Human Factors Consideration for the

Sheila Scott Digital Twin Pilot

# Interview and Observation Addendum

An Interactive Qualifying Project submitted to the Faculty of

WORCESTER POLYTECHNIC INSTITUTE

in partial fulfilment of the requirements for the

Degree of Bachelor of Science

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This report represents the work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review.

## Appendix D: Informed Consent Form

Introduction

The purpose of this appendix is to present the informed consent form and text that will be used for both individual and focus group interviews.

Informed Consent

Thank you for agreeing to be interviewed as a part of our project. This informed consent form is to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. The purpose of this research is to gather more information about the building users and managers for the Sheila Scott building to help determine potential improvements for the management and use of Sheila Scott. Below we further describe the purpose of this research and what you can expect in the interview:

We are a four-student project team from Worcester Polytechnic Institute, which is a college in Massachusetts, USA; our names are Yutai Han, Ryan Kievra, Emily Raynowska, and Emma Smith. The purpose of this research is to help the University of Worcester and CPW gain insight into the human side of building management and building usage; this knowledge will be used to guide energy-saving measures in the Sheila Scott building.

Interview Expectations/Your Participation:

* This interview will take roughly 45 minutes. The interview will be recorded via audio.
* Notes will be taken by those conducting the interview.
	+ These notes will be made available to you at the end of the interview in order for you to ensure that the information is accurate.
* These notes will be analysed by the student project team and will be made available to the collaborators/sponsors of this project (Faculty/Staff from Worcester Polytechnic Institute & the University of Worcester).
* The information will appear in the research report, which is published by Worcester Polytechnic Institute. Your name will **NOT** be used in the final report, but your position may be indicated.
* If you have questions about this research, would like to withdraw from the study, or would like to read our final report, you may contact us at gr-uk22-dt@wpi.edu and our advisors at fjlooft@wpi.edu / lclooft@wpi.edu.
	+ This project team consists of Yutai Han, Ryan Kievra, Emily Raynowska, and Emma Smith. They are student researchers from Worcester Polytechnic Institute (Worcester, Massachusetts, USA).
	+ The advisors are Profs. Linda C. Looft and Fred J. Looft; they are professors from Worcester Polytechnic Institute.
* If you have any questions about the review process for this research, please contact Worcester Polytechnic Institute’s Institutional Review Board at irb@wpi.edu.

Information From Participant:

* I also understand that the information I share may be included in a research report. I may be identified by my position but my name or contact information will not be included.

By verbal agreement, I agree that;

1. I have read this information sheet and understand the nature of this research and how the interview will be run;
2. I am voluntarily taking part. I understand that I can stop the interview at any time and/or decline to answer any question;
3. I don’t expect to receive any benefit or payment for my participation;
4. I understand that I am free to contact the researcher with any questions I may have in the future or to request a final copy of the report.

**Contact Information**

If you have any further questions or concerns about this project, please contact:

Digital Twin Student Project Team

Members: Yutai Han, Ryan Kievra, Emily Raynowska, and Emma Smith

Email: gr-uk22-dt@wpi.edu

You can also contact our advisors:

Names: Linda C. Looft and Fred J. Looft

Emails: lclooft@wpi.edu and fjlooft@wpi.edu

Contact Worcester Polytechnic Institute’s Institutional Review Board:

Email: irb@wpi.edu

## Appendix E: Interview Questions for Instructors in the Sheila Scott

Introduction:

This appendix covers the questions that will be asked to the instructors that participate in an interview.

*The goal of this interview is to gather information regarding how instructors interact with the Sheila Scott building.*

Preamble:

We are students from Worcester Polytechnic Institute, a university in Massachusetts, USA. We are collaborating with the University of Worcester and CPW to identify ways to save energy in the Sheila Scott building. We are very grateful that you are taking the time to answer these questions. Your participation in this interview is voluntary, and you may end the interview at any point in time or skip any questions. This interview will last approximately 45 minutes.

We will use the information collected from this interview in our final report, which will be published by Worcester Polytechnic Institute. This report will also be shared with the University of Worcester and CPW, as they will be using the results to determine the best course of action for energy saving measures with Sheila Scott. The information will be collected via recording the audio of the interview and note-taking. You will be given the chance to review the information from this interview at the end to ensure that the information is accurate. Do you have any questions about the information on the informed consent form? Do you consent to participate in this research? Do you have any questions for us prior to starting this interview?

Interview Questions

Could you please state your name and position title?

What do you do day-to-day at your job?

What makes a room or environment on the campus comfortable to you?

The University of Worcester seeks to provide comfortable conditions in which to work and study. Are you aware of the university’s comfort policy?

Do you have access to thermostats? Radiators? AC units?

How often do you find yourself opening windows?

What room(s) do you utilise the most for your instruction?

Are you comfortable in the rooms where you instruct in regards to humidity, temperature and light?

What improvements to the Sheila Scott building would you recommend?

## Appendix F: Survey for Students in the Sheila Scott Building

Introduction:

This appendix covers the questions that will be asked to the students that have classes in the Sheila Scott building.

*The goal of this interview is to gather information regarding how students interact with the Sheila Scott building.*

Sheila Scott Student Survey

Preamble:

Hello,

We are students from Worcester Polytechnic Institute, a university in Massachusetts, USA. We are collaborating with the University of Worcester and CPW to identify ways to save energy in the Sheila Scott building. We are very grateful that you are taking the time to answer these questions. Your participation in this survey is voluntary, and you may skip any questions. This survey should take approximately 5-10 minutes to complete.

If you have any questions or would like to be made aware of the results of our survey, you can contact us at gr-uk22-dt@wpi.edu. Participating in this study may not help you directly, however it will help us learn valuable information about your usage and interactions within the Sheila Scott building. This information you share through this survey will be published, however your personal information will be kept confidential.

Thank you for your participation.

Sincerely,

Digital Twin Project Team

Yutai Han, Ryan Kievra, Emily Raynowska, and Emma Smith

Demographics

1. What is your area of study?

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Quick Questions

1. What makes a room on campus comfortable for you? (Select all that apply)

*Check all that apply.*

* Temperature
* Furniture
* Access to food and drink
* Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
1. Which of these things in the Sheila Scott building do you have access to? (Select all that apply)

*Check all that apply.*

* Thermostat
* Radiators
* Air Conditioning Units
* I don’t know
1. The University of Worcester seeks to provide comfortable conditions to work and study. Are you aware of the university’s comfort policy?

*Mark only one.*

* Yes
* Maybe
* No
1. Are you comfortable in the rooms you use, in Sheila Scott, in regard to humidity, temperature, and light?

*Mark only one.*

* Yes
* Maybe
* No

Longer Question

1. What improvements to the Sheila Scott building would you recommend?

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Focus Groups

1. Would you like to be contacted in the near future about participation in a focus group related to our study?

*Mark only one.*

* Yes
* No
1. If you answered Yes to the above question, please include your email address here.

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## Appendix G: Interview Questions for Estates University Staff

Introduction:

The purpose of this appendix is to present a sample of interview questions that will be used for the individual interviews with employees of the Estates Staff Team.

*The goal of speaking to the Estates/Facilities Team is to get an idea as to how the building is managed from a facilities perspective, specifically with assets, space, and energy usage. The questions will depend on the person’s job functions and duties.*

Preamble:

See Appendix E

Interview Questions:

What is your name, job function, and job title?

What do you do day-to-day at your job?

Are you an “on-call” staff?

Can you explain the workflow process for maintenance requests?

Is there a level of priority for these requests?

In case of an emergency request, are there tradespeople “on-call”?

We are aware that Sheila Scott was not a purpose-built university building, are there any unique challenges or frequent issues because of that?

As far as you could recall, what are some of the regular maintenance items for Sheila Scott?

Are you an active user of the Archibus system?

To what capacity?

We are actively assisting Simon Dutton (Facilities) with the integration of newly procured modules of Archibus, the data stream from the Digital Twin Pilot could potentially benefit the Archibus system. What benefit do you see that would benefit maintenance?

What kind of preventive maintenance do you see that could be done?

What are some other potential benefits you see from live data being fed into Archibus?

What do you hope to see out of this digital twin?

Do you foresee any issues or limitations of the digital twin?

## Appendix H: Interview Questions for University Timetabling Staff

Introduction:

The purpose of this appendix is to present a sample of interview questions that will be used for the individual interviews with employees of the Timetabling Staff Team.

*The goal of interviewing the Timetabling Team is to gain insight into how the majority of campus buildings are managed from a scheduling perspective. The Timetabling Team does the scheduling for classes and meetings for faculty and students.*

Preamble:

See Appendix E

Interview Questions:

What is your name, job function, and job title?

What do you do day-to-day at your job?

Can you explain the timetabling process for the buildings on campus? For meetings? For Classes?

What programs or software do you use?

How do students and staff book rooms?

Is there a way these two systems interact or communicate?

Does one overrule the other?

If so, does the other party get informed of this?

What would be your ideal timetabling system for the university?

How is room usage/capacity determined?

How is it being monitored?

How do you determine what rooms specific classes require?

Is it normal for classes to be cancelled or rescheduled prior to Easter break?

## Appendix I: Interview Questions for Clinical Skills Technicians

Introduction:

The purpose of this appendix is to present a sample of interview questions that will be used for the group interview with employees of the Clinical Technicians Team.

*The goal of interviewing the Clinical Skills Technicians is to gain insight into how Sheila Scott is managed, specifically from an academic perspective. The Clinical Technicians do the timetabling for the building, and they help set up the rooms for the needs of the instructor.*

Preamble:

See Appendix E

Interview Questions:

What is your name, job function, and job title?

What do you do day-to-day at your job?

Could you explain the timetabling process for the Sheila Scott building?

What are your current steps to timetabling the building? (including room confirmation)

Are there any ways you can think of to improve the current timetabling system for Sheila Scott, with the understanding that you all have tried many different ways to do so?

What other timetabling techniques have you tried already?

How is room usage and capacity determined?

Do you have access to building controls?

Do you find yourselves having to change the heat?

Do you have to change heating for specific classes?

What is the flow of traffic into and out of the building?

## Appendix J: Questions for Information Technology Staff

Introduction:

The purpose of this appendix is to present a sample of interview questions that will be used for the individual interviews with employees of the Information Technology Staff Team.

*The goal of interviewing the Information Technology staff is to gain their insight about how implementation of a digital twin would benefit their department, as well as gain insight into the implementation steps on their end. The Information Technology staff are involved heavily in the technological needs of those on campus.*

Preamble:

See Appendix E

Interview Questions:

What is your name, job function, and job title?

What do you do day-to-day at your job?

How much do you know about the ongoing digital twin implementation project?

How involved have you been in the implementation of the digital twin?

What potential benefits or drawbacks do you see regarding the implementation of the digital twin?

What is your role in data management of buildings?

Do certain people manage the entire estate or different areas of the estate.

How often do you use Archibus?

Any other sensors with Wi-Fi?

Let’s say you put in a new BMS, what’s IT’s department?

Does IT have to be present if estates adds a sensor to a building?

## Appendix K: Observation Tracking Form

Introduction:

The purpose of this appendix is to present the form used to track the observations of the Sheila Scott building, which provided the team with the necessary information to report on Sheila Scott’s usage.

*The goal of observing the Sheila Scott building is to gather quantitative data about the utilisation of the building by both lecturers and students.*

Observation Tracking Form

General Information

1. Who is observing?

*Mark only one.*

* Emma
* Emily
* Yutai
* Ryan
1. Room # being observed?

*Mark only one.*

* SS006
* SS007
* SS008
* SS011
* SS012
* SS013
* SS014
* SS015
* SS020
* SS021
1. What is the date of the observation?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Example: April 16th, 2022*

1. When did the observation occur?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Example: 9:45 PM*

Data

1. How many windows are open?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How many emergency exit doors are open?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the room capacity right now?

*Mark only one.*

* Over Crowded
* Just Right
* Under Occupied
* Empty
1. Are people dressed for spring (shorts and light jackets) or winter (many layers and heavy coats) weather?

*Mark only one.*

* Spring
* Winter
1. What is the temperature outside?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Any other observations?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_