Pre-Workshop Survey Form (MS Forms)

Introduction

Dear Participant,

It is my pleasure to invite you take part in this study. The study is a part of an ongoing PhD project entitled "Solar Active Cooling Integrated Facades". It is conducted by Hamza Hamida, a doctoral researcher at the Faculty of Architecture and the Built Environment, Delft University of Technology, Delft, the Netherlands.

This research project is supervised by Dr. Ing. Thaleia Konstantinou, Prof. Dr.-Ing. Ulrich Knaack, and Dr. Alejandro Prieto.

What is the purpose?

This survey aims to obtain the perspective of different stakeholders regarding the roles and responsibilities to design and develop solar cooling integrated facades. The targeted group of stakeholders includes the following:

1. Client Team: Owner, investor, and/or real estate/property developer.

2. Design Team: Design coordinator, architectural designer, façade designer, and/or consultant (Mechanical, Electrical and Plumbing (MEP), building physics, or facade consulting).

3. Construction Team: Contractor, subcontractor, supplier/manufacturer, and/or façade builder/assembler.

The survey will take 15 to 20 minutes, and it has the following three parts:

- Section (A): Informed Consent Form
- Section (B): General Information of the Participants
- Section (C): Main Questions

On behalf of the Architectural Facades and Products research group at TU Delft.

Kind regards,

Hamza Hamida

PhD Candidate

Architectural Façades & Products (AF&P) Research Group

Department of Architectural Engineering + Technology (AE+T)

Faculty of Architecture and the Built Environment (A+BE)

Delft University of Technology (TU Delft)

Email: H.B.Hamida@tudelft.nl

Survey Informed Consent Form (Section A)

• I have read and understood the study information. I have been able to ask questions about the study and my questions have been answered to my satisfaction.

• I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

• I understand that taking part in the study involves filling an online survey.

• I understand that the study will end within 15 to 20 minutes.

• I understand that risks related maintaining the confidentiality and privacy, including names of participants and their organizations, will be mitigated by the following actions:

1. Storing survey data on the TU Delft storage drive where it will has a restricted access only among the study team.

2. Names will be deleted after anonymization.

3. The use of Microsoft Forms platform provided by TU Delft will be used as much as possible.

• I understand that personal information collected about me that can identify me, such as emails, consent forms, and names, will not be shared beyond the study team.

• I understand that the (identifiable) personal data I provide will be destroyed at the end of the PhD project.

• I understand that after the research study the de-identified information I provide will be used for publications and academic purposes.

• I agree that my responses, views or other input can be quoted anonymously in research outputs.

• I give permission for the de-identified anonymized transcripts that I provide to be archived in 4TU.Reserch Data repository so it can be used for future research and learning.

• I understand that access to this repository is unrestricted.

- **I agree to all of the aforementioned points**

General Information of the Participants (Section B)

1. First Name

2. Last Name

3. What is your main educational and technical background? (You can choose more than one option)

[ ] Architecture
[ ] Building Physics
[ ] Civil Engineering
[ ] Mechanical Engineering
[ ] Electrical Engineering
[ ] Others: _____

4. What is your field of professional experiences in the building industry?

( ) Client Team: Owner, investor, and/or real estate/property developer.
( ) Design Team: Design coordinator, architectural designer, façade designer, and/or consultant (Mechanical, Electrical and Plumbing (MEP), building physics, or facade consulting).
( ) Construction Team: Contractor, subcontractor, supplier/manufacturer, and/or façade builder/assembler.

5. Based on the selected previous answer (client, design, or construction team), could you please provide your specific role within the selected team?

6. Professional years of experience

( ) Less than 5 years
( ) 5 to 10 years
( ) 11 to 15 years
( ) 16 to 20 years
( ) More than 20 years

7. In which countries have most of the projects you have worked on been located? (You can name between 1 and 4 countries)

8. Have you been involved in the design and/or construction of building facades?

( ) Yes
( ) No

9. Which of the following phases have you been involved in during the design or construction of building façades? (You can choose more than one option)

[ ] Design
[ ] Production
[ ] Installation (Assembly)
[ ] Maintenance/operation
[ ] None of the above, as I have not been involved in the design or construction of building façades

10. Have you worked on projects involving the application of solar technologies in buildings?

( ) Yes
( ) No

11. Which of the following technologies were used in projects that applied solar technologies in buildings? (You can choose more than one option)

[ ] Photovoltaics (PV)
[ ] Solar Thermal Collectors (STC)
[ ] Photovoltaic Thermal Collectors (PVT)
[ ] Others (_____)
[ ] None of the above, as I have not been involved in projects that applied solar technologies in buildings

12. Have you worked on projects involving the application of solar cooling technologies in buildings?

( ) Yes
( ) No

13. Which of the following technologies were used in projects that applied solar cooling technologies in buildings? (You can choose more than one option)

[ ] Electrically-driven systems (Photovoltaic (PV)-assisted vapor-compression air-conditioning equipment or Thermoelectric technologies)
[ ] Thermally-driven systems (Absorption, Adsorption, Desiccant, or Thermomechanical technologies)
[ ] Others (_____)
[ ] None of the above, as I have not been involved in projects that applied solar cooling technologies in buildings

14. Have you worked on projects involving façade integration of solar or solar cooling technologies?

( ) Yes
( ) No

15. Which of the following technologies were used in projects that integrated solar or solar cooling technologies into facades? (You can choose more than one option)

[ ] Photovoltaics (PV)
[ ] Solar Thermal Collectors (STC)
Photovoltaic Thermal Collectors (PVT)
[ ] Electrically-driven systems (Photovoltaic (PV)-assisted vapor-compression air-conditioning equipment or Thermoelectric technologies)
[ ] Thermally-driven systems (Absorption, Adsorption, Desiccant, or Thermomechanical technologies)
[ ] Others (_____)
[ ] None of the above, as I have not been involved in projects that integrated solar or solar cooling technologies into facades

Main Questions (Section C)

Solar cooling technologies utilize solar energy to produce either conditioned air or chilled water. These technologies are divided into two primary categories: those that generate hot water using Solar Thermal Collectors (STCs) and those that produce electricity using Photovoltaic (PV) panels. These categories represent two key approaches for converting solar energy into cooling effects: thermally driven processes and electrically driven processes. Electrically driven systems include PV-assisted vapor-compression air conditioners or thermoelectric systems, while thermally driven systems encompass methods such as absorption, adsorption, desiccant cooling, and thermomechanical processes.

Integrating components of solar cooling technologies into facades can be defined as building envelope systems that include elements using and/or controlling solar radiation to deliver self-sufficient solar renewable electric and/or thermal energy needed to generate cooling effect in a particular indoor environment.

In this research, a total of five main stages have been defined for designing and developing building façades that integrate solar cooling technologies. The following picture illustrates the main stages involved in designing and developing façade products that incorporate solar cooling technologies for office buildings. It highlights each stage along with its purpose and outcomes. Please note that these stages specifically relate to the design and development of façade products integrating solar cooling technologies for office buildings.

In the following section you will give your opinion on the roles and responsibilities of stakeholders within these stages.

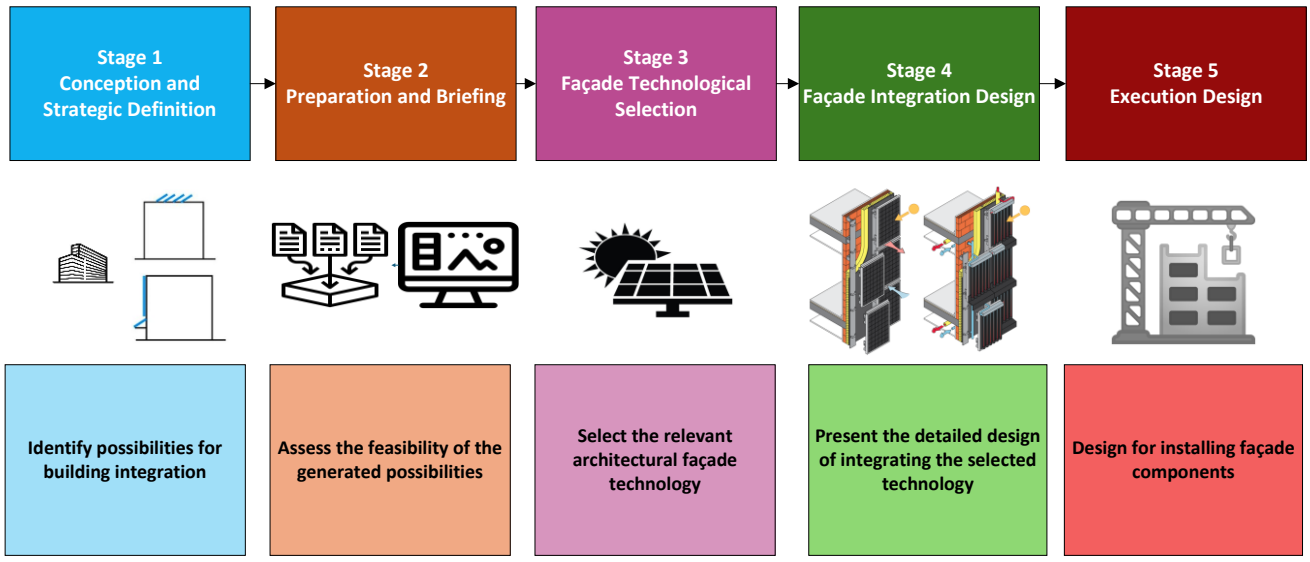

Figure 1: Design and development stages

Stage 1

Conception and Strategic Definition: Identify possibilities for building integration.

Based on your expertise, what role do you play in the conception and strategic definition stage? (You can choose more than one option)

[ ] Determination of project objectives and criteria
[ ] Define facade basic requirements
[ ] Obtain building permit
[ ] Determine functional requirements of façades
[ ] Assessment of energy performance and cooling demand
[ ] Determine relevant measures to optimize energy performance
[ ] Identify construction characteristics of the building envelope
[ ] Determine relevant solar cooling technologies
[ ] Identify available envelope possibilities for building integration: Rooftops and/or facades
[ ] Others (_____)
[ ] I have no role

Stage 1

Conception and Strategic Definition: Identify possibilities for building integration.

Based on the role you chose for Stage 1 (Conception and Strategic Definition), which of the following stakeholders do you interact with? (You may select more than one option.)

[ ] Owner, investor, and/or real estate/property developer (Client Team)
[ ] Design coordinator (Design Team)
[ ] Architectural designer (Design Team)
[ ] Façade designer (Design Team)
[ ] Consultants (Mechanical, Electrical and Plumbing (MEP), building physics, or facade consulting) (Design Team)
[ ] Suppliers/manufacturers (Construction Team)
[ ] Façade builders/assemblers (Construction Team)
[ ] Contractors (Construction Team)
[ ] Others (_____)
[ ] I do not interact with stakeholders because I have no role

Stage 2

Preparation and Briefing: Assess the feasibility of the generated possibilities.

Based on your expertise, what role do you play in the preparation and briefing stage? (You can choose more than one option)

[ ] Assessment of pre-technical feasibility by determine available envelope possibilities meeting cooling demand
[ ] Evaluation of how the technology can be integrated and operated
[ ] Assessment of economic viability
[ ] Others (_____)
[ ] I have no role

Stage 2

Preparation and Briefing: Assess the feasibility of the generated possibilities.
Based on the role you chose for Stage 2 (Preparation and Briefing), which of the following stakeholders do you interact with? (You may select more than one option.)

[ ] Owner, investor, and/or real estate/property developer (Client Team)
[ ] Design coordinator (Design Team)
[ ] Architectural designer (Design Team)
[ ] Façade designer (Design Team)
[ ] Consultants (Mechanical, Electrical and Plumbing (MEP), building physics, or facade consulting) (Design Team)
[ ] Suppliers/manufacturers (Construction Team)
[ ] Façade builders/assemblers (Construction Team)
[ ] Contractors (Construction Team)
[ ] Others (_____)
[ ] I do not interact with stakeholders because I have no role

Stage 3

Façade Technological Selection: Select the relevant architectural façade technology.

Based on your expertise, what role do you play in the façade technological selection stage? (You can choose more than one option)

[ ] Summarization of techno-economic feasibilities
[ ] Selection of architectural façade technology and agreement on products
[ ] Others (_____)
[ ] I have no role

Stage 3

Façade Technological Selection: Select the relevant architectural façade technology.

Based on the role you chose for Stage 3 (Façade Technological Selection), which of the following stakeholders do you interact with? (You may select more than one option.)

[ ] Owner, investor, and/or real estate/property developer (Client Team)
[ ] Design coordinator (Design Team)
[ ] Architectural designer (Design Team)
[ ] Façade designer (Design Team)
[ ] Consultants (Mechanical, Electrical and Plumbing (MEP), building physics, or facade consulting) (Design Team)
[ ] Suppliers/manufacturers (Construction Team)
[ ] Façade builders/assemblers (Construction Team)
[ ] Contractors (Construction Team)
[ ] Others (_____)
[ ] I do not interact with stakeholders because I have no role

Stage 4

Façade Integration Design: Present the detailed design of integrating the selected technology.

Based on your expertise, what role do you play in the façade integration design stage? (You can choose more than one option)

[ ] Determination of characteristics of key elements
[ ] Identification of means of connections according to the standards
[ ] Demonstration of detailed design
[ ] Others (_____)
[ ] I have no role

Stage 4

Façade Integration Design: Present the detailed design of integrating the selected technology.

Based on the role you chose for Stage 4 (Façade Integration Design), which of the following stakeholders do you interact with? (You may select more than one option.)

[ ] Owner, investor, and/or real estate/property developer (Client Team)
[ ] Design coordinator (Design Team)
[ ] Architectural designer (Design Team)
[ ] Façade designer (Design Team)
[ ] Consultants (Mechanical, Electrical and Plumbing (MEP), building physics, or facade consulting) (Design Team)
[ ] Suppliers/manufacturers (Construction Team)
[ ] Façade builders/assemblers (Construction Team)
[ ] Contractors (Construction Team)
[ ] Others (_____)
[ ] I do not interact with stakeholders because I have no role

Stage 5
Execution Design: Design for installing façade components.
Based on your expertise, what role do you play in the execution stage? (You can choose more than one option)

[ ] Identifying potential missing elements in tendering documents
[ ] Spatial coordination of architectural and engineering information
[ ] Approve the final design
[ ] Production and assembly design
[ ] Determine installation techniques of the façade system
[ ] Project planning and scheduling
[ ] Others (_____)
[ ] I have no role

Stage 5
Execution Design: Design for installing façade components.
Based on the role you chose for Stage 5 (Execution), which of the following stakeholders do you interact with? (You may select more than one option.)

[ ] Owner, investor, and/or real estate/property developer (Client Team)
[ ] Design coordinator (Design Team)
[ ] Architectural designer (Design Team)
[ ] Façade designer (Design Team)
[ ] Consultants (Mechanical, Electrical and Plumbing (MEP), building physics, or facade consulting) (Design Team)
[ ] Suppliers/manufacturers (Construction Team)
[ ] Façade builders/assemblers (Construction Team)
[ ] Contractors (Construction Team)
[ ] Others (_____)
[ ] I do not interact with stakeholders because I have no role