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**Appendix A:**

**Table AII Binary Interaction Matrix**

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15
B1	-	1	0	0	1	0	0	0	1*	0	0	0	0	0	0
B2	0	-	0	0	0	0	0	0	1	1	0	0	0	0	0
B3	0	0	-	0	0	1	1	0	0	0	0	0	0	0	0
B4	0	0	0	-	0	0	1	0	0	0	0	0	0	0	1
B5	0	0	0	0	-	0	0	0	0	1	1	0	0	0	0
B6	0	0	0	0	0	-	0	0	0	0	0	0	1	1	0
B7	0	0	0	0	0	0	-	0	0	0	0	0	1	1	0
B8	1	0	0	0	0	0	0	-	0	0	0	1	0	0	0
B9	0	0	1*	0	0	0	0	0	-	1*	0	0	0	0	0
B10	0	0	1	1	0	0	0	0	0	-	1	0	0	0	0
B11	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0
B12	0	1	0	0	1	0	0	0	0	0	0	-	0	0	0
B13	0	0	0	0	0	0	0	0	0	0	0	0	-	1	0
B14	0	0	0	0	0	0	0	0	0	0	0	0	1	-	0
B15	0	0	0	0	0	0	0	0	0	0	0	0	1	1	-

**Table AIII INTERPRETIVE MATRIX**



	B1	B2	B3	B4	B5
B15	—	—	—	—	—
B14	Segregation is required to know the	Due to cost involved in Incineration	—	—	—
B13	Due to the cost involved in Segregation and	Lack of subsidy and infrastructure provided by	—	—	—
B12	—	—	Lack of subsidy and infrastructure	—	—
B11	—	—	—	—	Lack of awareness about requirement of coordin
B10	—	—	—	Smart waste management tools required	—
B9	—	—	—	—	—
B8	—	—	—	—	—
B7	—	—	—	—	—
B6	—	—	—	—	—
B5	—	—	—	—	—
B4	—	—	—	—	Lack of safety strategies and
B3	—	—	—	Trained staffs required to handle	Due to more cost will involve with more
B2	—	—	—	—	—



<b>B3</b>	—	—	—	—	—
<b>B2</b>	—	Lack of knowledge about safety meas	—	—	—
<b>B1</b>	—	—	—	—	—
	<b>B11</b>	<b>B12</b>	<b>B13</b>	<b>B14</b>	<b>B15</b>

B1: Low awareness on HCWM, B2: No Proper training and workshops B3: Less number of working Staffs, B4: Lack of Bins B5: No support from top authorities B6: No separation and collection center B7: Not availability of incineration Plant, B8: No support from the government, B9:Less number of availability of tools, B10: Rigidity with their old thinking, B11: Lack of coordination between authorities, B12: Less priority to HCWM, B13: Less implementation of disinfectant techniques, B14: No information about waste quantity, B15: Less number of Recycling centers.

## Appendix B:

### A Survey to find barriers in health care waste management sector:

Dear Respondent.

I am pursuing my PhD degree at the Department of Mechanical Engineering; IIT (BHU), Varanasi. The purpose of this questionnaire is to gather data on current health care waste management practice and barriers to proper implementation of health care waste management practices in government and private nursing homes and hospitals. The study is purely for academic purposes and thus not affects you in any case. So, your genuine, frank and timely response is vital for the success of the study. Therefore, I kindly request you to respond to each item of the question very carefully.

The information such gathered shall only be used for academic research in an aggregate manner and all information given by you will kept confidential.

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### Demographic Information

Hospital name-.....

Area Name.....

1) Qualification:

- |            |                          |                    |                          |
|------------|--------------------------|--------------------|--------------------------|
| a) Tenth   | <input type="checkbox"/> | b) b) Intermediate | <input type="checkbox"/> |
| c) Diploma | <input type="checkbox"/> | d) d) Graduation   | <input type="checkbox"/> |

2) Type of Hospital:

- |                               |                          |                                  |                          |
|-------------------------------|--------------------------|----------------------------------|--------------------------|
| a) Govt. Hospital             | <input type="checkbox"/> | b) b)Small Size Private Hospital | <input type="checkbox"/> |
| c)Large Size Private Hospital | <input type="checkbox"/> | d) d) Other Clinics              | <input type="checkbox"/> |

3) Job title:

- |                      |                          |              |                          |
|----------------------|--------------------------|--------------|--------------------------|
| a) Doctor            | <input type="checkbox"/> | b) Nurse     | <input type="checkbox"/> |
| c) Medical Assistant | <input type="checkbox"/> | d) d) Helper | <input type="checkbox"/> |

4) Years stayed at the organization:

- a) Under 2 years       b) 2–5 years   
 c) 6–10 years       d) over 10 years

Your department/work unit \_\_\_\_\_

With regard to Health care waste management practices of your firm, please tick (√) in the appropriate box for extent to which you agree or disagree with each statement.

**The Barrier scales are seven-point Likert type scales with**

1-strongly disagree 2- disagree 3-somwhat disagree 4-nuetral 5-somewhat agree 6-agree 7-strongly agree

	<b>Barriers</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>1.</b>	Do not have proper knowledge about bad impacts of Health care waste on Society.							
<b>2.</b>	Do not have Training of how to handle health care waste							
<b>3.</b>	Insufficient staffs are working in health care waste Management							
<b>4.</b>	Segregation bins are not available for different types of wastes.							
<b>5.</b>	Lack of support from top management towards health care waste management							

<b>6.</b>	There is no place for segregation and temporary storage of health care waste.							
<b>7.</b>	There is no Incineration plant not within the Hospital.							
<b>8.</b>	There is no any type of Government support and policies.							
<b>9.</b>	There is no tools and precautions to handle health care waste.							
<b>10</b> ·	People do not like to change their mind.							
<b>11</b> ·	Lack of Coordination between municipalities, Pollution control board and hospital authorities.							
<b>12</b> ·	Lesser Prioritization to Waste Management issues in policies of Health Care Units							

<b>13</b> •	Lack of strict implementation of infection control measures like sterilization and disinfectant techniques.								
<b>14</b> •	No adequate information regarding waste quantity and compositions								
<b>15</b> •	Not the availability of recycling centers.								
<b>16</b> •	No Regular Monitoring of Health care waste Management.								
<b>17</b> •	No HR department in hospitals								
<b>18</b> •	Lack of smart waste management techniques.								

**Appendix C:**

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15
B1	0														
B2		0													
B3			0												
B4				0											
B5					0										
B6						0									
B7							0								
B8								0							
B9									0						
B10										0					
B11											0				
B12												0			
B13													0		
B14														0	
B15															0

B1: Lack of awareness

B2: Lack of Training

B3: Insufficient staff working in HCWM

B4: Unavailability of segregation bins

B5: Lack of segregation personnel

B6: No Segregation and Collection center

B7: Incineration plant not within the Hospital

B8: No Financial Support from Government

B9: High Disposal cost

B10: Lack of handling tools and precautions

B11: Reluctance to change and adoption

B12: Lack of coordination between municipality, Pollution Control Board and hospital authorities

B13: Lesser Prioritization to Waste Management issues in policies of Health Care Units

B14: No adequate information regarding waste quantity and compositions.

B15: Lack of Recycling Centers

0= No influence

1= Low Influence

2= Medium Influence

3= High Influence

4= Very High Influence

### **List Of Papers Published/Accepted for Publication:**

- **Raj, A.** and Samuel, C. (2022) “Application of total interpretive structural modeling (TISM) for analysis of barriers influencing Healthcare Waste Management Sector: A Case Study”, International Journal of Healthcare Management.

**DOI:** 10.1080/20479700.2022.2114734

- **Raj, A.** and Samuel, C. (2022) “Identifying and Evaluating barriers for healthcare waste management: An Integrated Approach”, International Journal of Productivity and Quality Management.

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- **Raj, A.** and Samuel, C. (2021) “A Study of Barriers in Healthcare Waste Management Sector”, International Journal of Environment and Waste Management.

**DOI:** 10.1504/IJEW.2023.10038700

- **Raj, A.,** Samuel, C. and Singh, A. (2023) “Addressing the Healthcare Waste management barriers: A Structural Equation Modeling Approach”, Health Services Management Research.

**DOI:** <https://doi.org/10.1177/09514848231186775>

### **Manuscript Under Review**

- **Raj, A.** and Samuel, C. (2022) “Assessing and Overcoming the barriers for Healthcare Waste Management in India: An Integrated AHP and fuzzy TOPSIS approach”, Journal of Health Organization and Management.