

Workforce Adaptability among Gen Z Employees in Industry 5.0: A Freight and Logistics Perspective

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Abstract—The shift to Industry 5.0 has increased the need for a flexible workforce that can work well in settings where humans and technology collaborate, especially in the freight and logistics sector. There was limited research examining how digital and psychological capabilities collectively impact the adaptability of the Gen Z workforce in Industry 5.0. This study investigated the effect of digital competency, learning orientation, and technological optimism on Gen Z workforce adaptability through the mediating effect of self-efficacy. Data was collected via a structured questionnaire administered to Gen Z employees in Sri Lanka's freight and logistics industry and analyzed using partial least squares structural equation modelling (PLS-SEM). The findings indicate that individual capabilities significantly influence Gen Z workforce adaptability to Industry 5.0. The study provides practical guidance for organizations by emphasizing the importance of strengthening job-related digital competencies and fostering a continuous learning culture to enhance employee confidence and performance. As this cross-sectional study focuses on Gen Z employees in Sri Lanka's freight and logistics sector, the findings may have limited generalizability. Future research should consider longitudinal and cross-cultural approaches to enhance broader applicability.

Keywords—Freight and Logistics, Gen Z, Industry 5.0, Skill Gap, Work Force Adaptability

I. INTRODUCTION

The foundation known as Industry 5.0 will revolutionize the way companies are structured going forward. It will focus on creating and training an adaptable workforce with the aim of increasing effectiveness and efficiency, using the latest and emerging digital technologies. Furthermore, it is committed to creating human-centric, intelligent, and resilient manufacturing systems in line with Industry 5.0 [1]. The companies in the freight and logistics sector are beginning to re-evaluate their operations and employee engagement focusing on the use of intelligent platforms and data-driven automation initiatives. These developments will increase the need for employees to fill newly created job vacancies [2]. Gen Z is expected to become the majority workforce in Sri Lanka's logistics industry. They will need ongoing training, technical confidence, and very strong self-confidence to succeed in current digitalized environment [3, 4]. Therefore, the adaptability of Gen Z employees can be seen as a critical

component of Industry 5.0 readiness. There has been an emphasis on technology when discussing Industry 5.0 as a model centered around the human aspect. There is limited attention has been given to the psychological skills and behaviorally preparedness of workers. Thus, they can adapt and adjust their skills to new job requirements [5]. Considering past literature, there is very limited empirical evidence on how individual capabilities of digital competency (DC), learning orientation (LO) and technological optimism (TO) affect the adaptability of the entire workforce and how they respond to it. The most studies have concentrated on manufacturing, IT, and apparel [6]. Hence, there is a limited understanding of the freight and logistics industry in Sri Lanka. In developing economies, there has been limited attention to the role of self-efficacy (SE) as a bridge to enhance the adaptability of individual worker capabilities to the workforce. However, these individual abilities have not been discussed through an integrated framework with SE as the mediating variable. Therefore, this research seeks to answer these interrelated gaps by performing an empirical validation of a human-centric framework (DC, TO, LO → SE → Gen Z workforce adaptability) for Gen Z workers employed in the freight and logistics sector in the nation of Sri Lanka [7-9].

The importance of this study it addresses a critical and timely issue of workforce adaptability among Gen Z workers in this sector in Sri Lanka. This study examines the factors that are essential to support the integration of an effective workforce. It enhances organizational resilience and ensures the sustainable development of Sri Lanka's logistics sector in line with Industry 5.0 principles. From a practical perspective, the findings provide valuable insights to the decision makers for establishing effective training, reskilling, and support mechanisms. It enhances adaptability among Gen Z employees in technology-driven environments. This is important because Gen Z employees represent the future workforce. Hence, making their adaptability is critical to sustaining long-term organizational and national competitiveness. This study aims to investigate how DC, LO, and TO influence Gen Z workforce adaptability to Industry 5.0 in the freight and logistics sector in Sri Lanka through the

mediating effect of SE. The specific objectives of this research are:

- To examine the impact of DC on Gen Z workforce adaptability to Industry 5.0 in Sri Lanka's freight and logistics sector when mediated by SE in Sri Lanka's freight and logistics sector.
- To examine the impact of LO on Gen Z workforce adaptability to Industry 5.0 in Sri Lanka's freight and logistics sector when mediated by SE in Sri Lanka's freight and logistics sector.
- To examine the impact of TO on Gen Z workforce adaptability to Industry 5.0 in Sri Lanka's freight and logistics sector when mediated by SE in Sri Lanka's freight and logistics sector.

II. RELATED WORK AND THEORETICAL BACKGROUND

A. Industry 5.0 and Workforce Adaptability

Industry 5.0 can be described as a human-centric concept that goes beyond the automation-based focus of Industry 4.0. It also encompasses resilient and collaborative manufacturing systems. The adaptability of the workforce is understood as the ability of employees to adapt to continuous learning, flexibility, and the technological, digital, and organizational changes that support it [10].

B. Digital Competency

DC can be defined as the knowledge, skills, and problem-solving abilities required to effectively use digital tools, including communication, technological fluency, and the ability to communicate. Previous Studies show that DC has a significant positive impact on job performance. As state, DC positively affects confidence and adaptability because it strengthens SE related to technology [11]. Furthermore, confirmed that digital literacy improves SE in individuals with high DC. It proves that it improves psychological adaptability in a technologically intensive environment. Also, when focusing on the freight and logistics sector in Sri Lanka, it becomes clear that strong DC are essential for Gen Z's adaptability in Industry 5.0.

C. Technological Optimism

TO refers to individuals' positive attitudes towards technology and the belief that technology enhances efficiency, control, and work outcomes. This is an important attitude that we have identified, as it shapes the readiness to adopt new systems. According to recent literature, TO improves psychological well-being and increases willingness to use new technologies [12]. Furthermore, the literature shows that TO strengthens acceptance and engagement in digital environments. In the freight and logistics sector, this TO supports the Gen Z workforce adaptability.

D. Learning Orientation

LO is the ongoing interest of an individual in acquiring new knowledge, developing skills, and improving their technical skills. Previous studies have shown that employees with a strong learning mindset demonstrate higher levels of confidence and resilience. The research conducted in Sri Lanka provides evidence that employees who are inclined to LO. It typically have high levels of SE and will exhibit positive behaviors [13]. The success and confidence of these employees are directly related to their ability to learn and to

become competent in a variety of tasks [14]. The present work supports the idea that LO work will increase the ability of employees to adapt in a rapidly changing environment, such as that of the Gen Z employee in the Sri Lankan freight and logistics industry under Industry 5.0.

E. Self-efficacy

SE is the belief in individuals' ability to perform tasks efficiently, shaping confidence in responding to digital and work demands. We identified that strong SE beliefs play a valuable mediating role as they enhance confidence and adaptive behavior. Recent findings show that SE significantly increases engagement across sectors and acts as a mediator between supervisor support, work-life balance, and performance [15]. Furthermore, SE influences how digital literacy affects technological stress and it also helps improve adaptive coping [16]. In the freight and logistics sector, higher SE supports the Gen Z workforce adaptability.

F. Theoretical Foundation

In this study, the most appropriate and accurate theories identified, such as technology acceptance theory, social cognitive theory, and human capital theory are used to explain the adaptation of the Gen Z workforce in the industry 5.0. First, technology acceptance theory demonstrates that TO develops the willingness to adopt and effectively use technological systems [17]. This fits well our study. Social cognitive theory posits SE as a key factor [18] influencing adaptive work behavior in tech-centric settings. Additionally, human capital theory shows that DC as a most valuable resource that improves employee adaptability in the changing freight and logistics operations [19]. These perspectives are very useful for the proposed research model in the industry 5.0 environment.

III. CONCEPTUAL FRAMEWORK AND HYPOTHESES

A. Conceptual Framework

The Fig. 1 shows that proposed conceptual framework explains how DC, LO, and TO influence the adaptability of the Gen Z workforce with the mediating effect of SE in the freight and logistics sector in Sri Lanka.

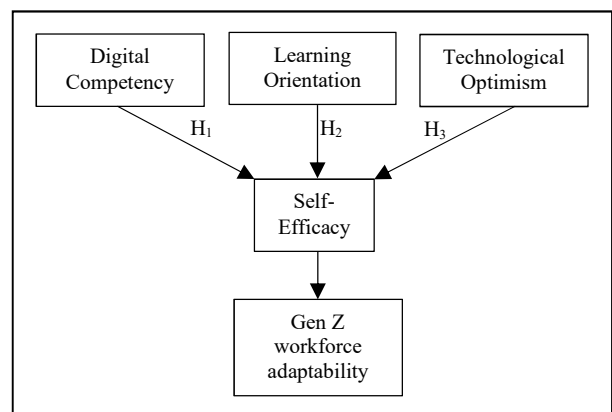


Fig. 1. Conceptual Framework

B. Proposed Hypotheses

- H₁: DC significantly influences Gen Z workforce adaptability through the mediating effect of SE
- H₂: LO significantly influences Gen Z workforce adaptability through the mediating effect of SE.

H₃: TO significantly influences Gen Z workforce adaptability through the mediating effect of SE.

IV. METHODOLOGY

This part covers the research design, population, sampling, data collection and analysis approach in studying adaptable behavior of Gen Z employees engaged in industry 5.0 freight and logistics sector.

A. Research Design

The research methodology for these three objectives follows a clear and organized approach. It begins with a positivist research philosophy. This philosophy focuses on objectives and measurable data, which allows for the use of quantitative methods like surveys and statistical analysis to identify patterns and trends among the study variables. The study uses a deductive research approach. The Study begins with established digital behavior, psychological empowerment and adaptability theories to formulate the hypotheses. The hypotheses will be tested using a mono-method quantitative approach, through the administration of structured questionnaires. The study selected quantitative primary research because it allows statistical analysis to measure variable relationships together with their impact on each other [20]. Thus, confirming research hypotheses and generalizations. A cross-sectional time horizon has been selected for collecting the data at a single instant to enable an immediate understanding of the adaptability levels of Gen Z employees of Sri Lanka, within the parameters of Industry 5.0 Logistics & Freight.

B. Population and Sampling

The target population includes Gen Z employees, aged 18 to 28, working in Sri Lanka's freight forwarding, logistics operations, courier services, warehousing, and port-related activities. The unavailability of reliable and updated data to establish a proper population framework for the target group in Sri Lanka's freight, the study has used a non-probability purposive sampling technique used to select respondents who met the study criteria. This approach allows researchers to purposefully select participants who possess relevant knowledge and experience related to workforce adaptability [21]. The unit of analysis for the study is the individual Gen Z employees working in the different sectors of Sri Lanka's Freight and Logistics. Our sample size is 251, which is determined through considerations of feasibility and scope.

C. Data Collection

The data collection process is continued through a well-structured questionnaire created to gather insights on variables such as DC, LO, TO, SE and Gen Z workforce adaptability. The Pre-testing phase ensures the questionnaire is comprehensible, reliable, and capable of accomplishing its purpose. Furthermore, the operationalization of variables is accompanied by strict validation procedures. The study employs standardized measurement procedures to assess the variables of DC, LO, TO, SE, and adaptability for reliability and validity. Smart PLS is used as software for data analysis in this research and this tool was chosen for its user-friendly interface and suitability for handling small sample sizes and non-normal data distributions [22]. This tool provides a lot of support for advanced statistical analysis, model building,

validation, and hypothesis testing [23]. To explore the complex relationships between the study's key variables. Partial least squares structural equation modelling (PLS-SEM) technique will be used to facilitate testing of causal relationships and predictions [24]. Before the main research was conducted, a pilot test conducted with 100 employee responses collected through company visits where questionnaires were handed out to Gen Z employees working in the freight and logistics sector. This method helped make the indicators more accurate. After the data collection was completed, we confirmed the reliability and validity of the indicators using preliminary tests with SmartPLS. This method has confirmed that this dataset is well and ideally suited for PLS-SEM analysis.

V. RESULTS

A. Characteristics of Respondents

The characteristics of the respondents in the study were summarized by using descriptive statistics. It provides a clear and natural explanation of the respondents' conditions within the research context [25]. The summary of the traits of Gen Z workers in the freight and logistics sector in Sri Lanka. The large no of respondents is male, most are completed bachelor's or undergraduate degrees, and were employed in permanent positions. A large proportion of respondents possessed industry experience of 3 years or less, indicating a high percentage of young professionals. As the sector primarily consists of on-site employment, most respondents worked onsite as well. Detailed characteristics of all respondents present in TABLE I.

TABLE I. CHARACTERISTICS OF RESPONDENTS

	Characteristics of Respondent	Total	%
Gender	Male	146	58.2%
	Female	105	41.8%
Current highest Education Level	G.C.E. O/L or equivalent	6	2.4%
	G.C.E. A/L or equivalent	57	22.7%
	Certificate course	22	8.8%
	Diploma or NVQ qualification	46	18.3%
	Undergraduate	60	23.9%
	Bachelor's Degree	51	20.3%
	Postgraduate	9	3.6%
	Diploma or master's degree		
What is your current employment status?	Permanent	208	82.9%
	Temporary	30	12%
	Contract-based	13	5.2%
Years of Experience in the Transport/Logistics Industry	Less than 1 year	86	34.3%
	1-3 years	96	38.2%
	4-6 years	41	16.3%
Work Modality	Over 6 years	28	11.2%
	On-site	236	94%
	Hybrid	12	4.8%
	Fully remote	3	1.2%

B. Reliability and Validity Test

This study based on predefined constructs and theory, CFA was used to confirm whether the measurement items fit the hypothesized factor structure. It demonstrated the factor structure of the constructs, while the measurement model assessment table evaluated the reliability and validity [26]. The visual representation of CFA model is represented in Fig.

2, and the meaning of the short labels used is defined in the following TABLE II.

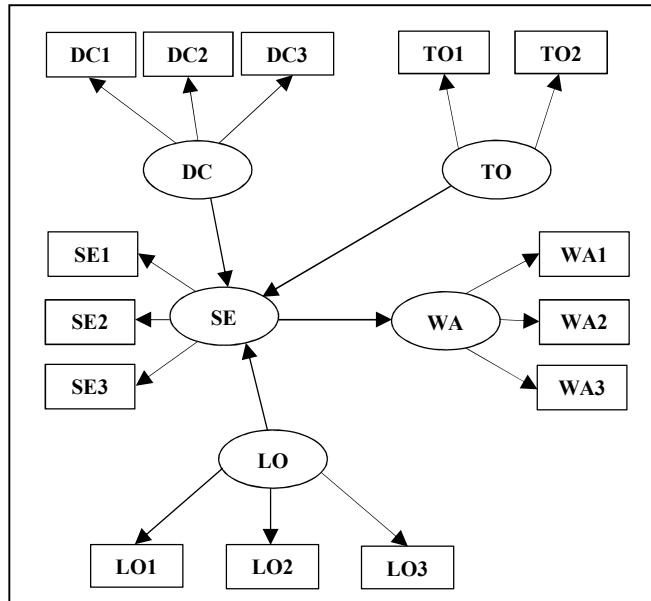


Fig. 2. CFA Full Model

TABLE II. ABBREVIATIONS AND DEFINITIONS OF MEASUREMENT INDICATORS

Variables	Code	Indicator Description
DC	DC1	Digital Work Proficiency
	DC2	Digital safety and data protection
	DC3	Digital innovation and adaptability
LO	LO1	Learning from experience
	LO2	Continuous improvement mindset
	LO3	Feedback driven learning
TO	TO1	Belief in technology-driven improvement
	TO2	Trust in tech-readiness of the organization
SE	SE1	Capability to complete assigned work independently
	SE2	Cross-Generational Confidence
	SE3	Belief in influencing career growth
WA	WA1	Behavioral adaptability
	WA2	Adaptive performance under pressure
	WA3	Change-oriented mindset

The results of the measurement model reliability and validity were conducted by SmartPLS using the values of the Composite Reliability (CR), Cronbach Alpha, and the Average Variance Extracted (AVE), and according to [26]. The results are presented in table TABLE III. The instruments of the study should pass the acceptable internal consistency, and the values are usually more than 0.70 and 0.50 respectively for CR and AVE. For this study, the CR values for all the constructs - DC, LO, TO, SE, and workforce adaptability - exceeded the value of 0.70, and the values of the AVE for all the constructs exceeded the value of 0.50, thus confirming the satisfaction of the conditions for internal consistency and convergent validity, respectively. The value of Cronbach's Alpha for each construct exceeded the value of 0.7. Overall, the results make it possible to confirm that the measurement model is satisfactory.

TABLE III. VALUES ASSOCIATED WITH THE MEASUREMENT MODEL

Variable	Codes	Outer Loadings	Composite Reliability	Cronbach's Alpha	AVE
Digital Competency	DC1	0.853	0.892	0.817	0.734
	DC2	0.898			
	DC3	0.817			
Learning Orientation	LO1	0.828	0.870	0.776	0.690
	LO2	0.841			
	LO3	0.823			
Technological Optimism	TO1	0.858	0.849	0.644	0.737
	TO2	0.859			
Self-Efficacy	SE1	0.875	0.883	0.800	0.715
	SE2	0.828			
	SE3	0.833			
Gen Z Workforce Adaptability	G1	0.882	0.889	0.812	0.727
	G2	0.841			
	G3	0.833			

C. Hypotheses test

The findings illustrate that (H₁) DC → SE → Gen Z has a significantly indirect impact on Gen Z workforce adaptability. The p-value of 0.016 provides evidence of significance at the 0.05 level of significance, thus validating the mediating process of SE for developing better Gen Z workforce adaptability in the Sri Lankan freight and logistics industry on the basis of their digital capabilities.

(H₂) LO → SE → Gen Z workforce adaptability & (H₃) TO → SE → Gen Z workforce adaptability remained consistent in both analyses. Both results produced positive effects using the data sample. H₂ represents an extremely low p-value of 0.001, and H₃ has a p-value of 0.000, indicating that these reliable results are consistent regardless of the sample size. This results in LO and TO effectively predicting SE, and hence the adaptability of Gen Z within the freight and logistics industry. Below TABLE IV represents the details of the results obtained.

TABLE IV. HYPOTHESIS TEST

Hypotheses	Path Coefficient	Standard Deviation	t value	P value	Decision
H ₁	0.161	0.067	2.406	0.016	Significant
H ₂	0.243	0.073	3.315	0.001	Significant
H ₃	0.261	0.059	4.401	0.000	Significant

In conclusion, by using a statistically valid sample size, the structural model was strengthened and significant correlations between all variables in the study have been supported and validated. DC plays a positive and significant role in Gen Z workforce adaptability through SE and establishes itself as a significant factor influencing adaptability in Gen Z employees. LO and TO also play significant and positive roles and confirm their significance in influencing Gen Z employees to possess adaptability skills. However, it is highlighted that DC, LO, and TO are

significant factors that influence adaptability in the freight and logistics industry in Sri Lanka.

VI. DISCUSSION

This study demonstrates how important psychological readiness has been on Gen Z's ability to adapt to the industry 5.0 informed freight and logistics work environment. The impact of LO, TO and SE shows how social cognitive theory defines SE as the major mechanism by which motivational orientation is converted into adaptive behavior [27, 28] and supports older studies which support the finding that learning oriented individuals, and individuals with a positive technology belief, demonstrate higher levels of SE, which contribute positively to their adaptability to, and performance in, a changing work environment [29, 30].

This study supported the research hypothesis H₁, which suggested that DC would improve the adaptability of Gen Z employees. The results indicated that employees with high DC levels would attain high SE levels, thus enhancing performance. The study revealed the role of DC alongside technology readiness in the adaptation of an individual [31]. The social cognitive theory explains that DC development results help people to gain better control over their digital tasks through SE [28]. The study proves that the society and culture of Sri Lanka create an opportunity for Gen Z employees to apply their digital skills. According to the results of H₂ validates that individuals who exhibit good LO can attain better results due to their self-confidence [32]. Continuous learning develops their job roles in context of Industry 5.0. Theoretically, the goal orientation theory suggests that those with a high LO seek opportunities for developing competence. It develops their mastery experiences create a belief in their capabilities, against to the social cognitive theory. The source of SE, allowing individuals to be effective in uncertain and changing environment. This finding prove that Sri Lanka is still moving away from its conventional education systems to modern education systems. The increasing number of educational programs will enable them to acquire new information and skills. Discussing H₃, TO develops more trust and confidence in digital systems. According to Social Cognitive Theory, an individual's cognitive appraisal of the environment shapes their SE beliefs and behaviors. When employees perceive technological advances as opportunities rather than threats, their anxiety about them decreases and their confidence in using digital tools increases. The ability to adapt and act proactively is strongly predicted by SE. Therefore, Gen Z can enhance greater confidence to take innovative action. Their behavior allows them to flexibly solve problems and respond to digital transformation.

VII. PRACTICAL IMPLICATIONS

The findings of this study provide important implications for corporate leaders, HR managers, and policymakers as the Sri Lankan freight and logistics sector embraces Industry 5.0. The findings show that the freight and logistics sector needs clearly defined digital literacy enhance programs. Thus, organizations can hold digital skills workshops about software, tools, and systems that are appropriate for the job role they are engaged in. This increases the digital confidence of Gen Z. It enhances and strengthens adaptability. The majority of Gen Z highly values career growth and

continuous learning. Therefore, companies should provide job-related professional qualifications and industry-relevant diploma programs, and career development funds or financial support. Through learning pathways, employees become more confident, future-ready, and motivated to adapt to technological and organizational changes. In the era of highly technological advancements of Industry 5.0, organizations launch new systems to achieve high employee productivity. Thus, awareness sessions should be held about them. This reduces employee fear about using technological systems and tools. Then they build confidence in technology as an opportunity instead of a threat and perform successfully. In our study, SE is considered a key psychological mechanism.

VIII. CONCLUSION

This study provides employers with special guidelines to follow when transitioning to Industry 5.0. It creates a platform for developing a highly adaptable Gen Z workforce. Which is critical for achieving an innovative and sustainable competitive advantage to industry 5.0 for the freight and logistics sector in Sri Lanka. According to the limitations this study is cross-sectional research design used to gain insights from only one point in time. Hence, it is not possible to make any inferences or draw conclusions about future changes in the causal link between the two variables. The study relates to the geographical location from which the sample was collected. In this case, all the respondents were from one country (Sri Lanka) there is no generalizability of the study findings to industries located in other geographic regions or countries. The data collected from respondents through self-reported questionnaires. It raises the potential for respondents providing answers that may introduce common method bias or response bias into the data set. Finally, the study considered many of the most important predictors of adaptability in terms of leadership style and company culture. It has not considered other potentially relevant variables that would have provided extra support for the findings from this study. The future research can build upon these findings. Researchers should apply the current framework to other generations and other industries or countries. And researchers can recruit larger, more diverse participant samples that will better inform developments. From the targeted sample size of 384 respondents, this paper included the 251 valid responses during the initial stage of data collection. The rest of data will be conducted in the later part of the research. Hence, that has been added as a limitation of the current study, and future direction. Finally, future studies could explore additional mediators and moderators.

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