

Living Walls in the Built Environment



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DENVER, CO

**YOUNG AND EMERGING PROFESSIONALS
PANEL**

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What is a Living Wall?



- An *interior* vertical surface covered with live vegetation that may or may not be integrated with the building's mechanical air distribution system.



What is a Living Wall?



What is a Living Wall?



Elevated Landscape Technologies

What is a Living Wall?



Patrick Blanc



Purpose of Research Study



- **Primary Intent**

- Provide a better understanding of how decisions have been made regarding the installation of living walls
- Disseminate the information gathered to promote use of living walls

Purpose of Research Study



- **Supporting purposes**
 - Summarize benefits of natural elements (especially plants and living walls)
 - Describe current status of living walls
 - Provide recommendations for further research

Research Questions



- 1) Given the positive contributions that living wall systems can make to overall indoor environmental quality, why are they not currently being used more in buildings?
- 2) How have designers and owners made decisions on whether to incorporate living walls into their buildings?

Limitations



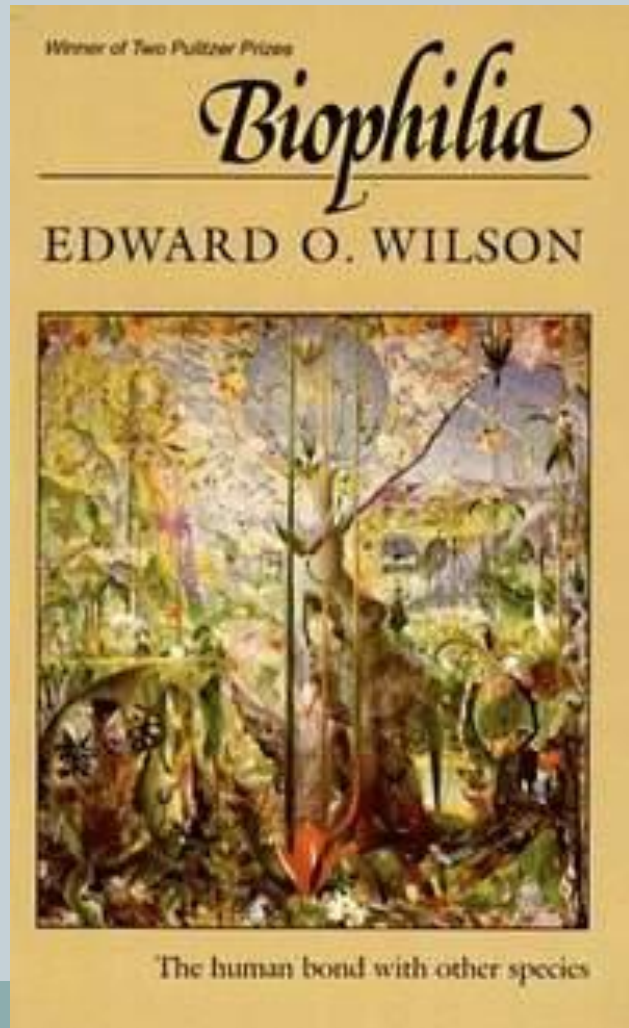
- Not a common technology
 - Not many installations to choose from as samples
- Geographic
- Study specific to interior living walls

Review of Relevant Literature



- Psychological well-being
- Physical health
- Current status of living walls

Psychological Well Being



- “The innate [human] tendency to focus on life and lifelike processes.”

-Edward Wilson, 1984
- Inherent love of nature and need to associate with other life forms and natural processes

Psychological Well Being



- Savannah hypothesis







Image from: <http://wtcampaigns.wordpress.com/2009/08/20/its-a-bit-like-la-law-this-week/>



Psychological Well Being



- Studies show that natural elements can:
 - Decrease stress & frustration
 - Decrease aggression and crime rates
 - Reduce hospital patients' recovery time
 - Increase overall happiness and well-being
 - Increase productivity
 - Indirectly decrease overall environmental impact



Physical Health



- **Indoor air pollution**
 - Energy crisis of 1970s
 - Sick Building Syndrome
- **Pollutants**
 - Volatile organic compounds (VOCs)
 - Combustion gases
 - Bioeffluents
 - Tobacco smoke
 - Soil gases



Physical Health



- **Indoor environmental quality affects:**
 - Illness
 - Absenteeism
 - Worker productivity
- **Worker salaries make up 35 - 40% of most companies' budgets**
 - Environmental quality can improve productivity and therefore increase profitability

Physical Health



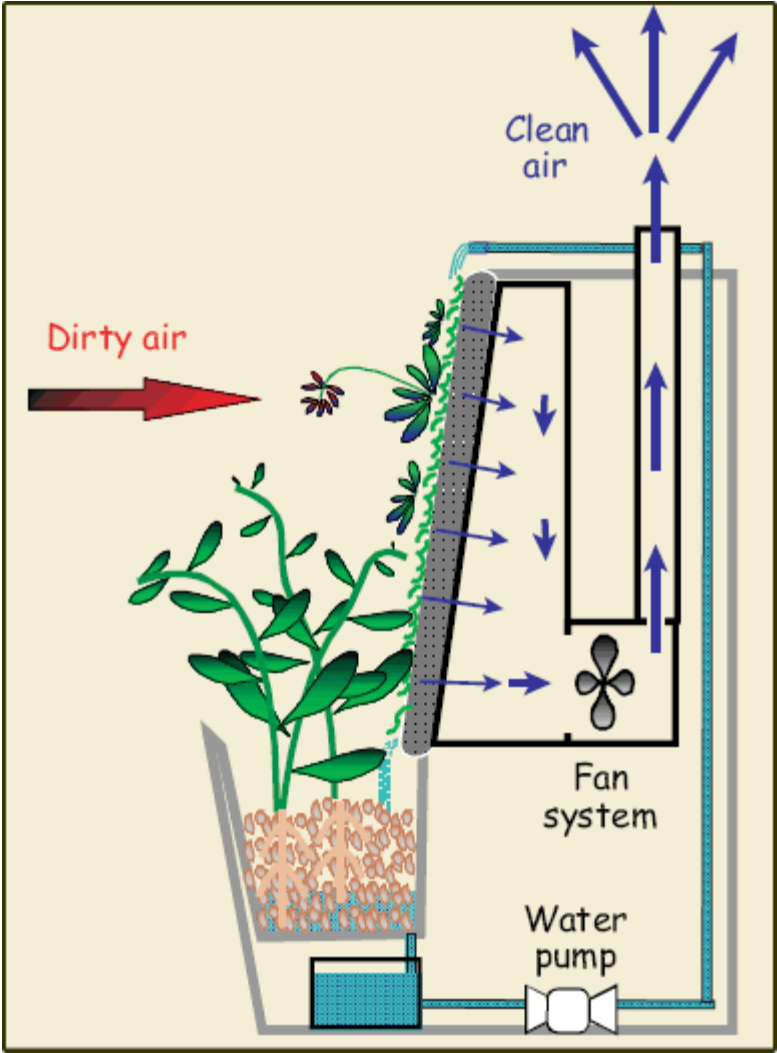
- **Benefits of plants**
 - Increase oxygen levels
 - Regulate humidity
 - Decrease particulate matter (dust)
 - Remove VOCs and other harmful contaminants
- **Not only plants though...**
 - Soil
 - Root structures
 - Micro-organisms



Living Wall Installations



- **University of Guelph-Humber**
 - Toronto, Canada
 - Built by Air Quality Solutions
 - Completed in 2004
 - 30' wide x 50' tall
 - Fully integrated with mechanical air system
 - Reduces energy use



Living Wall Installations



- **Cambridge Civic Center**
 - Cambridge, Ontario
 - Built by Nedlaw Living Walls
 - Completed in 2007
 - 25' wide x 48' tall
 - Fully integrated with mechanical air system
 - Skylights & windows provide natural light

Living Wall Installations



- University of Toronto
 - Built by Genetron Systems
 - Completed in 2005
 - Nearly self-sustaining ecosystem
 - Specially selected plants, animals, and water
 - “Nutrient desert”

Living Wall Installations



Living Wall Installations



- **Tel-e-Connect**
 - Built by Genetron Systems
 - Completed in 2002
 - 37' wide x 20' tall
 - Living wall, aquatic ecosystem, and water features

Research Design and Methods



- Interviews
 - 16 people who installed living walls
 - Unable to identify any people who did **not** install living walls

Interview Questionnaire



- 41 Questions
 - Decision making factors
 - Objective factors
 - Participant demographics

Research Questions



- 1) Given the positive contributions that living wall systems can make to overall indoor environmental quality, why are they not currently being used more in buildings?
 - Unable to answer this question

2. How have designers and owners made decisions on whether to incorporate living walls into their buildings?
 - Many factors affected decisions

Decision Making Factors

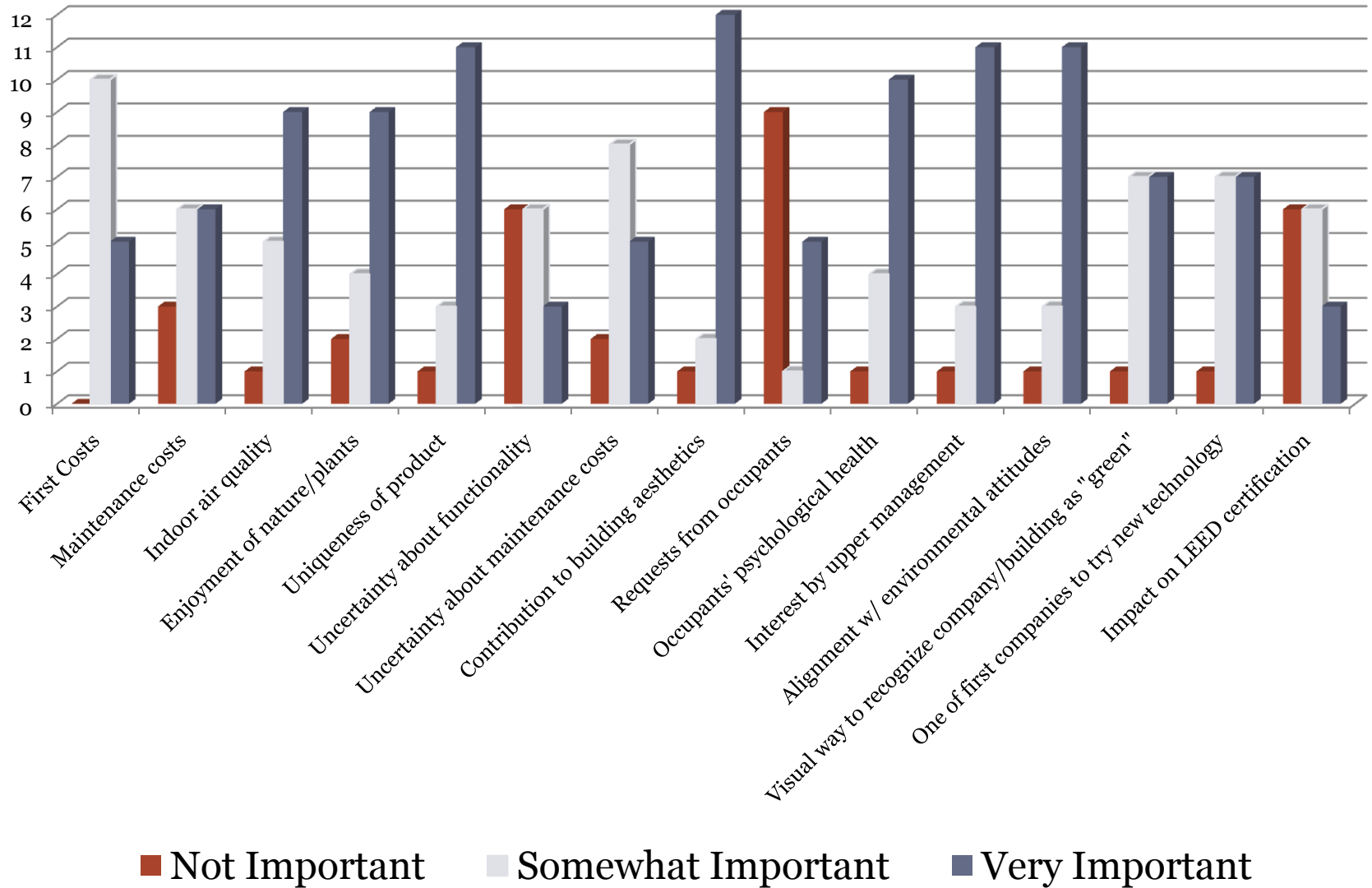


In your opinion, how important was the following factor in the decision to install a living wall?

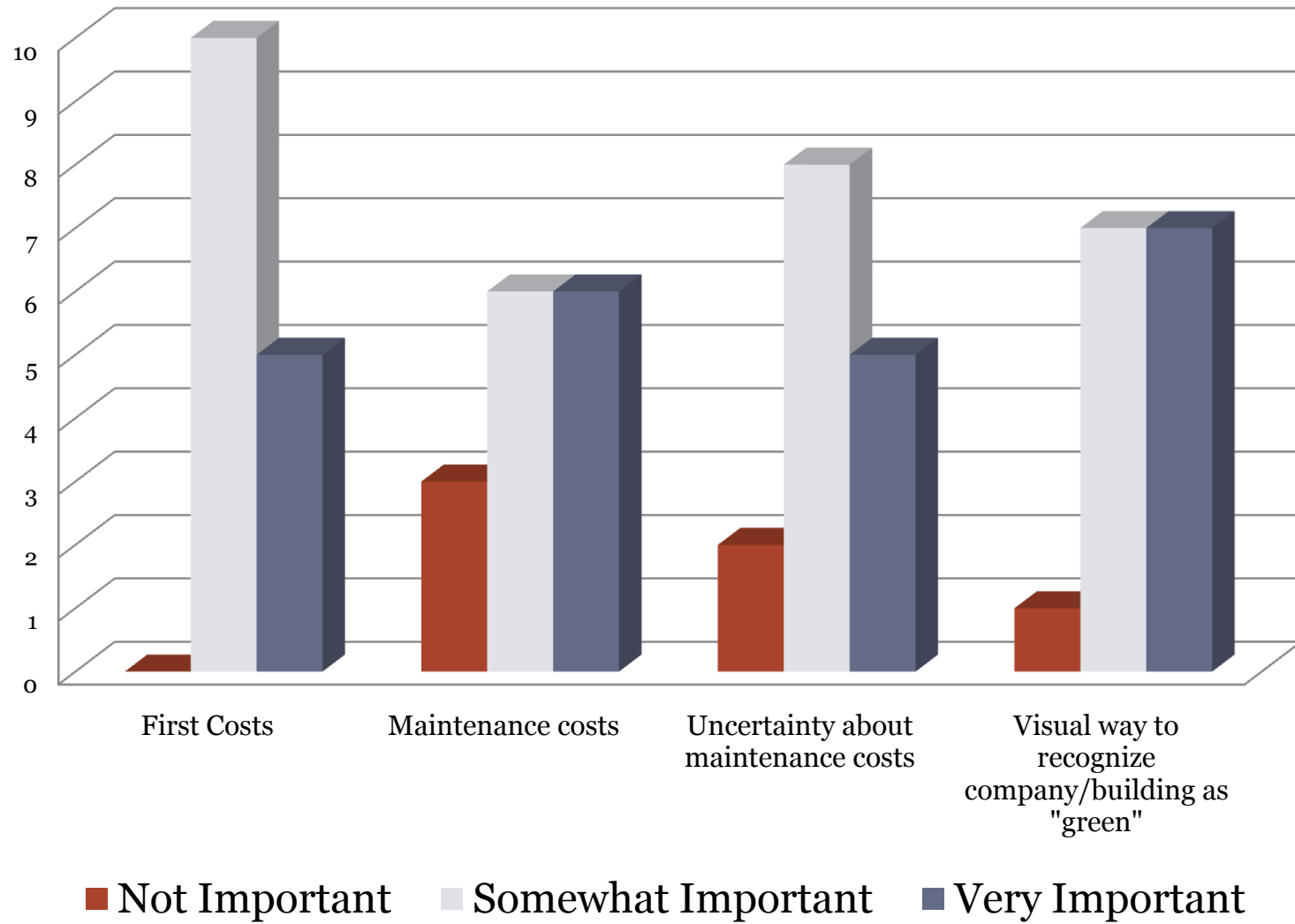
- i. Not important at all
- ii. Somewhat important
- iii. Very important

(15 factors total)

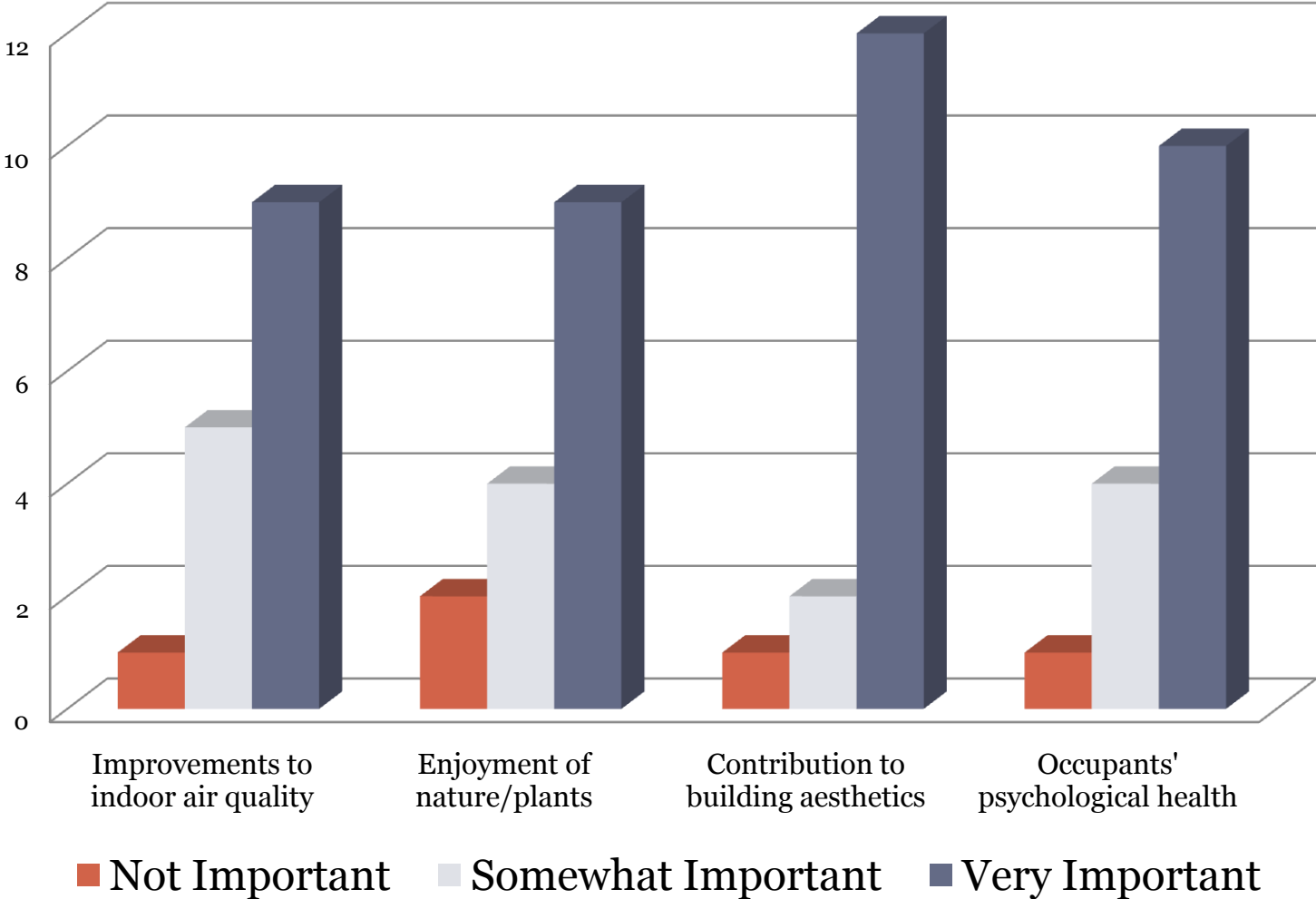
Factors Influencing Decision to Install Living Walls



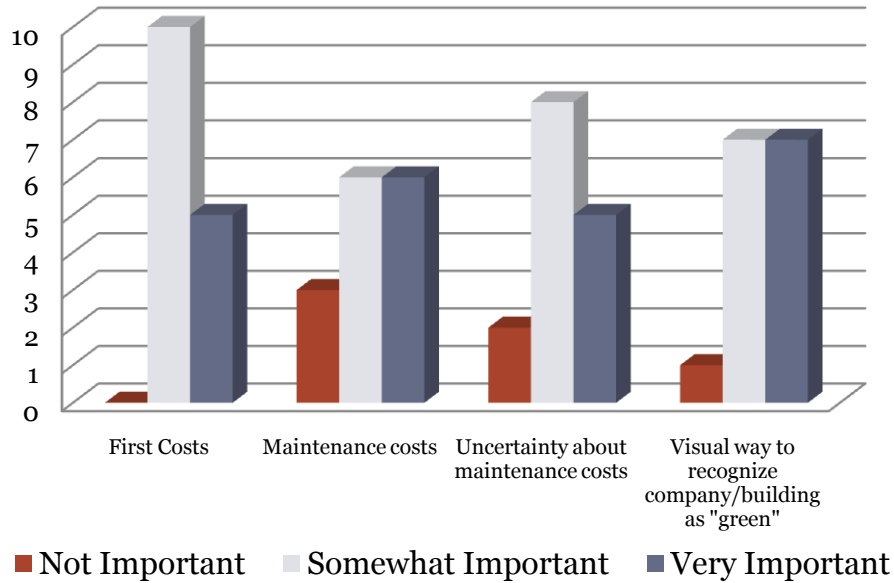
Economic Factors



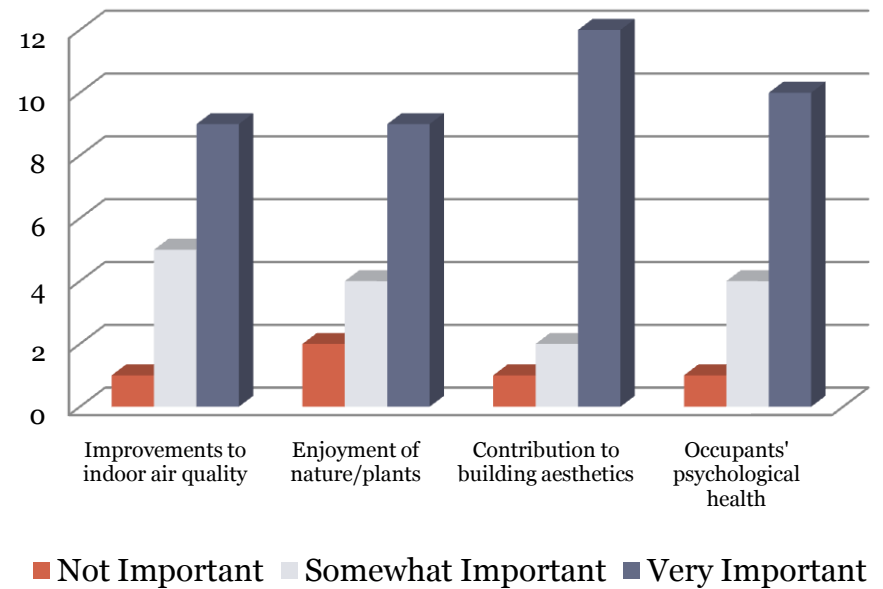
Perceived Benefits of Living Walls



Economic Factors



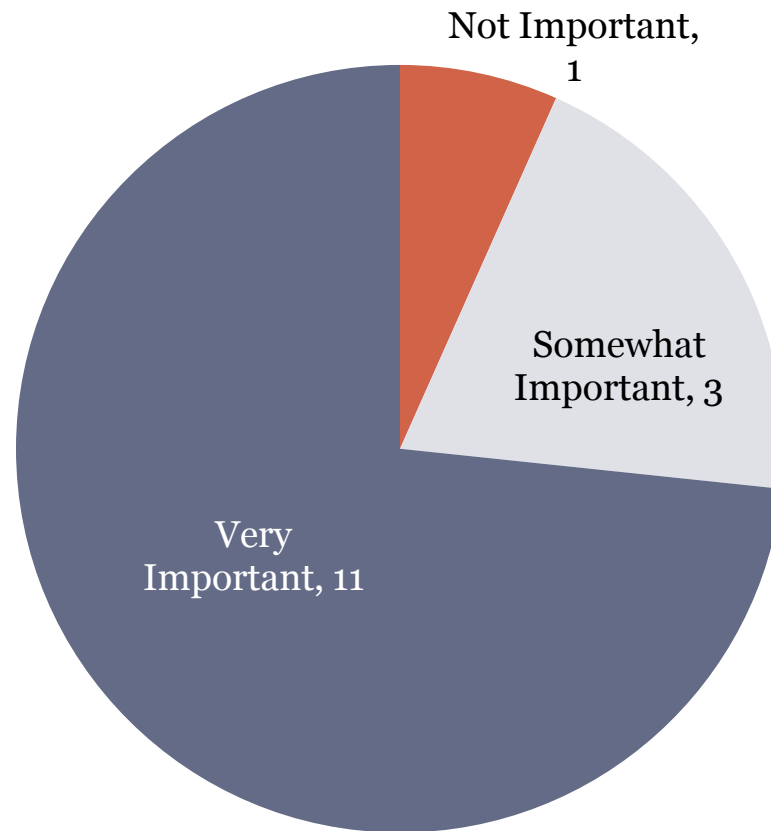
Perceived Benefits of Living Walls



Novelty of Living Walls



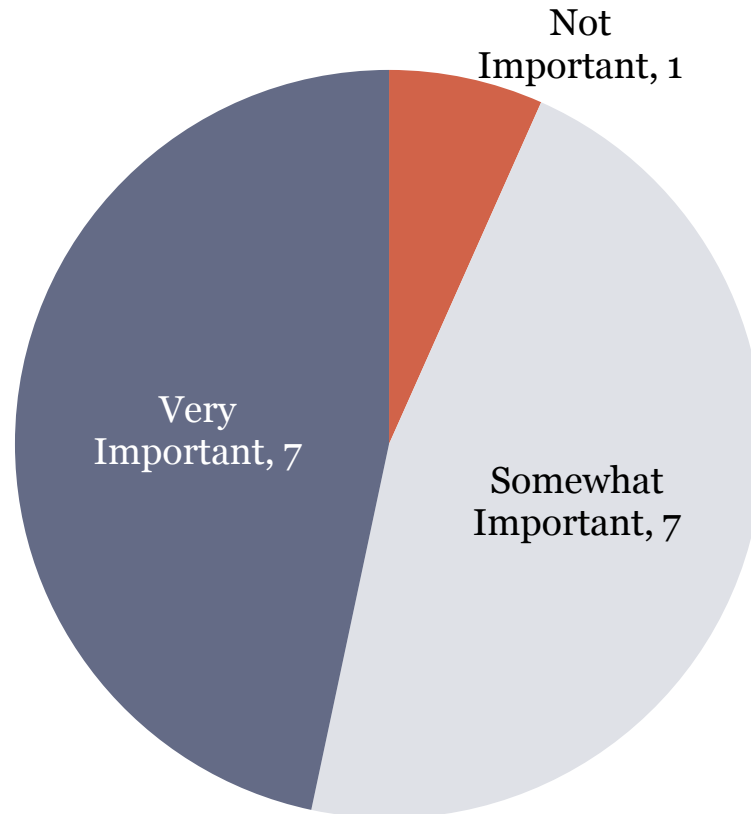
Uniqueness of Product



Novelty of Living Walls



One of the First Companies to Try New Technology

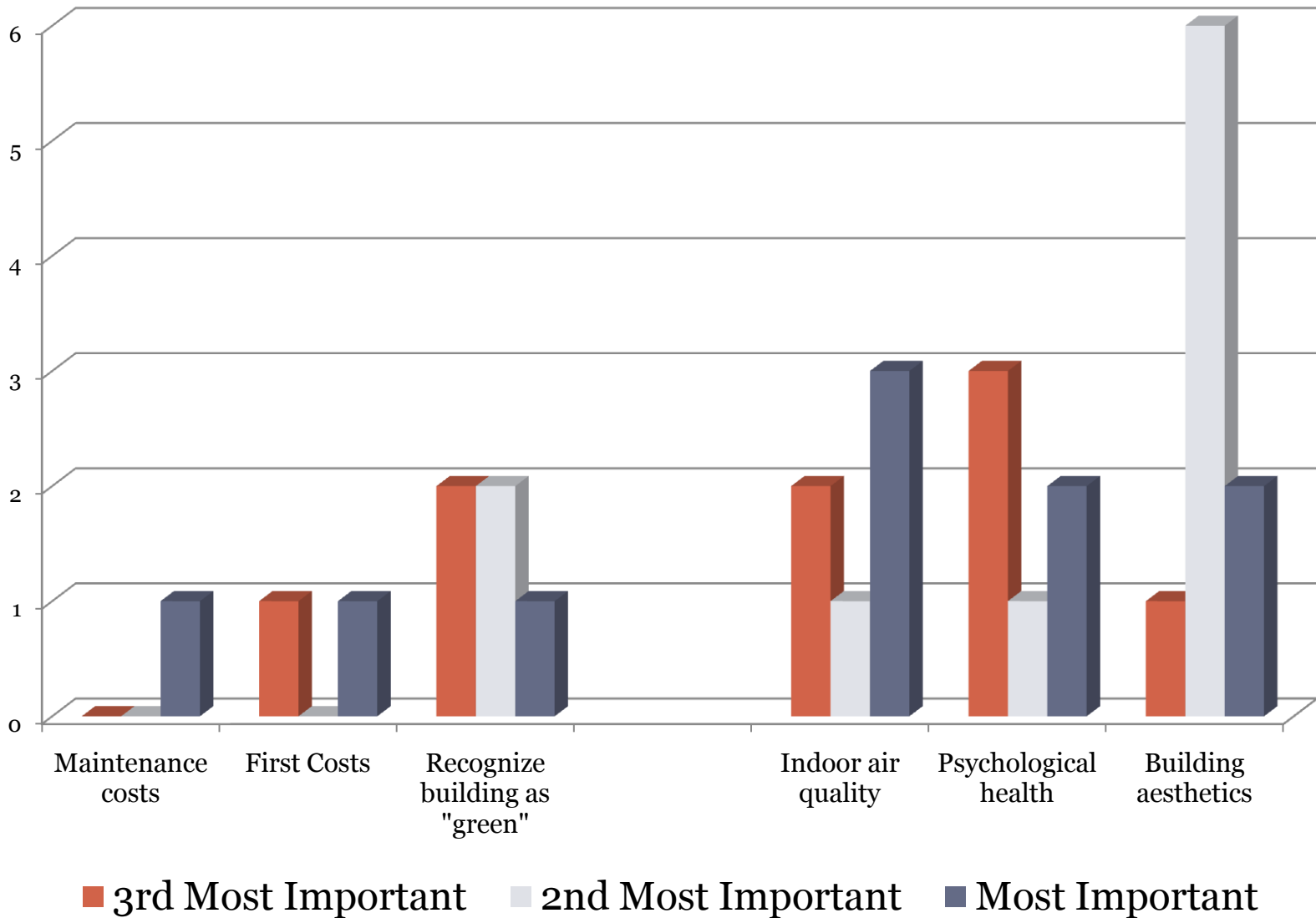


The Most Important Factors



- Which were the three most important factors in the decision to install a living wall?

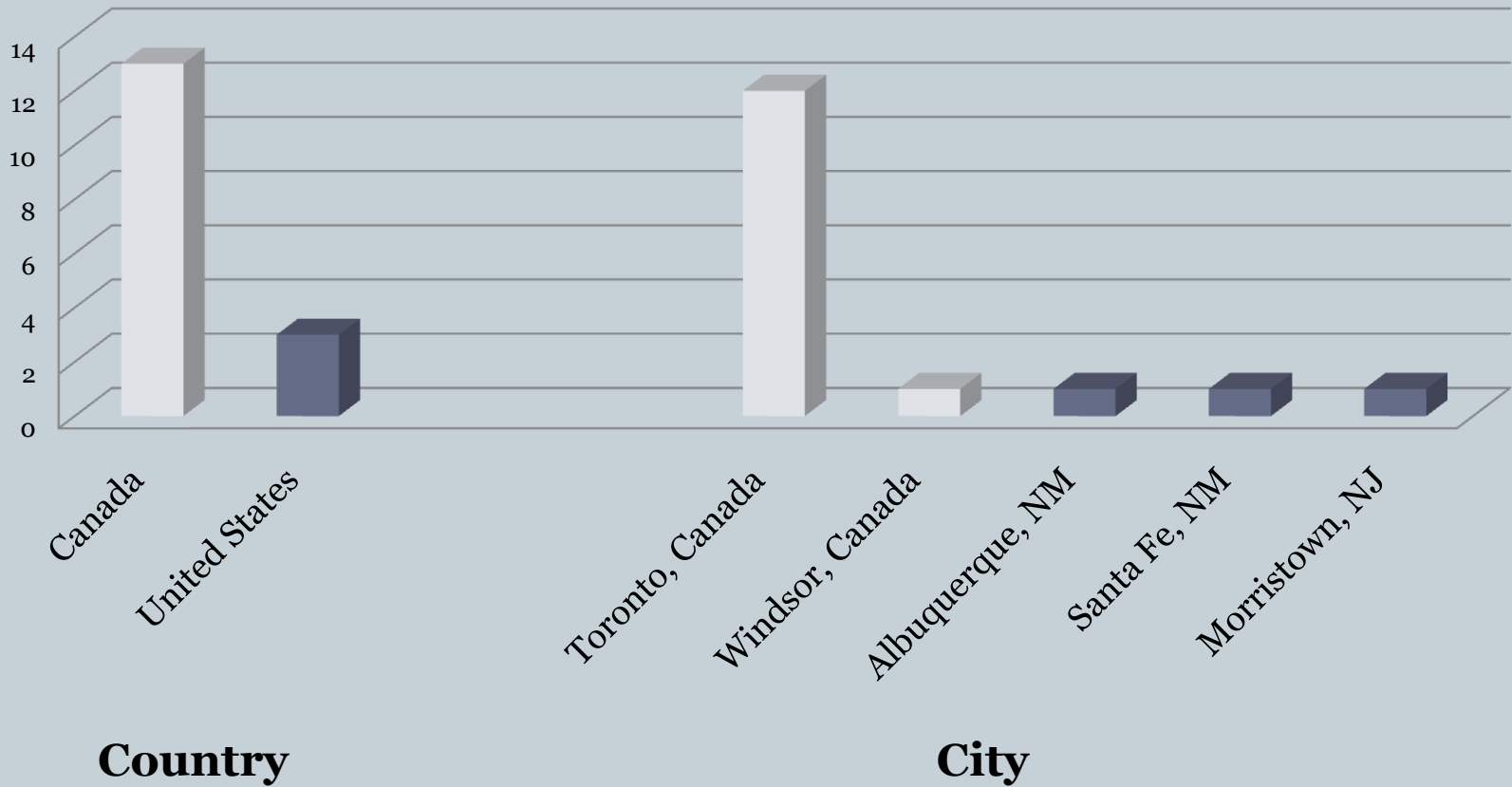
Selection of Most Important Factors



Objective Factors



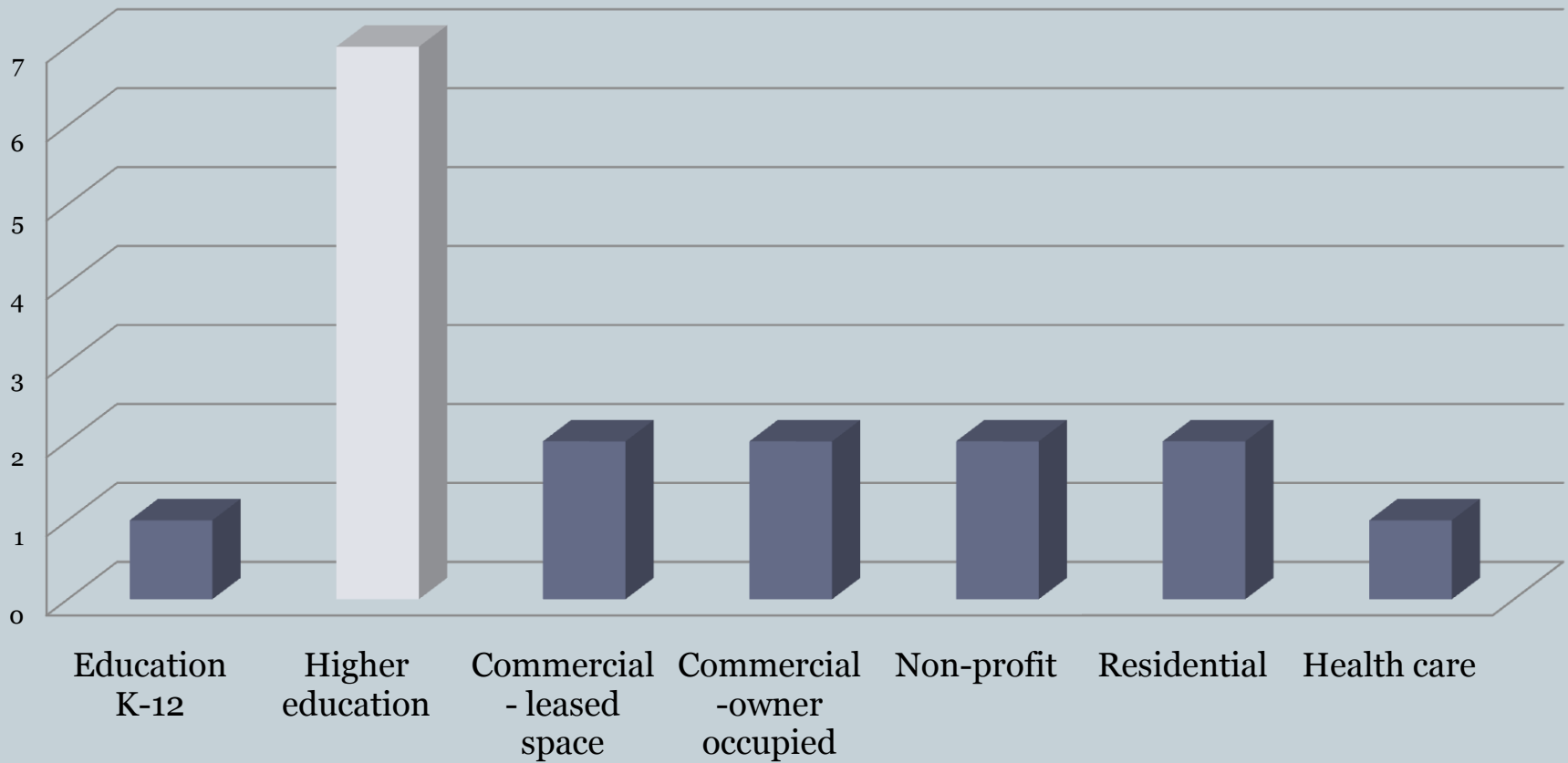
Location of Living Walls



Objective Factors



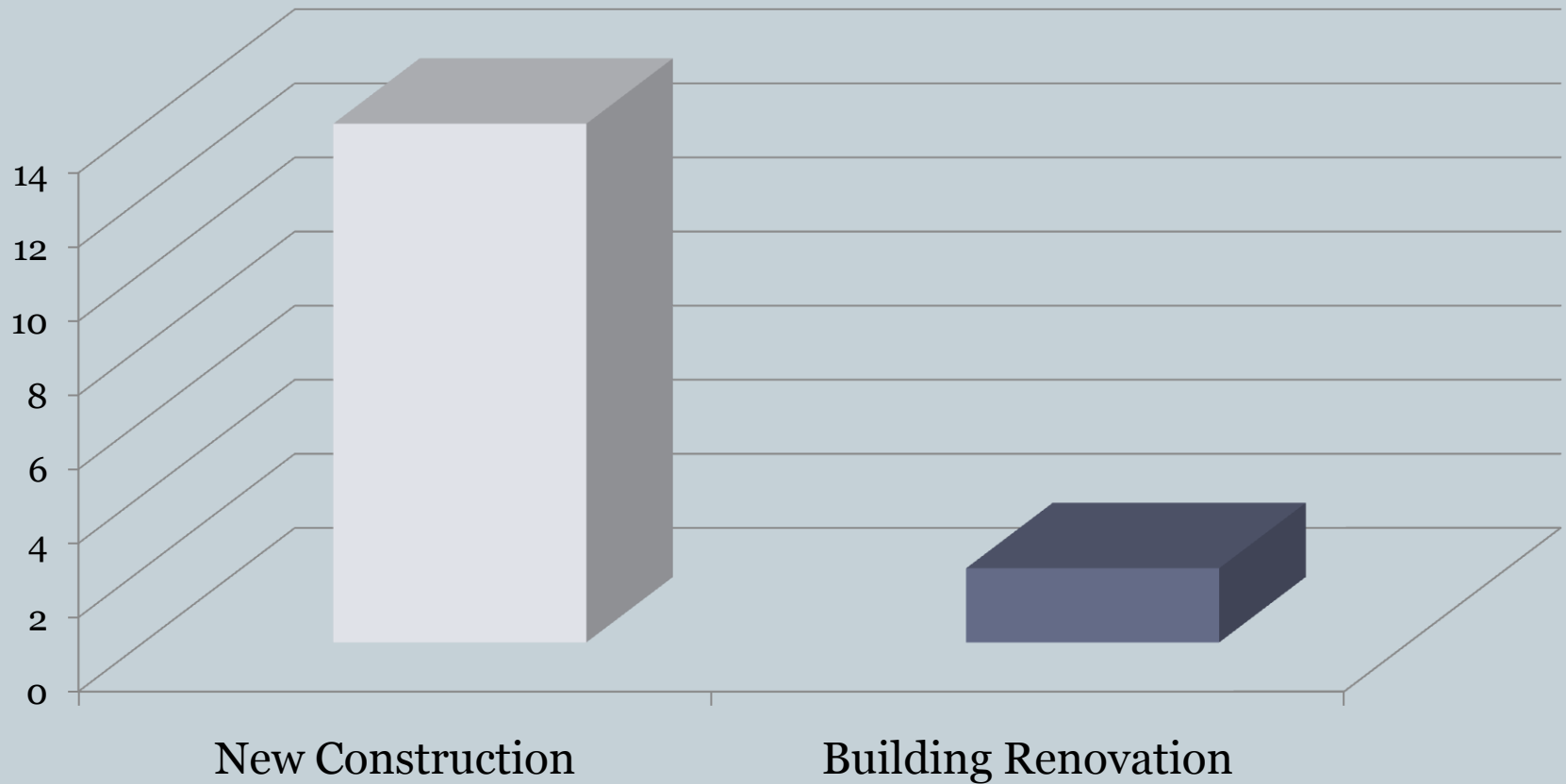
Building Tenant Types



Objective Factors



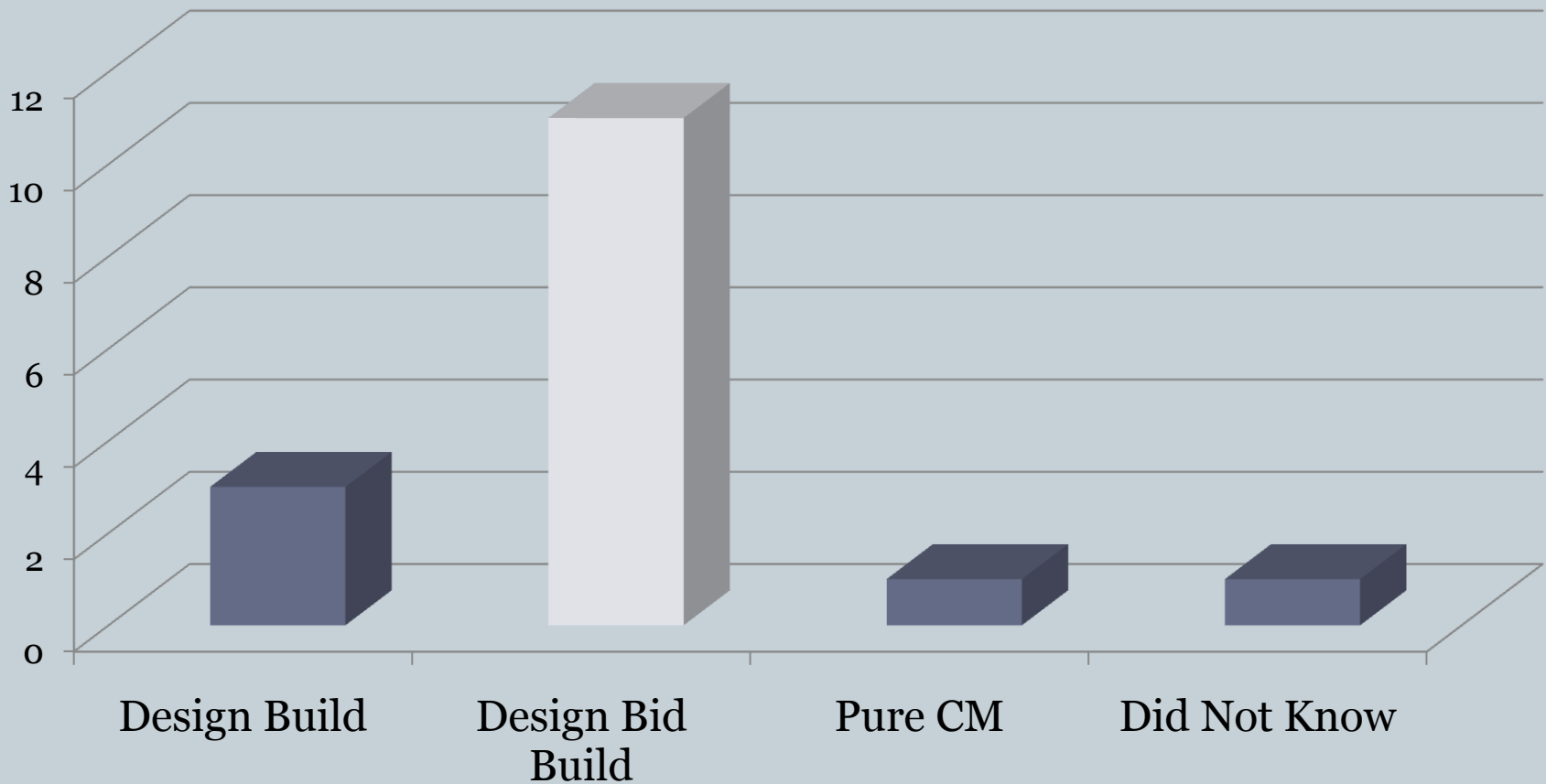
Construction Type



Objective Factors



Project Delivery System



Additional Comments



- **Praise for living walls**
 - Occupants enjoy living walls
 - “No regrets”
- **Concerns about living walls**
 - Unique maintenance
 - Budgeting for maintenance
 - Water leaks
- **Hindsight**
 - Design building holistically with living wall

Conclusions About Decisions



1. Perceived benefits were more important to respondents than economic factors
2. “Contribution to building aesthetics” was the most important factor
3. Novelty of living walls was important in decisions

Conclusions About Living Walls



1. Space with living wall often used as community gathering place/event center
2. Living wall installations are more feasible for new construction
3. Complications exist but there are viable solutions

Further Research



- **Further quantify benefits**
 - Air quality, psychological health, community space, impact on LEED certification
- **Economic studies**
 - Reduced ventilation, marketing, worker productivity
- **Maintenance issues**
 - What are issues? Explore viable solutions
- **Overall satisfaction with living walls**
 - Testimonials







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