

밀레니얼과 Z세대의 리빙랩 전망에 대한 정책 제안

조 윤 정*

Policy Suggestions for Prospective Living Labs for Millennials and Generation Z

Cho Yooncheong

〈Abstract〉

The purpose of this study is to investigate factors influencing the prospects of living labs among Millennials and Generation Z and to provide policy suggestions. This study proposed a comprehensive framework to investigate the influence of citizen awareness, perceived definition, willingness to participate, the role of local government, and expected satisfaction. This study employed an online survey conducted by a well-known research organization. Factor and regression analysis were utilized for data analysis. The results of this study indicate that the effects of citizen awareness, willingness to participate, the role of local government, and expected satisfaction on the prospects for living labs were significant for Millennials, whereas the effects of perceived definition and expected satisfaction on the prospects for living labs were significant for Generation Z. This study suggests the importance of developing better policies to create prospective living labs for real-world environments. This includes preparing policies for the development of future-oriented living labs, establishing innovative living labs for practical applications, and designing future-ready living labs to address real-world challenges.

Key Words : Prospects of Living Labs, Policy Suggestions, Millennials, Generation Z

I. Introduction

A living lab serves as a better environment by enhancing citizens' lives. A study by [1] emphasized

that the aim of the live-in lab was to establish a co-creative open platform for research and education, with the objective of bridging the gap between industry and academia. A study by [2] underscored the importance of adopting a citizen-centric living lab methodology in smart cities to effectively address burgeoning urban challenges. A study by [3]

* Professor, KDI School of Public Policy and Management (Corresponding Author)

highlighted the living lab concept as a promising platform for testing technologies and supporting the transition towards sustainable energy systems. This recognition underscores the role of living labs in driving innovation, fostering collaboration, and accelerating the adoption of renewable energy and energy-efficient solutions [3]. A study by [4] emphasized how the integration of smart technology enabled solutions to address various societal challenges, coupled with a concentrated focus on urban areas as pivotal agents of transformation, gave rise to the notion of smart cities. This conceptual framework underscores the importance of leveraging technological innovations within city environments to enhance efficiency, sustainability, and quality of life for residents [4]. A study by [5] emphasized that although urban living labs have been implemented in many cities, their organizational and legal structures have not often been thoroughly analyzed. The initiatives of living labs represent a collaborative effort to leverage living labs as platforms for experimentation, co-creation, and community engagement within the context of broader European innovation projects [5]. A study by [6] highlighted that living labs have emerged as a crucial interface for higher education institutions to collaborate with companies, citizens, non-profit organizations, and government entities in addressing a wide range of social challenges and advancing sustainable development. This collaboration fosters innovation, knowledge exchange, and practical solutions to complex problems [6].

Based on these considerations, this research aims to investigate factors that influence the prospects of living labs, which play a crucial role in a real-world environment. Living labs are environments or

platforms where technologies, products, and services are co-created, tested, and validated in real-life settings. This study proposed a comprehensive framework to investigate the influence of citizen awareness, perceived definition, willingness to participate, the role of local government, and expected satisfaction on prospects for living labs - a topic that has received relatively little attention in previous research on living labs. This study employed quantitative research methods to investigate citizens' perceptions, specially focusing on classifying Millennials and Generation Z, an aspect that has been rarely explored in previous research on living labs. This study investigates the engagement and adoption of innovations within living labs by Millennials and Generation Z, as well as their perceptions of the potential of living labs. By utilizing quantitative techniques, the study aimed to systematically analyze and quantify the viewpoints and attitudes of these generational cohorts towards living labs, providing valuable insights into how younger demographics engage with and perceive these innovative urban environments. This approach fills a significant gap in the existing literature, offering a nuanced understanding of Millennials' and Generation Z's perspectives within the context of living labs. This study formulated the following research questions: i) how does citizen awareness impact the prospects of living labs? ii) how does perceived definition impact the prospects of living labs? iii) how does willingness to participate impact the prospects of living labs? iv) how does the role of local government impact the prospects of living labs? v) how does expected satisfaction impact the prospects of living labs? and vi) how the prospects of living labs impact on willingness to participate in living labs for public service and

engage in policy discussions related to living labs.

the literature on public administration for its implications on administrative paradigms, organizational structures, and responsibilities.

II. Literature Review

2.1 Definition of Living Labs

A study by [8] introduced students to community operations research by employing a city neighborhood as a living laboratory. A study by [1] defined living labs as open innovative ecosystems situated in real-life environments, utilizing iterative feedback processes throughout the lifecycle approach of an innovation to generate sustainable impact. A study by [9] emphasized that urban living labs are public spaces where local authorities engage citizens in the development of innovative urban services, utilizing a methodology grounded in open innovation, experimentation, and citizen engagement. A study by [10] asserted that living labs serve as a valuable instrument for identifying community needs, enhancing local development, and facilitating the integration of technological and social innovations into policies and local governance processes. A study by [11] discussed how living labs implement innovation mechanisms within various living lab networks, focusing on coordination and participation perspectives. A study by [12] highlighted that living labs are acknowledged as a progressive approach to fostering innovation and enhancing collaborative planning, receiving significant attention from the research and innovation agendas of the European Union in recent years. A study by [9] also highlighted the concept of co-production, extensively analyzed in

<Table 1> Definition of Living Labs

Literatures	Definition of Living Labs
[7]	A novel strategy for spurring innovation opportunities in education for sustainability.
[1]	An open innovative ecosystems situated in real-life environments.
[9]	Public spaces where local authorities engage citizens in the development of urban services.

2.2 Cases of Living Labs

A study by [9] highlighted three experiences of urban living labs made in Amsterdam, Boston, and Turin. In their analysis, [13] examined the implementation of the Torino Living Lab initiative in Turin, Italy, focusing on the collaborative efforts between firms, public bodies, universities, and communities to create innovation within the urban context. The Torino Living Lab represents a dynamic ecosystem where diverse stakeholders come together to foster innovation and address urban challenges through participatory approaches [13]. A study by [14] analyzed two living labs including Citilab in the city of Cornellà and the network of fab athenaeums in the city of Barcelona. The study by [14] explored how Citilab leverages the digital impact to cultivate creative thinking, design, and innovation within the

realm of digital culture. According to [15], the living lab known as Botnia focuses on the development of innovative IT services or products, with real users, based on user needs, within a real-world context, and is open to all types of IT stakeholders. A study by [2] examined the Seongdaegol Living Lab in South Korea which originated as a community initiative led by local mothers to establish a children’s library in 2010. Over time, this initiative evolved into a vibrant hub for local mother’s exchange activities and a communal space serving various public purposes within the locality [2].

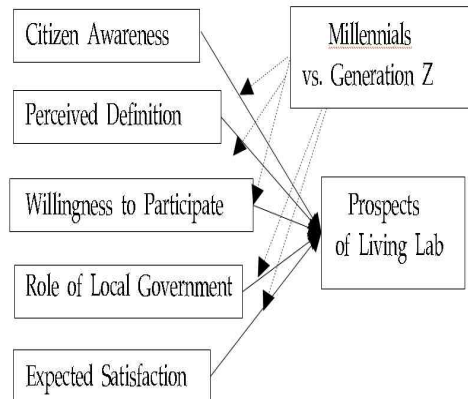
2.3 Prospects of Living Labs

A study by [2] highlighted the online progression of smart cities through the consistent conceptualization and implementation of living labs. A study by [16] emphasized that living laboratories are a prevalent smart city intervention with the potential to mitigate power imbalance and empower citizens to actively shape the development of smart cities. A study by [17] explored how living labs contribute to promoting urban entrepreneurship in towns and cities and their sustainability. A study by [17] found the results that living labs are the cradle for urban entrepreneurship and a vehicle for economic and social development and sustainability. A study by [14] discussed how living labs, acting as intermediaries, serve as environments conducive to supporting public open innovation processes. A study by [14] also explored how living labs offer the opportunity for public agencies to engage with private sector organizations, fostering collaboration and innovation in a shared environment. A study by [7] emphasized that

implementing living labs for innovation, particularly within the realm of real-world sustainability challenges, hinges upon collaboration founded on mutual agreement and trust among stakeholders.

III. Hypotheses Development

The conceptual model of this study is summarized in Figure 1.



<Figure 1> The Conceptual Model

3.1 Effects of Citizen Awareness on Prospects of Living Labs

A study by [15] discussed the concept of a living lab as both an innovation milieu and an innovation approach, presenting two distinct perspectives to clarify its role and purpose. A study by [15] also addressed that a living lab is an open innovation environment in real-life settings in which user-driven innovation is the co-creation process for new services,

products, and societal infrastructures. A study by [18] highlighted the critical role of citizens' acceptance and behavioral intention in influencing the adoption and outcomes of smart city projects. However, [2] addressed that contrary to expectations, technology-centric smart city development has resulted in a lack of opportunities for citizen participation. A study by [2] also examined the significance of citizens' active participation in living labs and identified the factors that shape the level of engagement. This study proposed that individuals' awareness of what living labs entail, including their objectives, processes, and potential outcomes, could shape their perceptions and attitudes towards participating in or supporting these innovation environments. This study suggests that the level of awareness among citizens, specifically within younger demographic groups like Millennials and Generation Z, about the purpose, benefits, and opportunities offered by living labs could significantly impact their interest, engagement, and support for such initiatives. This study hypothesized that citizen awareness could influence the prospects of living labs, particularly concerning Millennials and Generation Z.

H1a: Citizen awareness has a significant impact on the prospects of living labs in the case of Millennials.

H1b: Citizen awareness has a significant impact on the prospects of living labs in living labs in the case of Generation Z.

3.2 Effects of Perceived Definition on Prospects of Living Labs

This study explores how citizens' awareness of the definition of living labs influences their perceptions

and prospects regarding living labs. The concept of living labs originated in Europe [12] and has since gained global recognition as a model for open innovation and user-centered design in urban and regional development. A study by [19] emphasized that when implementing the living labs approach within the context of sustainable development in suburbs, it is crucial to prioritize society's collective goals as articulated by municipalities and users [19]. This underscores the importance of aligning living lab initiatives with broader societal objectives related to sustainability, urban resilience, and community well-being [19]. A study by [20] discussed the growing prominence of living labs as a research methodology aimed at enhancing the participation of end-users in the development and implementation process of an innovation. A study by [20] also underscored the significance of living labs in enhancing end-user participation and engagement in innovation research. This study suggests that how Millennials and Generation Z perceive and define living labs can impact their interest and willingness to engage with such initiatives. This study hypothesized that perceived definition could influence the prospects of living labs, especially among Millennials and Generation Z.

H2a: The perceived definition of living labs has a significant influence on the prospects of living labs in the case of Millennials.

H2b: The perceived definition of living labs has a significant influence on the prospects of living labs in living labs in the case of Generation Z.

3.3 Effects of Citizens' Willingness to Participate on Prospects of Living Labs

A study by [16] emphasized that citizens' most esteemed resources lies in their co-creation capabilities, particularly magnified in the Internet era. A study by [16] also highlighted that they advocate for a concept of digital social innovation, wherein innovators, users, and communities engage in collaborative efforts facilitated by digital technologies to co-create knowledge and solutions aimed at addressing diverse social needs. A study by [21] explored the role of participatory technology in empowering individuals to actively engage as participants in public issues, thereby fostering greater civic involvement and democratic participation. A study by [22] conducted an analysis on networks as platforms for integrating pre-existing idiosyncratic resources alongside emergent resources and benefits derived from rich and regular interactions. A study by [22] also addressed that these interactions encompass various forms such as learning, enjoyment, reputation building, identification, and fostering positive attitude toward citizen participation. This study posits that facilitating living labs involves engaging with potential participants and end-users who will be actively involved in testing and providing feedback on innovations within the living lab. This inclusive approach enhances the validity and effectiveness of the living lab outcomes by considering the needs and preferences of various user groups. This study hypothesized that citizens' willingness to participate in living labs positively influences the prospects of living labs, particularly concerning Millennials and Generation Z.

H3a: The level of citizens' willingness to participate in living labs significantly impacts the prospects of living labs in the case of Millennials.

H3b: The level of citizens' willingness to participate

in living labs significantly impacts the prospects of living labs in living labs in the case of Generation Z.

3.4 Effects of The Role of Local

Government on Prospects of Living Labs

A study by [2] noted that the village movement within the Seongdaegol Living Lab in South Korea evolved into a self-sufficient energy initiative, influenced by both grassroots efforts and local government policies. A study by [21] highlighted in their study on participatory technologies in smart cities that respondents expressed a need for user-friendly tools and positive feedback from the local government to effectively engage in civic participation. A study by [5] studied a living lab as part of a large European project that involved multiple cities testing technologies and focusing on creating a living community to support a local ecosystem of innovation. A study by [5] underscores the need for a deeper understanding of the governance models, organizational frameworks, and legal frameworks that underpin the operation and success of urban living labs. This study hypothesized that the involvement of local government could influence the prospects of living labs, particularly concerning Millennials and Generation Z.

H4a: The involvement of local government significantly impacts the prospects of living labs in the case of Millennials.

H4b: The involvement of local government significantly impacts the prospects of living labs in living labs in the case of Generation Z.

3.5 Effects of Expected Satisfaction on Prospects of Living Labs

A study by [23] highlighted that smart city app artifacts are intricately connected to citizens' psychological, social, and political empowerment. A study by [23] also posit that these apps play a significant role in shaping citizens' satisfaction with both the smart city technology and government. A study by [24] emphasized the importance of long-term participation in living labs by examining key factors such as participants' satisfaction, perceived burden, and motivational drivers and needs. This study suggests that Millennials and Generation Z individuals' expectations of what they will gain from participating in living labs can influence their likelihood of engaging with these initiatives. If they anticipate positive experiences, valuable outcomes, and meaningful contributions through their involvement in living labs, they may be more inclined to participate. Expected satisfaction reflects the anticipated benefits and value that Millennials and Generation Z associate with participating in living labs. This study proposes that higher expected satisfaction levels lead to increased motivation among Millennials and Generation Z to actively engage and contribute to living labs. Positive expectations can drive enthusiasm, commitment, and investment in collaborative innovation efforts. This study hypothesized that expected satisfaction could influence the prospects of living labs, especially among Millennials and Generation Z.

H5a: Expected satisfaction significantly influences prospects on living labs in living labs in the case of Millennials.

H5b: Expected satisfaction significantly influences prospects on living labs in living labs in the case of Generation Z.

3.6 Effects of Prospects of Living Labs on Intention to Participate

A study by [4] emphasized that recent technological evolutions have fostered a fresh belief in the positive effects of innovative technologies in a city. A study by [25] examined the concept of user innovation within living labs, emphasizing the collaborative co-creation of value with users in real-life environments. A study by [25] also delved into understanding the link between the mechanisms employed by user innovators and the resulting innovation outcomes within the context of living labs. A study by [13] provided insightful policy recommendations for cities seeking to establish urban living labs, outlining best practices for their design, implementation, and management. A study by [26] highlighted good practices and delivered some policy innovations and could inspire living labs to promote innovation and encourage transition towards sustainable development at the local level. This study examined the relationship between prospects for living labs and willingness to engage in policy discussions related to living labs. This study posits that the perceived potential and opportunities offered by living labs, such as opportunities for innovation, co-creation, and impact in public service and policy domains, will influence Millennials and Generation Z's intention to participate. Therefore, this study hypothesized the impact of the prospects for living labs on intention to

participate in living labs for the public service and engage in policy discussion related to living labs, particularly concerning Millennials and Generation Z.

H6a: The prospects for living labs significantly influences intention to participate in living labs for the public service in the case of Millennials.

H6b: The prospects for living labs significantly influences intention to participate in living labs for the public service in the case of Generation Z.

H7a: The prospects for living labs significantly influences intention to participate in policy discussion for living labs for the public service in the case of Millennials.

H7b: The prospects for living labs significantly influences intention to participate in policy discussion for living labs for the public service in the case of Generation Z.

IV. Methodology

This study utilized an online survey administered with the support of a reputable survey agency. The survey began with warm up questions designed to assess participants' awareness of living labs, followed by inquiries addressing the proposed variables, and concluded with demographic questions. This study highlights popular examples of living labs before posing survey questions to ensure that citizens are familiar with living labs. This study incorporates various proposed variables including citizen awareness, perceived definition, willingness to participate, the role of local government, and expected satisfaction. The study will apply 5-point Likert scales for major

proposed items (1 - strongly disagree, 5 - strongly agree). This study examines how Millennials and Generation Z engage with and adopt innovations within living labs, alongside exploring their perceptions of the potential of living labs.

This study collected 217 responses including 135 responses from Millennials and 82 responses from Generation Z. A study by [27] defined that Generation Y, or Millennials, as those born between 1980 and 1994, while Generation Z encompasses those born between 1995 and 2010. A study by [28] noted that Millennials, having grown up in the digital age, exhibit greater familiarity with communication, media, and digital technologies compared to previous generations. A study by [29] emphasized that Millennials enjoy using technology and became dependent on it at an earlier age compared to other generations. A study by [30] defined Generation Z as those born after 1995, characterized by their digital nativism and unique traits. Millennials and Generation Z differ significantly in several aspects related to technology and digital engagement. Indeed, the differences between Millennials and Generation Z reflect the dynamic evolution of technology, digital culture, and shape distinct generational behaviors and preferences. This study posits that living labs can be particularly engaging for Millennials and Generation Z, since these technology-savvy cohorts are often eager to participate in innovative projects and provide valuable insights.

The survey employed stratified sampling, considering factors such as gender, age, and education levels. This study conducted an online survey in South Korea to assess the potential of living labs.

〈Table 2〉 Demographics of Respondents

Classification	% (Millennials)	% (Gen Z)
Gender		
Male	48.9	50.0
Female	51.1	50.0
Age		
20-24 years old	-	8.1
25-29 years old	-	29.0
30-34 years old	38.5	-
35-39 years old	23.7	-
40-44 years old	37.8	-
Education		
High School Graduate	11.9	20.7
In College	8.9	26.8
Bachelor's Degree	73.3	48.8
Graduate Degree	5.9	3.7
Annual Salary		
Below KRW 10,000,000	11.1	20.7
More or equal to KRW 10,000,000 ~ below KRW 20,000,000	8.1	8.5
More or equal to KRW 20,000,000 ~ below KRW 30,000,000	14.8	28.0
More or equal to KRW 30,000,000 ~ below KRW 40,000,000	19.3	30.5
More or equal to KRW 40,000,000 ~ below KRW 50,000,000	15.6	7.3
More or equal to KRW 50,000,000 ~ below KRW 60,000,000	11.1	1.2
More or equal to KRW 60,000,000 ~ below KRW 70,000,000	9.6	2.4
More or equal to KRW 70,000,000	10.4	1.2

In terms of gender distribution, among Millennials, 48.9% of respondents were male and 51.1% were female. For Generation Z, the distribution was equal, with 50.0% male and 50.0% female respondents. In terms of age distribution, the respondents were categorized as follows: 8.1% in the 20-24 age group, 29.0% in the 25-29 age group, 38.5% in the 30-34 age

group, 23.7% in the 35-39 age group, and 37.8% in the 40-44 age group. In terms of educational distribution, among Millennials, 11.9% of respondents held a high school degree, 8.9% attended college, 73.3% obtained a bachelor's degree, and 5.9% held a graduate degree. For Generation Z, 20.7% of respondents held a high school degree, 26.8% attended college, 48.8% obtained a bachelor's degree, and 3.7% held a graduate degree. This study employed factor analysis, ANOVA, and multiple regression analysis to scrutinize the proposed hypotheses.

V. Data Analysis

5.1 Perceived Definitions of Living Labs

Among the proposed definitions, this study found that a total of 48.9% of Millennials agreed and strongly agreed that living labs contribute to a sustainable society and promote social interaction, while a total of 50.0% of Generation Z agreed and strongly agreed with this perspective. This study also found that 49.9% of Millennials agreed and strongly agreed that living labs are integrated networks facilitated by open innovation and user-centered research, while 54.9% of Generation Z shared this perspective. This study also found that 48.1% of Millennials agreed and strongly agreed that living labs involve induced user participation, while 52.5% of Generation Z shared this perspective. This study also found that 67.0% of Millennials agreed and strongly agreed that living labs are online platforms facilitating integrated processes for identifying and resolving urban issues related to the environment, energy, and well-being, while 63.4% of

Generation Z shared this perspective.

〈Table 3〉 Perceived Definition (Millennials/Generation Z)

Classification		Agree (%)		Strongly agree (%)	
		M	Z	M	Z
1	Living labs for sustainable society and social interaction.	37.8	30.5	11.1	19.5
2	Living labs for integrated network through open innovation and user-centered research.	37.8	37.8	11.1	17.1
3	Living labs to induce user participation.	34.8	35.4	13.3	17.1
4	Living labs are online platforms that facilitate integrated processes for identifying and resolving urban issues such as those related to the environment, energy, and well-being.	42.2	36.6	14.8	26.8
5	Living labs are user-centered, open innovative eco-systems based on systematic co-creation.	42.2	26.8	11.9	24.4

This study also found that 54.1% of Millennials agreed and strongly agreed that living labs are user-centered, open innovative eco-systems based on systematic co-creation, while 51.2% of Generation Z shared this perspective. Additionally, among Millennials who are aware the living labs, 19.6% agreed or strongly agreed that they are aware of living labs, and 5.9% have participated in living labs. Furthermore, 43.0% of Millennials expressed that they

would expect satisfaction through participation opportunities if given the chance to participate in living labs. Additionally, 8.1% of Millennials strongly expressed this expectation. 22.0% of Generation Z agreed or strongly agreed that they are aware the living labs, 13.4% of Generation Z have participated in living labs. Additionally, 52.4% of Generation Z expressed that they would expect satisfaction through participation opportunities if given the chance to participate in living labs. Furthermore, 6.1% of Generation Z strongly expressed this expectation.

5.2 Hypotheses Testing

This study measured the reliability of proposed variables by checking Cronbach's alpha. Cronbach's alphas in the case of Millennials were found to be as follows: 0.814 for citizen awareness, 0.817 for perceived definition, 0.892 for willingness to participate, 0.899 for the role of local government, 0.743 for expected satisfaction, and 0.901 for prospects on living labs. Cronbach's alphas in the case of Generation Z were found to be as follows: 0.815 for citizen awareness, 0.809 for perceived definition, 0.888 for willingness to participate, 0.904 for the role of local government, 0.785 for expected satisfaction, and 0.908 for prospects on living labs.

Citizen awareness [32] refers to the level of knowledge, understanding, and consciousness that individuals possess about issues, events, or matters affecting their community, society, or environment. It encompasses awareness of social, political, environmental, and economic issues that impact individuals and collective well-being. Citizen awareness involves being informed about current

events, policies, laws, rights, and responsibilities as members of a society or community. It empowers

individuals to participate in civic activities, engage in informed decision-making, and advocate for causes that align with their values and interests.

<Table 4> Questionnaire Items

Factor	Questionnaire Items
Citizen Awareness	How aware citizens are of the meaning of living labs, the application of living labs in society, how citizens prefer to receive more information to improve their understanding of living labs, and how citizens perceive the necessity of promotion on living labs to enhance their perception.
Perceived Definition	How citizens perceive definitions of living labs as international space for sustainable society, open innovative network space, methods to attract user participation, online platform to solve problems in society, and/or open innovative eco-system for better living environment.
Participate Intention	How citizens intend to participate in living labs if more opportunities and information are provided and opportunities are provided with easy access.
Role of Local Government	How citizens perceive the efforts of local governments to deliver the meaning of living labs to citizens and apply living labs in society, persuade citizens to participate in living labs, offer better public service by applying living labs, and promote living labs actively.
Expected Satisfaction	How citizens expect satisfaction with living labs and overall satisfaction by utilizing living labs.

Enhancing citizen awareness is often considered crucial for promoting active citizenship, democratic participation, and social change. The perceived definition [33] in this study refers to how living labs are understood, interpreted, or recognized by citizens based on their subjective perception or viewpoint. Participation intention [34] refers to an citizens' opportunity or willingness to engage in a living labs. It reflects the citizens' readiness or desire to take part in a specific action or initiative. The role of local government [35] refers to the responsibilities, functions, and duties performed by governing bodies at the local or municipal level within a specific geographical area. Local governments are typically responsible for managing and overseeing various aspects of public life and community well-being within their jurisdiction. Expected satisfaction reflects the consumer's or citizen's predictions or expectations regarding the performance, quality, and overall experience associated with the offering [36]. Table 4 summarized the questionnaire items applied in this study for major variables.

Factor analysis was employed to extract scale items. Principal component analysis was employed as the method for extraction, with maximum iterations for convergence. Factors with eigenvalues greater than 1 were extracted. VARIMAX with Kaiser Normalization was applied as the rotation method, with maximum iterations for convergence.

Table 5~6 presented a summarized component matrix, including factor loadings.

<Table 5> Component Matrix for Citizen Awareness, Perceived Definition, Willingness to Participate, Role of Local Government, & Expected Satisfaction (Case of Millennials)

Factor	Component					
	1	2	3	4	5	6
CA4	.87					
CA3	.85					
CA2	.78					
CA1	.75					
CA5	.54					
PD4		.84				
PD3		.81				
PD2		.80				
PD1		.78				
PD5		.58				
WP3			.92			
WP2			.90			
WP4			.80			
LG1				.87		
LG3				.86		
LG2				.85		
LG4				.84		
LG5				.83		
ES2					.89	
ES3					.88	
ES1					.87	
PR3						.87
PR6						.86
PR5						.83
PR2						.82
PR1						.80
PR4						.71

WP3			.92			
WP2			.90			
WP4			.76			
LG1				.89		
LG3				.87		
LG2				.86		
LG4				.83		
LG5				.82		
ES2					.91	
ES3					.90	
ES1					.80	
PR3						.89
PR6						.86
PR5						.83
PR2						.80
PR1						.80
PR4						.79

Multiple regression analysis was employed to test hypotheses, incorporating factor scores utilized as variables in the analysis. In this study, the independent variables included citizen awareness, perceived definition, willingness to participate, the role of local government, and expected satisfaction. The dependent variable employed in this study was prospects on living labs. The results of the ANOVA in the case of Millennials revealed that the overall model is significant, with an Fvalue of 50.689 at the 0.01 significance level and an R-square of 0.660. The results of the ANOVA in the case of Generation Z revealed that the overall model is significant, with an Fvalue of 30.199 at the 0.01 significance level and an R-square of 0.665. Table 7 illustrated that in this study, the effects of citizen awareness, willingness to participate, the role of local government, and expected satisfaction on prospects for living labs were found to be significant in the case of Millennials. Specifically, the effects of citizen awareness, willingness to participate, and expected satisfaction on prospects on living labs were significant at the 0.01 significance level, while the role of local government on prospects on living labs

<Table 6> Component Matrix for Citizen Awareness, Perceived Definition, Willingness to Participate, Role of Local Government, & Expected Satisfaction (Case of Generation Z)

Factor	Component					
	1	2	3	4	5	6
CA4	.93					
CA3	.89					
CA2	.88					
CA1	.70					
CA5	.66					
PD4		.85				
PD3		.84				
PD2		.83				
PD1		.76				
PD5		.56				

showed significance at the 0.05 level in the case of Millennials.

〈Table 7〉 Effects of Proposed Factors on Prospects of Living Labs

Independent Variables => Dependent Variable	Standardized Coefficient (t-value/sig) Millennials	Standardized Coefficient (t-value/sig) Generation Z
Citizen Awareness => Prospects of Living Labs	.299 (3.866***)	.069 (.703)
Perceived Definition => Prospects of Living Labs	.083 (1.118)	.413 (4.096***)
Willingness to Participate => Prospects of Living Labs	.255 (3.391***)	.023 (.233)
Role of Local Government => Prospects of Living Labs	.114 (1.993**)	.077 (.917)
Expected Satisfaction => Prospects of Living Labs	.240 (2.626***)	.468 (4.670***)

*** $p < 0.01$; ** $p < 0.05$; denotes statistical significance

Table 7 illustrated that in this study, the effects of perceived definition and expected satisfaction on

prospects for living labs were found to be significant at the 0.01 significance level in the case of Generation Z. Among the significant factors, the study found that the effect size was highest for the expected satisfaction on prospects on living labs followed by citizen awareness, willingness to participate, and the role of local government in the case of Millennials. The results of this study found that the effect size was higher for expected satisfaction on prospects for living labs compared to the effect of perceived definition on prospect for living labs in the case of Generation Z. As indicated in Table 7, hypotheses H1a, H2b, H3a, H4a, and H5a and H5b were accepted.

This study also conducted regression analyses to examine the effect of prospects for living labs on the intention to participate in living labs for the public service. For the effect of prospects for living labs on intention to participate in living labs for the public service, the results of the ANOVA revealed that the overall model is significant with an F-value of 105.525 at the 0.01 significance level and R-square of 0.442 in the case of Millennials, while the results of the ANOVA revealed that the model was significant with an F-value of 32.718 at the 0.01 significance level and an R-square of 0.290 in the case of Generation Z. For the effect of prospects for living labs on intention to engage in policy discussion for living labs, the results of the ANOVA revealed that the model was significant with an F-value of 72.339 at the 0.01 significance level and an R-square of 0.352 in the case of Millennials, while the results of the ANOVA revealed that the model was significant with an F-value of 25.848 at the 0.01 significance level and an R-square of 0.244 in the case of Generation Z. As indicated in Table 8, hypotheses H6a, H6b, H7a, and H7b were accepted.

〈Table 8〉 Effects of Prospects of Living Labs on Intention

Independent Variables => Dependent variable	Standardized Coefficient (t-value/sig) Millennials	Standardized Coefficient (t-value/sig) Generation Z
Prospect for Living Labs => Intention to Participate in Living Labs	.655 (10.273 ^{***})	.536 (5.672 ^{***})
Prospect for Living Labs => Willingness to Engage in Policy Discussion for Living Labs	.569 (7.985 ^{***})	.494 (5.084 ^{***})

*** $p < 0.01$; ** $p < 0.05$ denotes statistical significance

effects of perceived definition and expected satisfaction on the prospects for living labs were significant for Generation Z. However, the effects of perceived definition on the prospects for living labs did not were not significant in the case of Millennials. The effects of citizen awareness, willingness to participate, and the role of local government on the prospects for living labs were not significant in the case of Generation Z. Therefore, the results imply that Millennials who are aware of the prospects for living labs are willing to participate in living labs for societal development. However, Generation Z appear to be less aware of the prospects for living labs, consequently, their willingness to participate in living labs was not significant. The results also imply that Millennials perceive the role of local government as important for the establishment of living labs in society. Furthermore, the results of this study indicate that the impacts of prospects for living labs on willingness to participate in living labs and engage in policy discussion related to living labs were significant for both Millennials and Generation Z.

VI. Conclusion

6.1 Findings

This study investigates the factors influencing the prospects of living labs, which play a crucial role in a real-world environment. By examining Millennials and Generation Z, this study explores the impact of factors such as citizen awareness, perceived definition, willingness to participate, the role of local government, and expected satisfaction on the prospects for living labs. Furthermore, this study also examined the impacts of prospects for living labs on intention to participate in living labs and engage in policy discussion related to living labs. The results of this study indicate that the effects of citizen awareness, willingness to participate, the role of local government, and expected satisfaction on the prospects for living labs were significant for Millennials, whereas the

6.2 Managerial and Policy Implications

The results offer managerial and policy implications. Firstly, the insignificance of the effects of perceived definition on the prospects for living labs in the case of Millennials implies that promotional policies aimed at fostering the understanding and significance of living labs in real-world environments should be better developed. Secondly, the insignificance of the effects of citizen awareness, willingness to participate, and the role of local government on the prospects for living labs in the case of Generation Z implies that policies

targeting to these generations should emphasize the importance of living labs and participation for regional development and improved quality of life. Among the definitions, both Millennials and Generation Z better perceive living labs as online platforms that facilitate integrated processes for identifying and resolving urban issues such as those related to the environment, energy, and well-being, as well as user-centered, open innovative eco-systems based on systematic co-creation. The results suggest that definitions of living labs emphasizing user participation, user-centered research via integrated networks, and promoting a sustainable society and social interaction should be better emphasized for both Millennials and Generation Z. This study provides valuable insights into the role of public understanding and awareness in fostering innovation and participation in living lab initiatives. In conclusion, this study suggests the importance of developing better policies to create prospective living labs for real-world environments. This includes preparing policies for the development of future-oriented living labs, establishing innovative living labs for practical applications, and designing future-ready living labs to address real-world challenges. The results also suggest that prospects of living labs lead are associated with increased willingness to participate in living labs for societal development and engage in policy discussions related to living labs, highlighting the importance of these initiatives. As stated by [31], this study advocates for the implementation of New Public Management in living labs as an innovative approach to foster collaboration and experimentation in public service delivery.

Living labs offer unique opportunities for

individuals to actively engage in innovation and co-creation processes. The prospect of contributing to the development of new technologies, services, and policies can be highly appealing to individuals, particularly Millennials and Generation Z who are often eager to be part of transformative projects. Since living labs provide hands-on, experiential learning environments where participants can gain practical skills and knowledge, this aspect can attract younger generations who value continuous learning and personal development. The potential to make a tangible impact on societal issues through living labs can motivate individuals to participate. Millennials and Generation Z are generally interested in contributing to social causes and may view living labs as platforms for meaningful civic engagement. Living labs often leverage smart technologies and digital solutions, aligning well with the preferences of younger generations who are accustomed to digital connectivity and innovative solutions. The prospect of engaging with cutting-edge technologies can be a strong motivator for participation. Living labs emphasize transparency, collaboration, and openness in decision-making processes. Therefore, this can enhance trust and confidence among participants, encouraging them to actively participate in policy discussions and public service initiatives within living labs.

Millennials and Generation Z are increasingly interested in influencing policy decisions and urban development processes. The prospects of living labs offering a platform to directly influence policies and shape future urban environments can attract active participation from these demographics. Overall, the positive prospects associated with living labs, including opportunities for innovation, experiential learning,

social impact, technological engagement, transparency, and policy influence, can significantly enhance individuals' willingness to participate in living labs for public service and engage in policy discussions within these dynamic settings. The alignment of living labs with the values and aspirations of younger generations can further bolster their active involvement in shaping the future of cities through these innovative platforms. Moreover, as highlighted in a previous study by [37], implementing more effective strategies tailored to younger generations could enhance build customer relationship management.

6.3 Limitations and Future Research

This study acknowledges its limitations and proposes directions for future research. Future studies could enhance robustness by increasing the sample size. Future research could investigate the varying impacts of living labs by comparing successful and unsuccessful cases. Future research could explore Millennials and Generation Z by examining their social and personal characteristics, as investigated in a previous study [38].

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■ 저자소개 ■



조 윤 정
(Cho Yooncheong)

Professor, KDI School of Public Policy and Management
 May 2002, Rutgers University (Ph.D. in Management)
 May 1995, Cornell University (MBA)
 Fields of Interest: E-Commerce Marketing, Customer Relationship Management
 E-mail : yoonji22e@gmail.com

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