The NLC Wall Station User-Experience
Survey & Findings Report
Submitted December 15, 2020

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Section 1: Introduction

For the past five years, nearly every major lighting manufacturer has launched a Networked Lighting Control system (NLC). NLC lighting systems consist of addressable luminaires and controls devices, and allow for application of multiple control strategies, programmability, zoning, rezoning, and more. NLC systems are proliferating in the new construction and major renovation markets but failing to gain traction in the existing buildings, retrofit, or tenant improvement (T/I) markets.

Correspondingly, utility programs across the country recognize that NLC systems offer significant savings opportunities and many provide incentives to support market uptake via their commercial & industrial existing building lighting programs. Specific to the Pacific Northwest (PNW), many utilities have also invested in the development and delivery of education and publicly available tools and resources in order to drive market uptake.

Despite product availability, incentives from utilities, training, and a host of non-energy related benefits, NLC systems are not being adopted and installed in the existing buildings as expected. This is primarily reported from existing building utility lighting programs across the PNW.

LDL's Market Position
Lighting Design Lab (LDL) is a workgroup within Seattle City Light's (SCL) Electrification & Strategic Technologies Division. A unique charter allows LDL to partner with utilities outside SCL's service territory. LDL has 30 years of experience engaging with the lighting market supply chain and is an objective resource for the industry and utility program partners.

Since 2017, LDL has delivered dozens of virtual and in-person courses supporting NLC market adoption. LDL works with multiple manufacturers and has unique insights into market trends and barriers.

Section 2: The NLC User Experience

In 2019, LDL identified the NLC user-experience as a key obstacle to market acceptance. The NLC user experience consists of two focus areas. The first is the NLC wall station that allows building occupants to operate the lighting system. The second is the NLC configuration tool. These application-based configuration tools are how installers initially program and setup the systems and how facility professionals engage and maintain them.

The two NLC user experience focus areas and their respective user groups:

NLC User Experience:	User Group
Wall Stations	Occupants and facility professionals
App-Based Configuration Tools	Installers and facility professionals

In 2020, LDL implemented a multi-phased approach to better understanding both areas of the NLC user experience. **This report focuses on the approach and findings specific to NLC wall stations.**

Findings from the NLC configuration tools project can be found on LDL's website resources page.

Wall Station Survey
To better understand user preferences, and to test LDL's hypotheses, project partners developed a survey specific to modern wall stations. The results of this survey will be used to inform LDL's original hypothesis and will in turn be used to develop new curriculum, tools, and resources to support the market.

Section 3: Executive Summary

In 2020, Lighting Design Lab (LDL) conducted research on the NLC wall system user experience. The project was implemented in partnership with the University of Washington's Integrated Design Lab, and Washington State University's Integrated Design & Construction Lab. The project was funded by Seattle City Light, the Northwest Energy Efficiency Alliance, and LDL member utilities.

Working with City Light, NEEA, and regional utilities, LDL recognized that despite incentives and educational resources, NLC systems are not showing up in existing building utility lighting programs as projected.

LDL's unique role as a market aggregator and experienced educator helped inform the idea that the NLC user interface is likely a barrier to market acceptance. Thinking about both building occupants and facility professionals, LDL developed the following hypothesis:

Hypothesis:
In multi-scene spaces, the inherent values of NLC systems manifest best when the wall stations included (a) multi-scene based with scene specific labeling and (b) manual raise / dim as a dedicated feature.

To further understand the relationship between key features, design approaches, and wall station user preferences, LDL also hypothesized that user experience is worse when people are not familiar with networked lighting technology and key concepts.

Survey & Results:
A NLC wall station survey ran from October 5th to October 16th, 2020. The survey included 72 questions total and received 82 complete responses within the official survey period.

The survey results routinely support the hypothesis that, **in multi-scene spaces, users prefer wall stations that incorporate multi-scene capabilities**.

Furthermore, the findings reveal the following:

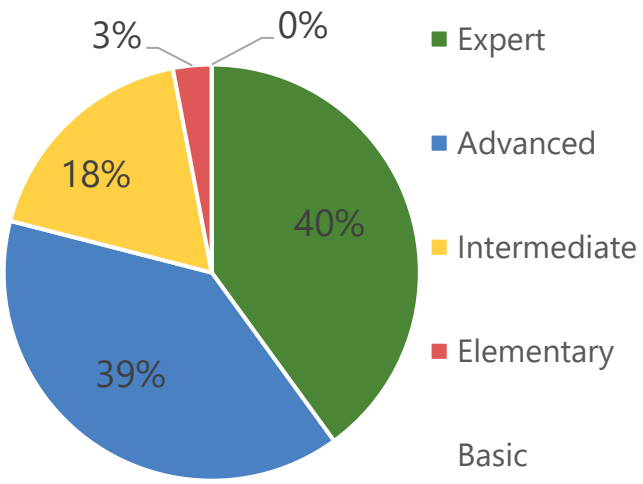
- **Scene specific text labeling is critical to the overall user experience.**
- **Multi-scene wall stations with generic labeling performed near the bottom,**
- **Multi-scene wall stations with scene specific labeling performed at the top.**
- **For both single-scene, and multi-scene applications, users prefer manual raise / dim as a dedicated feature.**

Lighting IQ
Survey Q39 asked participants to rate their level of knowledge with lighting controls. Q40 asked participants to rate their comfort level with lighting controls. For comparison with other standard variables, Q39 and Q40 were combined into a single unit and are referenced in this report as the survey participants self-prescribed *lighting IQ*.

Note: the term *lighting IQ* is used specifically within this report as shorthand for the self-prescribed knowledge and comfort level of participants and does not represent a novel definition.

Participant rankings for *lighting IQ* are divided into five categories: Expert, Advanced, Intermediate, Elementary, and Basic.

As discussed in Section 9, the *lighting IQ* variable proved to be a more reliable indicator of participants' preferences and lighting knowledge than other demographic variables such as the job/position or professional background.



Lighting IQ Predicts Preferences

Survey results also revealed a close correlation between a participant's self-prescribed *lighting IQ* and their wall station preferences.

- **Specifically, participants who scored higher up the *lighting IQ* scale predicably selected multi-scene wall stations with scene specific labeling and designated raise / dim throughout the survey.**
- **Conversely, participants who ranked as lower were more likely to select across the range of options**.
- **Survey results also suggest that for a population segments with a lower *lighting IQ*, even minimal exposure to basic concepts can shift user experience and align preferences with much more experienced lighting professionals.**

Other Key Findings:

Note: while the survey results support the following findings, the survey itself was not designed to examine these specific wall station nuances and further study is recommended.

- Labeling preference are likely a function of space type and a **hybrid labeling approach** is preferred by most users.

Wall Station Type	LDL Design Type	Most preferred labeling strategy
Single Scene	Simple	*Hybrid: icons and indicator lights
Multi-Scene	Advanced	*Hybrid: scene specific text, icons, and indicator lights

*including some combination (or all) of the following

- Specific to single-scene wall stations, users prefer some labeling over no labeling
- Fewer buttons or commands on a wall station does not automatically equate to it being simpler. Conversely, having more buttons does not necessarily result in users perceiving a wall station as more confusing.
- Multi-scene wall stations with generic text are likely the most confusing for users.

Next Steps:

In response to these findings, LDL plans to incorporate key concepts into existing market-facing tools and resources including education, training, and concise technical learning guides available to designers, installers, and end-users.

LDL is also providing a "Memo to Industry Partners" that includes a full copy of the report including recommendations for better user-based outcomes. LDL will work with industry partners to share key findings and will explore future opportunities to continue this work.

Section 4: Approach to Hypotheses

LDL started with the simple question: Are wall station interfaces a significant obstacle to user acceptance of NLC systems? This question expanded to:

a. Are there specific wall station design features that may help speed market acceptance?

b. What can user preference tell us about the competing approaches to implementation methods?

c. What are the critical knowledge gaps and opportunities throughout the product supply chain, which if addressed, may increase user-demand and market acceptance?

In response to these questions, LDL developed the following hypotheses.

Specific to building spaces, which require the capability to control multiple lighting scenes (e.g. conference rooms, office spaces, classrooms, etc.), the system advantages inherent to NLC systems manifest best for building tenants and facility operators when they are multi-scene based, include scene specific labeling, and provide manual raise / dim as a dedicated feature.

For purposes of testing, LDL organized the hypothesis into four distinct parts.

Hypotheses addressing *preferred* design feature	**ID**
Multi-scene based	H1
Scene specific labeling	H2
Includes manual raise / dim	H3
Manual raise / dim is a dedicated feature	H4

Wall station #9 (pictured right) exemplifies all the qualities outlined in LDL's hypothesis. (H1-H4)

Wanting to better understand the potential relationship between user preferences and their level of lighting knowledge, LDL included an additional hypothesis: the user experience is worse when people are not familiar with networked lighting technology and key concepts.

For purposes of testing, LDL organized this hypothesis distinct from the others.

Hypothesis addressing *source of confusion*	**ID**
User experience is worse when people are not familiar with networked lighting technology and key concepts.	H5

Section 5: Survey Background

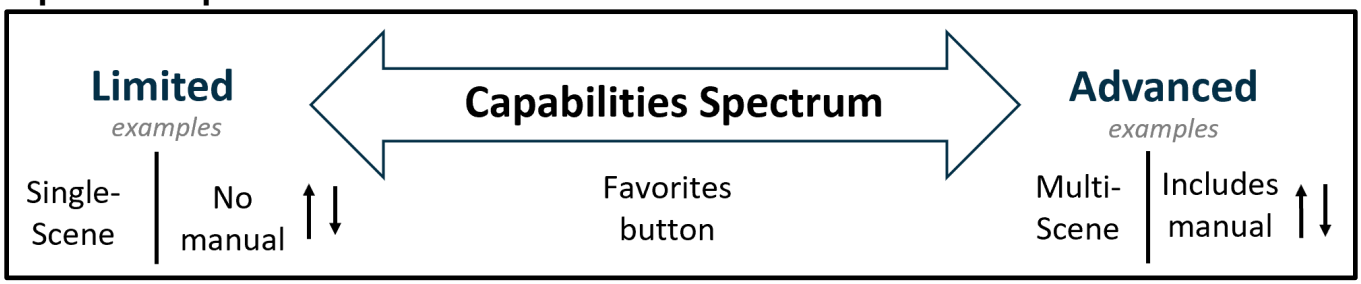
Scanning the market, LDL identified and observed several wall stations available from major manufacturers offering NLC systems and concluded that the user experience occurs across two separate but related spectrums, the capabilities spectrum and the user experience spectrum.

The wall station **capabilities spectrum** is based on the number of features and range of functionality.

The wall station **user experience spectrum** provides a method to measure users respsonses to a wide range of design approaches. At its core, the user experience spectrum is based solely on user perception (i.e. is the wall station confusing or simple to understand and operate).

The following figures help to illustrate how the two ends of either spectrum manifest in common design approaches.

Capabilities Spectrum



User Experience Spectrum

Based on observations, and seeking to test and measure the hypotheses, LDL proceeded to develop two classification systems to sort and catalog available products.

For the purposes of measuring the hypotheses, LDL selected nine wall stations for use in the survey. By curating the wall stations within each category, LDL attempted to represent the range of approaches manufactures are currently taking to optimize user experience.

Two Classification Methods

Primary Classification Method

The primary classification method places wall stations #1-9 into three categories and seeks to directly address the first half of LDL's hypothesis: In multi-scene applications, users prefer the advanced functionality of a multi-scene wall stations (H1) when they use scene-specific labeling (H2) that makes them easier to understand.

Primary Classification – Three Categories of Wall Stations			
Category	Category A	Category B	Category C
Description	Single-scene	Multi-scene, generic labeling	Multi-scene, specific labeling

Category A:

Category A is defined primarily by wall stations designed to control only one zone or scene (single-scene). These wall stations represent the most basic approach to scene control design.

They commonly mimic legacy switches in their functionality and typically have 4 or less command options.

Category A: Single Scene

(1) (2) (3)

Note: The survey does not feature any wall stations that are purely binary. (i.e. eligible wall stations must have at least some functionality beyond simply turning on and off).

Categories B & C:

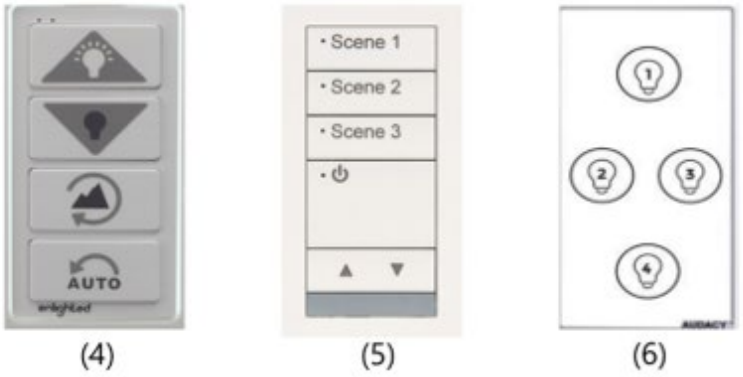
Categories B & C are identical in functionality and vary only in how their primary scene commands are labeled. (The two categories are bifurcated at this level for the purposes of testing and measuring LDL's hypotheses).

Categories B & C Shared Characteristics:

Categories B & C are defined by wall stations designed to control multiple programmable scenes. (i.e., they are multi-scene-based wall stations). These wall stations typically control two or more scenes, and the primary function is to allow navigation between multiple preprogrammed scenes.

Categories B & C Differences:
The labeling approach to programmable scenes is the distinct (and only) difference between the categories.

Category B: Multi-Scene **Generic** Labeling



(4) (5) (6)

- Category B is defined by multi-scene wall stations that apply **generic labeling** such as, *scene 1, scene 2, scene 3.*

Category C: Multi-Scene **Specific** Labeling

(7) (8) (9)

- Category C is defined by multi-scene wall stations that apply **specific labeling** such as, *Reading, Presentation, Relax, etc.*

Secondary Classification Method

The **secondary classification method** follows a more empirical approach to categorizing wall station interface features and informs hypotheses H1-H4. Specifically, the secondary method catalogs four characteristics for every wall station.

- Design type
- Labeling style
- Includes manual raise / dim as a feature
- Manual raise / dim is a dedicated feature

1. Interface Design Type

The interface *design type* refers to both the number of primary features or commands included on a wall station and how they are labeled.

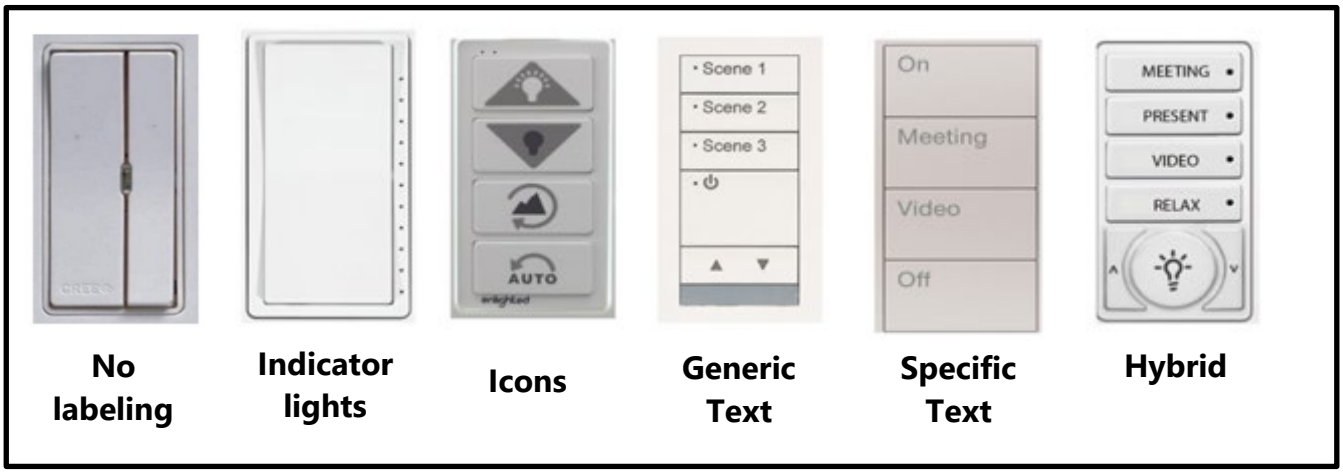
Interface Design Types			
	Very Simple	**Simple**	**Advanced**
Interface Description	Single button (including rockers)	Between two and four command / features	Four or more commands / features
Labeling Description	Minimal (none, indicator lights, icons)	Icons, text, hybrid	Icons, text, hybrid

2. Interface Labeling Style

LDL has identified six common approaches to wall station labeling. While the *no labeling* approach is unique to Very Simple design wall stations, the remainder of the labeling approaches are represented across all three primary wall station categories.

Labeling Approach	**Defined By**
No labeling	No labeling
Indicator lights	Indicator lights representing brightness or scene selection
Icons	Use of basic icons (e.g. *up / down arrows, light bulb on / off)*
Generic Text	Scene 1, Scene 2, Scene 3
Specific Text	Reading, Relax, Focus, Presentation
Hybrid	Typically a combination of text, icons, and / or indicator lights

Primary Approaches to Labeling Wall Stations



3. Manual Raise / Dim Identified

The final sub-category LDL has identified is specific to the manual raise / dim feature. This subcategory records both the appearance and control method for the interface.

Includes Manual Raise / dim	Method for Controlling
Does not include manual raise / dim	*NA*
Includes manual raise / dim	Dedicated buttons
	Dual-purpose buttons

Table cataloging design features as categorized by LDL

WS #1-9	Primary Category	Secondary Category (Design Type)	Dominate Labeling Method	Includes Manual ↑/↓	Manual ↑/↓ Approach
1	A	Very Simple	None	Yes	Dedicated ↑/↓
2		Simple	Icons	Yes	Dedicated ↑/↓
3		Very Simple	Indicator lights	Yes	Press n' hold
4	B	Advanced	Icons	Yes	Press n' hold
5		Advanced	Generic Text	Yes	Dedicated ↑/↓
6		Simple	Icons	No	NA
7	C	Advanced	Scene specific text	Yes	Dedicated ↑/↓
8		Simple	Scene specific text	No	NA
9		Advanced	Scene specific text	Yes	Dedicated ↑/↓

Section 6: Survey Outline

Part 1: Introducing NLC Wall Stations & User Preferences

Part 1 of the survey begins by introducing all nine wall stations with minimal context.

- Looking across all nine wall stations – users select the wall stations they believe are the most intuitive and most confusing

Part 1 then introduces the primary classification wall station categories and collects:

- User preference for favorite and least favorite within each category
- User confidence for operating each of the wall stations

Part 2: User Preferences for Configuration & Features

Section 2 of the survey asks questions specific to LDL's hypotheses to better understand user preferences for:

- Multi-gang vs. single-gang approach
- Labeling
- Manual raise / dim

Part 3: Forward Looking

Section 3 of the survey shows participants representations of emerging digital wall stations and seeks to understand:

- Users' current understanding of emerging trends
- Users' preferences for emerging trends

Part 4: Reflective Questions

LDL's hypothesis H5 states, User experience is worse when people are not familiar with networked lighting technology and key concepts. Section 4 seeks to gauge the survey participants' self-assessed *lighting IQ* by asking them to rank their proficiency and experience with lighting. Section 4 also seeks to understand how participants are responding to the introduction of key concepts and if the limited exposure within this survey has shifted their initial positions.

Part 5: Participant Background Information

Section 5 of the survey seeks to collect specific information on the participant so the data can be analyzed across user demographics including role within the building, age range, and professional role

Section 7: Survey Instrument Implementation

In total, there were 53 questions in the survey. Some questions were skip logic dependent, meaning that not all participants saw all 53 questions. The survey begins with a statement of consent, verification that the participant is over the age of 18, and that they are eligible to participate.

The survey link was sent to building occupants, from October 5th - October 16th, 2020 through compiled "list serves". In the initial contact email, an explanation of the survey research and an invitation to participate in the survey were included. On the 12th, a reminder email was sent to participants, which reminded participants to complete the survey, and two days later, a final reminder email was sent to stress the importance of the research and to thank those who had completed the survey. After the 2-week survey period, the survey link access was closed to participants on the October 16th, 2020.

The survey implementation plan was modeled after Dillman et al.[1] tailored design method for online surveys to reduce error due to non-response because participants are unable, unavailable, or unwilling to respond to the survey.

Institutional Review Board Approval
Before any data collection, the WSU Office of Research Assurances determined this study satisfied the criteria for Exempt Research at 45 CFR 46.104(b)(2).

Participants and Consent
The participants' consent was requested before continuing on to the survey. The consent form, located on the first page of the survey, clearly stated the purpose of the research and any known associated risks to the participants[2]. Participants had the option to decline participation at any point during the study by exiting.

The participants of this study included a range of building occupants, lighting designers, and facility operators. To be eligible for the survey, participants were required to be over the age of 18 years old. In total, 82 total responses were collected. The exact response rate is difficult to gauge since the survey was sent out to individuals, lab contacts, list servs and other; therefore, the total sample pool cannot be calculated.

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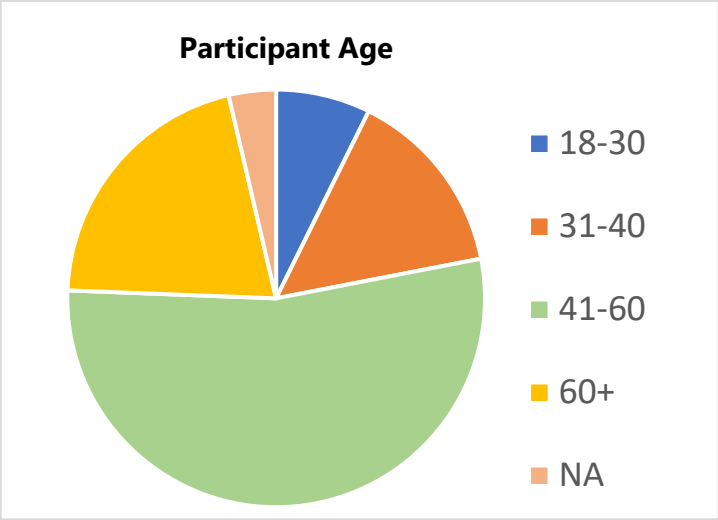
[1] D. A. Dillman, J. D. Smyth, and L. M. Christian, *Internet, mail, and mixed-mode surveys: the tailored design method*, 3rd ed. / Don A. Dillman, Jolene D. Smyth and Leah Melani Christian. ed. Hoboken, N.J.: Hoboken, N.J.: Wiley & Sons, 2009.
[2] J. W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 4th ed. Thousand Oaks, California: SAGE Publications, Inc., 2013, pp. 398-398.

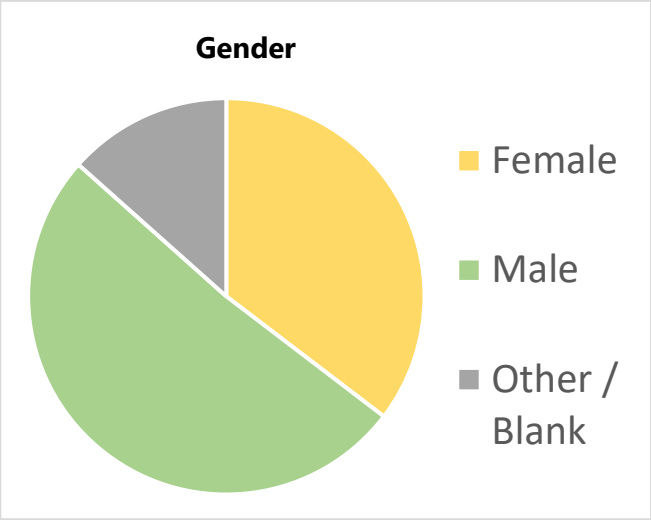
Section 8: Data Analysis

Before data processing, email addresses that were provided by participants were removed from the dataset and handled separately, on a password-protected computer. Additionally, before statistical analysis, survey questions were coded as nominal, ordinal, categorical, interval, or open-ended so that appropriate statistical tests could be used. The Social and Economic Sciences Research Center (SESRC) at Washington State University conducted the quantitative data analysis using the software Statistical Package for the Social Sciences (IBM-SPSS) and a survey reference spreadsheet, which was developed by LDL and ID+CL. Before data analysis, research questions and hypotheses were further streamlined to specifically guide the selection of the appropriate statistics.

General Demographics

The graphics below illustrate the age and gender distribution of participants.





Lighting IQ
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Survey Q39 asks participants to rate their level of knowledge with lighting controls. Q40 asks participants to rate their comfort level with lighting controls. For comparison with other standard variables, Q39 and Q40 were combined into a single unit and are referenced in this report as the survey participants self-prescribed *lighting IQ*.

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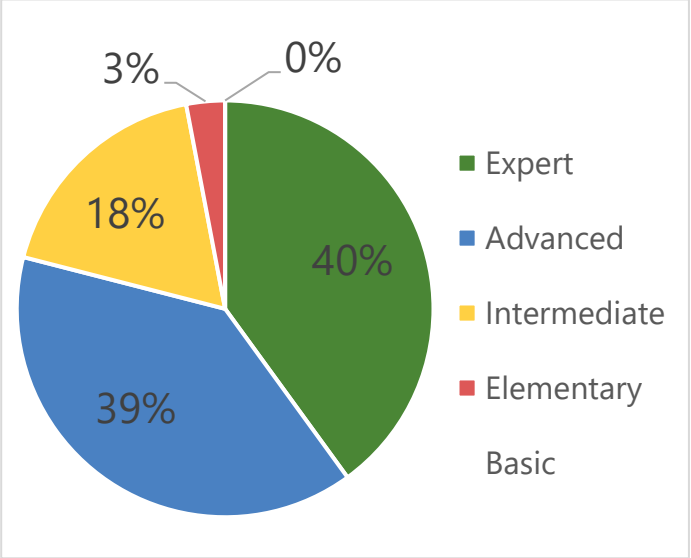


Section 9: Results

Results: Summary

Survey findings can be summarized as

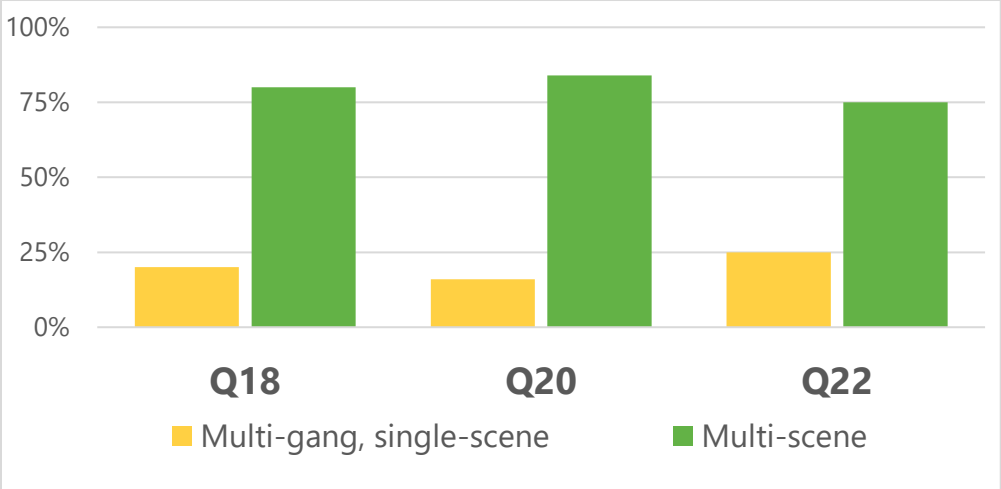
1. In multi-scene spaces, users prefer a single, multi-scene wall stations with scene specific labeling.
2. In general, users prefer wall station with manual raise / dim as a dedicated feature.
3. In general, users prefer a hybrid labeling approach that leverages two more methods of labeling.
4. *Lighting IQ* is a strong indicator of user preference.

1. Users prefer multi-scene wall stations with scene-specific labeling

Multi-scene vs. single scene

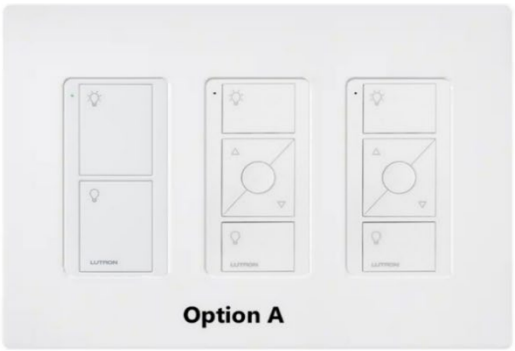
Multiple tests were run to identify if users preferred multi-scene wall stations over single-scene wall stations, and the resounding response, in short, is yes.

Questions 18 and 20 asked respondents to state their preference for multi-gang, single scene wall stations vs. a single, multi-scene walls station. Q 22 asked respondent preference for single-scene wall stations vs. multi-scene *without* the context of multi-gang application (three single-scene wall stations). The chart below shows the majority of survey respondents (79.3%, 84.1%, and 74.4%, respectively) preferred multi-scene wall stations.



Users prefer multi-scene wall stations over single-scene walls stations.

Image shown in Q20 feat. Multi-gang vs. multi-scene



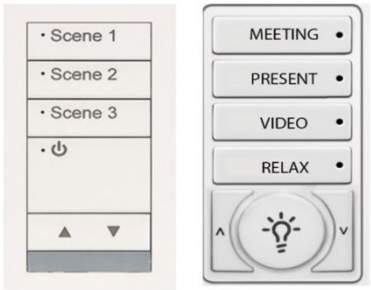
Three separate and adjacent wall stations, each controlling a specific lighting zone.

A single wall station controlling multiple lighting zones

84% of respondents preferred Option B, single wall station controlling multiple lighting zones.

Image shown in Q22 without multi-gang context

Two examples of **single scene** wall stations



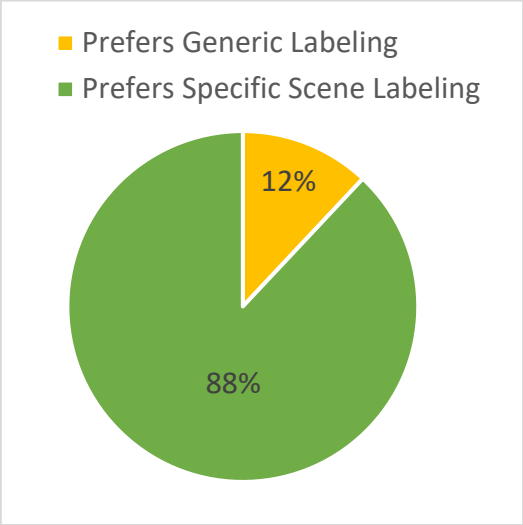
Two examples of **multi-scene** wall stations

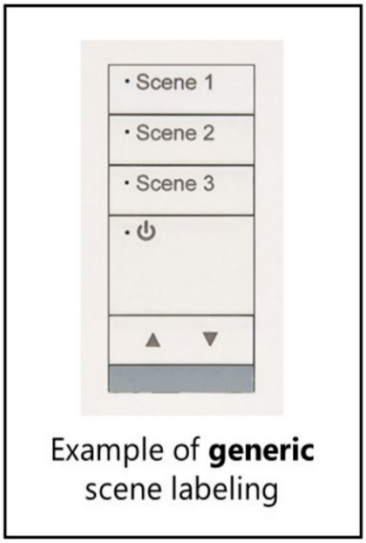
74% of respondents preferred a single wall station controlling multiple lighting zones.

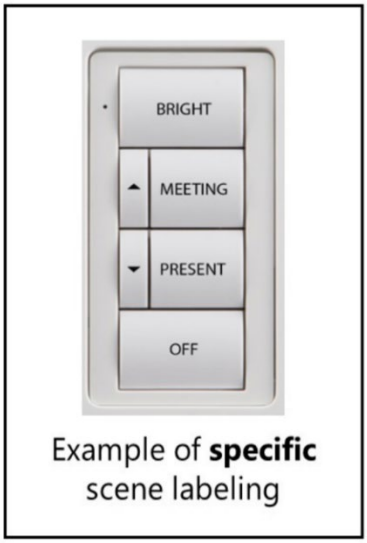
Scene Specific Labeling

Survey responses were evaluated to identify if users preferred wall stations that featured scene-specific labeling, as opposed to generic labeling. The simple answer is also **yes: preference was given to wall stations with scene-specific labels**. Responses to question 25 indicate that a vast majority of building users (87.8%) preferred scene-specific labeling over generic labeling (12.2%).

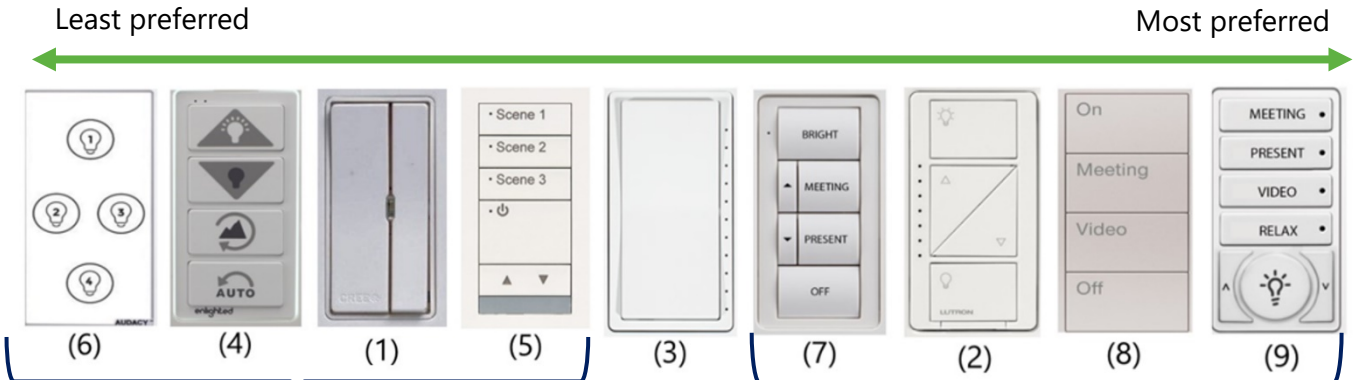
88% of respondents preferred a scene specific labeling over generic scene labeling.







A final way to understand user preferences for multi-scene wall stations with scene specific labeling is to examine user preferences for: wall stations 1-9.



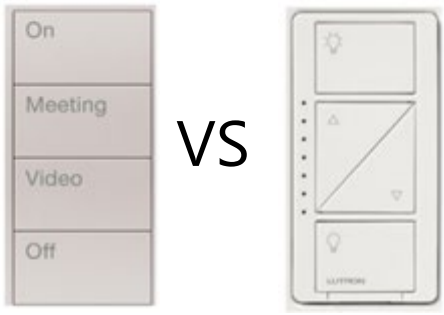
Three of the four least preferred wall stations are Category 2, multi-scene with generic labeling.

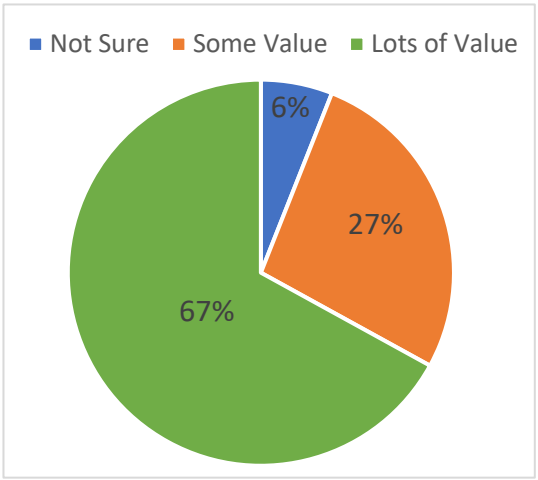
Three of the four most preferred wall stations are Category 3, multi-scene with scene specific labeling.

2. Users prefer wall stations with manual raise / dim as a dedicated feature.

When asked if they valued manual raise / dim as a feature, participants overwhelming agreed that there was either some value (26.8%) or lots of value (67.1%).

How much do you value manual raise / dim?

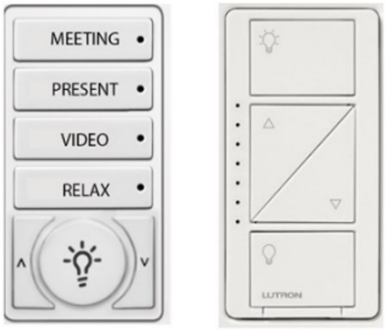


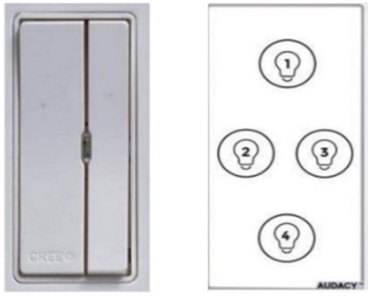


94% of respondent see value in manual raise / dim

User preference for manual raise / dim as a dedicated feature is further supported by participant responses to *most* and *least* intuitive wall station. For this question, respondents selected their most intuitive and least intuitive wall stations from the full set of nine.

Top Two Selected Wall Stations for Most Intuitive





Top Two Selected Wall Stations for Least Intuitive

Respondents identified wall stations 9 and 2 as the most intuitive. **Both include manual raise / dim as a dedicated feature.** Additionally, both wall stations include minimal icon labeling highlighting the feature.

Wall station 1 includes manual raise / dim as a designated feature, however, absent labeling, the design seems confusing to users. Wall station 8 does not include manual raise / dim as a feature.

User preference for manual raise / dim as a dedicated feature is supported still further by participant responses to *favorite* and *least favorite* wall station within each category. For these questions, respondents selected their favorite and least favorite wall station among a set of three. Note: Category A wall stations are all single-scene and all include manual raise / dim as a feature.

Category A
Favorite

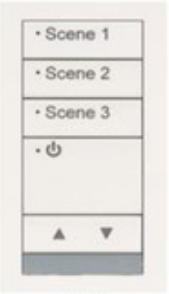
(2)

INSIGHT:
Wall station 2 is the single-scene perennial favorite. For single-scene wall stations, hybrid use of icons and indicator lights scored high. **Dedicated buttons for manual raise / dim also scored high across the survey.** Wall Station 1, which also scored as one of the least intuitive is the Category A, least favorite. This further supports that specific to single scene wall stations, users prefer a modicum of labeling to no labeling.

Category A
Least Favorite

(1)

Category B
Favorite



(5)

INSIGHT:
Category B, (multi scene wall stations with generic labeling) scored reliably low across the survey. Wall Station 5 was category favorite, **likely in part because its design includes dedicated manual raise / dim**. W all Station 4 was not only category B, least favorite, but also scored near the bottom of least intuitive out of all nine wall stations. This suggest users may not prefer manual raise / dim as an integrated feature. It also suggests users may not prefer abstract icons for labeling.

Category B
Least Favorite

(4)

Category C
Favorite

(9)

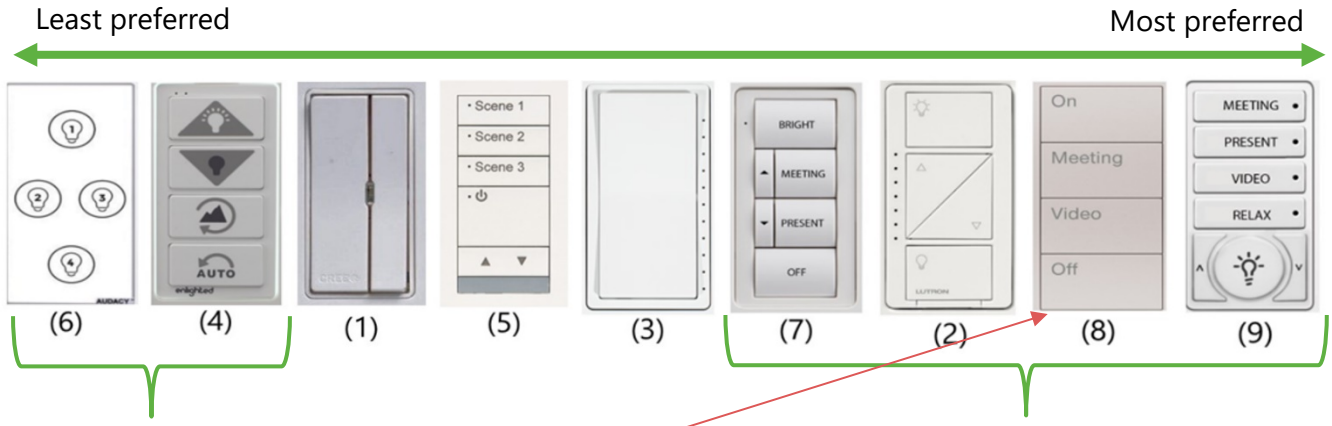
INSIGHT:
Category C, (multi-scene wall stations with scene specific labeling) scored reliably high across the survey. While Wall Station 8 scored least favorite within the category, it scores in the top quartile when compared to all nine wall stations. **Wall Station 8 was the only wall station in category C that did not feature manual raise / dim**. Wall Station 9, continues to impress with dedicated buttons for manual raise / dim and a hybrid labeling method which includes scene specific text, icons, and indicator lights.

Category C
Least Favorite

(8)

A final way to gauge user preference for manual raise / dim as a dedicated feature is to observe participant responses to the individual wall station category favorite and least favorite selections.

Note: Wall stations (WS 1, 2, 3, 5, 7, 9) had manual raising and wall stations (4, 6, 8) did not.



The two least preferred wall stations include examples of both (a) **no manual raise / dim** and (b) **raise / dim as an integrated feature** as opposed to dedicated feature.

WS-8 is an outlier

Three of the four most preferred wall stations (7, 2, and 9) **include manual raise / dim as a dedicated feature**. Each also utilizes arrow icons to highlight the functionality.

Hypothesis H1-H4 Conclusion:
The totality of responses strongly supports the hypothesis that in multi-scene spaces, users prefer multi-scene wall stations with manual raise / dim as a designated feature.

Additional Findings relevant to H1-H4:
Note: while the survey results support the following findings, the survey itself was not designed to examine these specific wall station nuances and further study is recommended.

Labeling Preferences:

- Labeling preference are likely a function of space type and a **hybrid labeling approach** is preferred by most users. (see table)

Wall Station Type	LDL Design Type	Most preferred labeling strategy
Single Scene	Simple	*Hybrid: icons and indicator lights
Multi-Scene	Advanced	*Hybrid: scene specific text, icons, and indicator lights

*including some combination (or all) of the following

Referring to interface design types:

- Specific to single-scene wall stations, *very simple design* wall stations are least preferred.

- Fewer buttons or commands on a wall station does not automatically equate to it being simpler. Conversely, having more buttons doesn't necessarily result in users perceiving a wall station as more confusing. This suggests that labeling likely the primary

- Multi-scene wall stations with generic text are potentially the most confusing for users.

Secondary Classification – Interface Design Types (page 9)			
	Very Simple	**Simple**	**Advanced**
Interface Description	Single button (including rockers)	Between two and four command / features	Four or more commands / features
Labeling Description	Minimal (none, indicator lights, icons)	Icons, text, indicator lights, hybrid	Icons, text, indicator lights, hybrid

Significant Predictors

The table below presents regression results using two different modeling approaches (logistic regression and ordinary least squares regression). The results demonstrate that *lighting IQ* statistically significantly predicts building users' orientations and preferences regarding wall station design features.

Furthermore, *lighting IQ* was the only statistically significant demographic based prediction. (i.e. the survey results found no correlations from age, gender, professional category, or building type.

***Lighting IQ* predicts the outcome variables for survey: Q3, Q28, Q31, Q33, and Q34.**

Predictor	Q3	Q28	Q31	Q33	Q34
Lighting IQ	1.848*** (.499) ↑	.264* (.156) ↑	.525*** (.111) ↑	-.224* (.132) ↓	-.341** (.108) ↓

Not surprisingly, participants with a higher self-prescribed *lighting IQ*,

- Q3, are more likely to be familiar with the concept of scenes
- Q28, are more likely to be excited for tunable white light
- Q31, are more likely to see the value in digital wall stations
- Q33, do not think they learned anything by taking the survey
- Q34, did not have their preferences shift in the course of the survey

Lighting IQ Predicts Preferences

Survey results also revealed a close correlation between a participant's self-prescribed *lighting IQ* and their wall station preferences. Specifically, participants who scored higher up the *lighting IQ* scale predicably selected multi-scene wall stations with scene specific labeling and designated raise / dim throughout the survey. Conversely, participants who ranked as lower were more likely to select across the range of options.

- **The findings suggest that a population segment with less lighting background does not agree on the best way to design wall stations or how to apply them in multi-scene spaces.**
- **Conversely, once an individual reaches a basic threshold of understanding with respect to scene-based design and NLC system capabilities, that individual will agree with peers, on both the design and the application of wall stations in multi-scene spaces.**

*p<.05; **p<.01; ***p<.001; standard errors in parenthesis.
Note: prediction results for Q3 are logistical odds, whereas Q28, Q31, Q33, and Q34 are OLS regression.

Significant Predictors Strike Back

Returning to the statistically significant correlations between *lighting IQ* and the outcome variables of survey questions:, Question 33 & 34, did you learn something & did your preferences change?

Predictor	Q33	Q34
Lighting IQ	-.224* (.132) ↓	-.341** (.108) ↓

- **Simply by taking the survey participants with lower self-prescribed *lighting IQ's* reported learning something and having their preferences shift.**
- **Survey results also support the idea that simply helping the public understand basic concepts of scene-based lighting design may significantly improve user experience as well as drive alignment on wall station design and application approach.**

Section 10: What's Next for LDL

In response to these findings, LDL plans to incorporate key learnings into existing market facing tools and resources which are publicly available. LDL will work with regional stakeholders to share findings that support utility programs.

The NLC User Experience Wall Station project has also informed LDL's 2021 market focus area, Wireless Protocols and IT Integration. As LDL further develops an understanding of this market segment, it will have an opportunity to update and revisit lessons learned from the wall station project.

LDL is also providing a *Memo to Industry Partners* which invites conversation and includes a full copy of the report including recommendations for better user-based outcomes.

Section 11: Recommendations to Industry Partners

1. Help Increase the Knowledge Base

Support knowledge development and industry resources aimed at demand side education. While featuring your latest product offerings, highlight your understanding of the user experience, and showcase your company's solution.

Practical examples for industry to consider include:

- Supporting local utility program / training events
- Donating limited equipment to showcase emerging technologies
- Supporting local IES (and similar) organizations

2. Streamline & Prioritize Scene Specific Labeling

With an understanding that the technology arc is rapidly projecting, LDL predicts several more years of static, purpose-built wall stations. Because the inherent benefits of NLC systems manifest best for users when they include scene specific labeling, manufacturers should

- Prioritize the availability of scene specific labeling through their supply chain
- Highlight the service as a value add which empowers the customer
- Streamline the process between product specification and system setup.