awareness and engagement between the professors at IIT Dharwad with the implementation agency. As a result, these professors had minimal interaction with the Honeywell team, leading to gaps in their understanding of the project's details and objectives.



5. Findings

The findings are organised in three sections. The first section deals with the ongoing impact generated by the Global Center of Excellence (GCoE), focusing on its contributions to clean and green energy innovations. The second section explores the support systems and influence of the incubation project called Catalyse, highlighting its role in nurturing innovative solutions. Lastly, the third section focuses on the experiences of the various stakeholders involved in aforementioned initiatives.

5.1 Impact generated by GCOE Project

The Global Center of Excellence (GCoE) promotes green energy through R&D, education, and entrepreneurship, aligning with India's net-zero goals. Its solar innovations have transformed Garag village (near IIT Dharwad), improving infrastructure and reducing energy costs.

» **Upskilling and Awareness among Students:** Regular upskilling sessions have been conducted at the GCoE. The lecture series has covered a wide range of topics including **scaling techniques, emerging green technologies, communication skills, interview preparation, innovation, and design**, as well as embedded systems and VLSI training. **Workshops have also been held on building hardware such as power converters, sensors, and controllers.** Approximately **20 sessions were** conducted, benefiting around 1500 students. These sessions utilized the equipment in the lab to aid in the training process, and participation was open to students from other colleges as well. This inclusivity has provided many students with valuable hands-on experience.

“

We conducted upscaling projects on solar energy, communication skills, electronics, etc. Over two years, we organised around 20-25 projects, benefiting about 1,500 students.

(Project Head, IDI)

”

“

I was involved in embedded and VLSI-based training. It was complex but resulted in significant upskilling beyond standard training. Additionally, we offered training in introductory technologies, including solar and renewable energy, as well as in thermal energy management.

(Professor 7, IDI)

”

Accelerated Hardware Validation and Rapid Prototyping of Green Energy Technology:

The advanced machinery and the expertise of highly skilled professionals at the GCoE have enabled **faster hardware validation and rapid prototyping of green energy technologies by students with innovative ideas**. The Centre has accelerated the innovation process in the green energy sector providing students with motivation and practical experience needed to upgrade their products and solutions.

“

Devices developed here have been deployed directly within the Garak village. We have also conducted extensive training and upskilling of students. Additionally, we have engaged in significant outreach efforts, including talks and seminars, which greatly benefited the students. In terms of core research, our current project focuses on R&D in electric power. The center has a state-of-the-art Hardware-in-the-Loop (HIL) simulator, which accelerates the process of testing and designing and facilitates rapid control prototyping.

(Professor 7, IDI)

”

OUTPUT: The GCoE at IIT Dharwad has three publications in publication process, including wind turbine innovations and clean energy.

5.2 Influence of Incubation and Support provided to Students

The Catalyse project was launched as an incubation support initiative focused on affordable clean energy. This project was executed by Honeywell Hometown Solutions Information Limited (HHSIF) in partnership with IIT Dharwad and other organisations, initiated in FY 2021-22. The project involved visiting colleges and organising two kind of competitions:

1. Presenting problem ideas
2. Presenting prototypes of solutions.

Approx. 143 teams expressed interest and applied in these competitions. **After the initial screening, 17 presentations were selected. These innovators received training and access to lab facilities to facilitate the effective implementation of their projects.**

After training, students' incubated products were deployed in Garag village, in convergence with the Adarsh Sansad Gram Yojana policy transforming it into a smart village through renewable energy initiatives, improving device efficiency and local livelihoods.



Figure 2: Training on Solar technology

*Garag village was chosen for implementing the Catalyse project's products due to its proximity to IIT Dharwad and the involvement of the SELCO Foundation.

Specific Area of Support



Expert Opinions: Whenever innovators encountered challenges the project provided substantial support in the form of professional advice to aid product development. **Evaluation meetings were held every 2-3 months**, ensuring consistent product progress. and guidance to overcome the obstacles whenever students faced difficulties, professional support was readily available to help resolve issues.



Training and Upskilling Sessions: Regular training sessions were conducted as part of the project to enhance the skills of the innovators. **The primary focus of these sessions was on solar energy and related technologies. These sessions were held approximately every 1.5 to 2 months**, allowing for continuous upskilling of participants.



Financial Support: The project also provided financial assistance for product development and covered stipends and allowances for students. This funding helped resolve issues that arose during product implementation. The student stipends served as motivation, enabling them to focus on the project without the added burden of financial stress.



Infrastructural Support: The GCoE center, along with its advanced machinery and lab facilities, offered significant support to innovators and students in building prototypes. Innovators highlighted how access to these resources greatly facilitated their work. In instances where students lacked the skills for machine creation, they relied on local workshops for fabrication assistance

“

Incubation centre used to conduct training sessions on solar thermal and photovoltaic topics regularly for up-skilling of general engineering college students.

(Innovator 2, IDI)

”

Major Impact Areas

The effectiveness of the Catalyse Project can be evaluated using the four levels of this model: Reaction, Learning, Behaviour, and Results as stated in assessment framework earlier

Level	Impact Description	Stakeholder Voices
Reaction	Stakeholders have expressed their satisfaction with the Catalyse project , highlighting its positive impact on students' skills and experience. The training sessions were effective in improving the participants' knowledge, especially in renewable energy . Additionally, the financial support provided during the project accelerated the prototype development process , enhancing the overall student experience.	My students have had a lot of benefits, especially in terms of knowledge and experience in the renewable energy field. The training sessions have motivated them and they used to share their positive experiences with me. This was the main benefit. (Innovator 2, IDI)
Learning	The project enhanced students' communication skills, offering practical experience with renewable energy technologies and advanced instruments. Regular training sessions provided valuable exposure, while the incubation project fostered entrepreneurial skills. Students gained hands-on knowledge in material collection, marketing, and cost management, contributing to their overall professional development.	Normally, students learn renewable energy technology only in the fifth or seventh semester and mostly from books. But through this project, they gained real-world experience. They learned how solar technology works and familiarised themselves with instruments like solar radiation measurement tools and thermocouples. Few engineering colleges offer this kind of laboratory experience. (Innovator 2, IDI)

Levels	Impact Description	Stakeholder Voices
Behaviour	<p>The project gave students vital life skills that positively impacted their professional development. One participant noted how their involvement in the project improved their communication and demonstration abilities which have helped them majorly. Additionally, students gained financial management skills, learning how to handle project expenses and account for costs effectively. This newfound competency in managing money was invaluable for their future endeavors.</p>	<p>I used to be very introverted, but after joining the project, I improved my demonstrational skills and communication.</p> <p>(Innovator 3, IDI)</p>
Results	<p>The final stage of the evaluation assesses the overall impact and effectiveness of the Catalyse project in achieving its goals. The project delivered substantial benefits, particularly in aiding students to secure placements in leading companies, with many participants finding jobs in core engineering fields. Additionally, it helped participants improve their social skills, manage finances better, and build valuable connections within the green energy sector.</p> <p>Innovators also experienced significant progress, with product development advancing to bring their innovations closer to market readiness. All the products saw positive upgrades, inching towards commercialization. The project also contributed to the development of Garag village's infrastructure. Solar-powered systems created through the project were implemented in local businesses like barber shops and Khadi Gramodyog, showcasing a wider impact on the community's access to sustainable solutions.</p>	<p>All my students who have participated in this project have benefited. They have all got placement in very good companies. Because of this incubation project and the upskilling they have received, they have got placed in core companies with pretty good package.</p> <p>(Innovator 2, IDI)</p>

Table 2: Major Impact Areas as per Kirk Patrick Framework

Case Studies

This section provides two case studies of two products that have been part of the Catalyse incubation project. This section aims to give an idea of the nature of innovations that have been part of the catalyse project, the support systems and value addition that have been provided by Catalyse project, the way forward for these projects and the challenges they are facing

Solar Water Hyacinth Remover

Relevance of the Solution:

Water hyacinth (*Eichhornia crassipes*), originally from the Amazon Basin, has become a global invasive species, wreaking havoc on water ecosystems. This fast-growing weed is notorious for causing a range of ecological and economic problems:

- Biodiversity loss: Blocks sunlight, smothers native plants, and depletes oxygen levels in water.
- Waterway blockages: Hinders irrigation, commercial fishing, and recreational activities.
- Health risks: Creates breeding grounds for disease-carrying mosquitoes, leading to diseases like malaria, dengue, and encephalitis.
- Economic impacts: Obstructs waterways critical for local commerce and fishing industries (Pendse & Deshmukh, 2024).

Given its wide-reaching effects, an efficient and sustainable method to remove water hyacinth is crucial for improving biodiversity and maintaining waterway function.

Current Solutions:

Chemical removal: Hazardous to the environment and biodiversity.

Manual removal: Time-consuming, labor-intensive, and less effective, especially in large water bodies.

Advantages of the Solar Water Hyacinth Remover:

The Solar Water Hyacinth Remover offers a remote-operated, solar-powered solution, addressing the limitations of manual removal. Key advantages include:

- Reduced manual labor and contact: Remote operation allows for safer and more efficient removal without direct interaction with contaminated waters.
- Lower operational costs: Powered by solar energy, this solution reduces costs associated with fuel and labor.
- Eco-friendly: Avoids the use of harmful chemicals, making it a more sustainable solution for environmental cleanup.

Target Stakeholders:

Local fishermen, Government and local authorities, Environmental agencies

Support from the Catalyse project:

The Catalyse project has been instrumental in transforming the Solar Water Hyacinth Remover from a concept to a fully functional prototype. Key support mechanisms include:

- **Technical Support:** IIT Dharwad provided crucial guidance in innovation, design thinking, and prototype development. The team learned valuable skills in defining the problem, generating ideas, and creating and testing a prototype.
- **Financial Support:** Funds from the project supported the fabrication and development of the prototype, covering key expenses and reducing the financial burden on the innovators.
- **Workshops and Training:** Innovators participated in workshops that expanded their understanding of solar energy technologies. They were trained on device design, the potential for social energy systems, and the integration of renewable technologies, all of which played a vital role in advancing their project.

Current Stage and Future Journey:

The Solar Water Hyacinth Remover has a functional prototype, but the journey toward patenting the product and moving to commercialization is still ongoing.

Solar Bubble Dryer

The solar bubble dryer is designed to efficiently dry food grains using solar energy. It features a black-coated surface that absorbs heat, which is transferred to the air and circulated through blowers or fans. This model can regulate the drying temperature, allowing it to effectively dry large quantities of grains while ensuring optimal moisture removal.

Relevance of the Solution:

In India, up to 70% of food grains are stored using traditional methods that are vulnerable to moisture, pests, and spoilage. These methods result in an annual loss of around 14 million tonnes of grains. There is a clear need for innovative, affordable drying solutions that can reduce these losses while ensuring quality and selective temperature control during the drying process (Bisheko et al., 2023).

Current Solutions:

- **Traditional Drying Methods:** Many farmers still rely on sun drying, spreading crops under the sun. While inexpensive, it exposes crops to risks like rain, animals, and contamination.

- **Modern Mechanical Dryers:** Some farmers use expensive mechanical dryers powered by electricity, biomass, or combustion, but these are impractical for most small to medium farmers due to high costs.

Advantages of the Solar Dryer:

- **Protection from Elements:** Unlike sun drying, the solar dryer shields crops from rain, wind, and contamination.
- **Cost-Effective and Portable:** Designed for affordability and ease of transport, it offers a more accessible option for rural farmers.
- **Easy Operation:** With a solar-powered system that operates without constant monitoring, minimal training is needed.

Target Stakeholders:

Small and medium farmers, particularly those using traditional methods, stand to benefit the most from this technology.

Support from the Catalyse Project:

- **Instrumentation and Testing Support:** IIT Dharwad provided access to essential instruments like pyranometers to measure solar radiation and air velocity, aiding in the equipment's development.
- **Lab and Guidance:** The project received laboratory access and expert guidance for testing and optimization.
- **Funding:** Financial support from the Catalyse project, in collaboration with IIT Dharwad and Honeywell, was crucial for the product's development.

Challenges Faced:

- **Farmer Reluctance:** Farmers have been hesitant to adopt the solar dryer due to familiarity with sun drying, which is quicker, processing up to 1,000 kg daily, while the solar dryer takes longer (1.5-2 days).
- **Scaling:** Transitioning from a prototype to a full-scale model capable of drying larger quantities poses technical and financial difficulties.

Way Forward:

- **Scaling and Demonstration:** The plan is to develop a full-scale model and demonstrate it in five villages. Partnering with local authorities will be key in encouraging adoption.
- **Farmer Training and Awareness:** Educating farmers on the benefits of the solar dryer will be critical in overcoming reluctance and boosting adoption.
- **Potential Expansion:** If successful, the solar dryer could be expanded to more villages and possibly scaled for commercial use, provided it meets farmer and government expectations.

5.3 Stakeholder Experience

» Experience with Catalyse project

Stakeholders had a generally **positive experience with the Catalyse program**, despite some confusion and coordination issues from the on-ground partner's end. Innovators **appreciated the diversity of participants**, including those from colleges in Kerala, which enriched the project. The program's successful execution during the post-COVID period, despite mobility restrictions, was particularly commendable.

Participants highlighted the importance of the regular, **insightful training sessions, which were vital for both personal development and product enhancement**. The expert guidance provided throughout the project was also highly valued and impactful.

“

The training session related to solar panels has helped us a lot. It taught on how to select panels, how to do design of panels and what the size of and battery size, everything has helped a lot, my students have attended actually.

(Innovator 4, IDI)

”

» Experience with Infrastructure Provisioned at the IIT GCoE

Professors have expressed **strong satisfaction with the quality of the machines and infrastructure provided at the IIT Global Center of Excellence**. These advanced tools have played a critical role in enhancing training sessions, supporting research and development projects, and contributing to academic publications. Since the center's establishment, **these resources have been pivotal in fostering innovation and skill development among students and faculty**. The **infrastructure** has significantly **supported the research process**. Machines such as development boards and soldering stations have been widely used in prototype creation, while the spectro electrochemistry setups have aided in testing and improving the efficiency of anti-glare windows.

The center's compressor has supported various mechanical applications, and the 3D scanner has proved invaluable for creating prototypes and raising awareness about green technologies. Additionally, tools like the laser cutting machine and metal press shearing machine have been essential for precise fabrication and design work.

These machines have not only advanced research efforts but have also **provided students with hands-on experience in cutting-edge technology, contributing to the overall quality and impact of the center's projects and publications.**

Experience with HHSIF

Stakeholders expressed highly positive feedback regarding their collaboration with Honeywell and praised the significant support provided by the HHSIF team, especially given the tight deadlines during the project's implementation. **Professors appreciated the flexibility they were granted in selecting the machinery and setting up the Global Center of Excellence,** which allowed them to tailor the facility according to their needs.

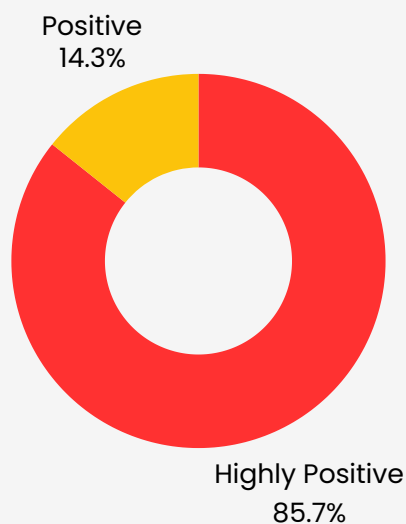


Figure 3 : Experience Rating by Professors

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We had full freedom to decide the best approach to set up the Global Center of Excellence facility. Honeywell gave us complete flexibility to design the GCoE structure and determine what components to add to the center. We deeply appreciate Honeywell for giving us that flexibility and freedom.

(Professor 7, IDI)

”

7 AFFORDABLE AND CLEAN ENERGY



Global Centre of Excellence primarily deals with awareness creation, capacity development, and promotion of Affordable Clean Energy. The center also promotes incubation and research support on Affordable Clean Energy.

5.4 Critical feedback from Stakeholders

While the implementation of the project has largely been positive, several areas could be improved to maximize its efficiency. Here are some key areas for improvement based stakeholder's feedback:

1. Lack of Clarity on Process and Project Flow: There was a lack of communication regarding the deliverables, timelines, and overall structure of the CSR process for GCoE. Professors unfamiliar with the CSR process faced challenges in understanding documentation and procedural requirements.

Similarly, there was a communication gap from IIT Dharwad regarding the discontinuation of the Catalyse program. This lack of communication created uncertainties among participants about the project's flow and closure process. The absence of a formal closure from IIT Dharwad led to documentation issues within the accounting systems of the innovators' respective organizations.

2. Patience and Time to Show Impact: Large-scale initiatives like the GCoE-ACE may take several years before their full impact becomes apparent. Suggestions have been made that expecting results within a year or two is unrealistic, with the real impact often visible after five years. Allowing a more extended period for impact assessment would better reflect the center's potential and contributions.



6. Recommendations

- **Expand Technological Focus beyond Solar Energy:** While the project has been successful as a green energy incubation center, it has predominantly concentrated on solar energy. Broadening the focus to include other renewable energy technologies such as biomass and wind energy could enhance the overall impact and would diversify the project's offerings and potentially increase its reach and effectiveness of the project.
- **Focus on Entrepreneurial Up-skilling:** In addition to technical training, it's crucial to provide robust entrepreneurial training to students. Many students, due to socio-economic and familial pressures, might shy away from pursuing entrepreneurial ventures after graduation. Integrating entrepreneurial skills training into the project would help students build the confidence and skills necessary to start their ventures.
- **Enhance Collaboration with Local MSMEs and Community Organizations:** A more collaborative approach involving local MSMEs and community organizations from the initial planning phase could improve the efficiency of the incubation process. Participants have faced challenges in finding vendors for fabrication and other tasks. By creating a network of reliable local MSMEs and community partners early in the process, the project could streamline operations, reduce delays, and enhance the overall experience for participants.

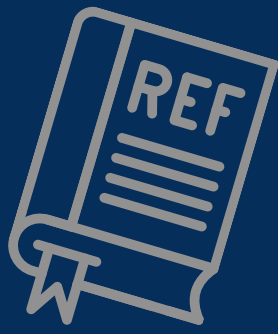


7. Conclusion

The Honeywell Hometown Solutions India Foundation (HHSIF) partnered with IIT Dharwad to establish the Global Center of Excellence (GCoE), with the primary objective of promoting clean and green energy technologies in India. Honeywell's key contribution to the GCoE was its financial assistance, which focused on infrastructure development necessary for the center's effective functioning. This support extended to the implementation of an incubation project (catalyse).

The GCoE's establishment in Karnataka has effectively addressed the region's lack of resources for green energy innovations. It has enhanced awareness and expanded the reach of green technologies through training sessions benefiting over 1,500 students. The center's advanced machinery supports rapid prototyping and hardware validation, with three publications in process. Integrating with the Sansad Adarsh Gram Yojana policy, GCoE has also facilitated the implementation of green technologies in local villages, boosting livelihoods and community technology.

The Catalyse Program, funded by HHSIF in collaboration with IIT Dharwad, successfully advanced 17 green innovations. The program provided continuous professional guidance, training, and financial assistance, crucial for product development and market readiness. This support enhanced participants' technical expertise and entrepreneurial skills. Despite some process-related challenges, stakeholders widely acknowledged the program's success. Participants valued the regular training sessions and the high quality of machinery and infrastructure provided. Professors appreciated the flexibility and strong support from the Honeywell team. Overall, the program has significantly impacted green energy innovation and awareness in the region.



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