Addressing the Workforce Skills Gap: Strategies for HRM in the Age of Technological Disruption

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Abstract: With study advent of recent technological disruption, the gap between desired workforce skills and available workforce skills has increased. The primary objective of this research is to investigate and address the workforce skills gap within the realm of human resource management (HRM) in the face of technological disruption. The research aims to provide a comprehensive understanding of the perceptions and experiences of employees regarding skill development initiatives, as well as the effectiveness of HRM strategies in fostering a skilled workforce. By utilizing survey data analyzed through SPSS, the study aims to identify key insights into current skill levels, the impact of technological changes in the workplace, and the role of HR departments in bridging skill gaps. The descriptive analysis provided insights into perceptions of skill readiness and the effectiveness of organizational initiatives. Regression examinations revealed significant relationships between various factors which mainly emphasized the importance of organizational support and individual perceptions in shaping workforce attitudes. The one-sample t-tests further highlighted significant differences in perceptions of main skill utilization and gender representation as well. The chi-square test also underscored the association between age and certainty levels in meeting job demands.

Index Terms – HRM, workforce skills, SPSS

I. INTRODUCTION

Clayton Christensen has first introduced the concept of "disruptive technology" in his popular book The Innovator's Dilemma. Christensen categorizes technology into two distinct groups: disruptive and sustaining [1,2]. According to Christensen, disruptive innovation involves the gradual advancement of a product or service from simple, entry-level applications in a market to eventually surpassing established competitors at the top of the market. Top companies that fail to embrace innovative technologies may risk losing their position in the market, even if they have the right strategies in place. Many businesses often ignore disruptions until they are already overtaken by the market. New technologies can be categorized into four main groups: networking, artificial intelligence, robotics, and advanced manufacturing [3]. Businesses respond to disruptions by adjusting, extending, or broadening their current practices, values, and organizational culture, as supported by empirical data. Digital disruptions consist of key components such as big data, user-friendliness, personalization, and contextual services enabled by algorithms, machine learning, and data visualization. It is crucial for a company to evaluate industry disruptors, current trends, markets, competitors, and consumers to thrive in the marketplace [4].

II. LITERATURE REVIEW

Marr et. al. [5] Artificial intelligence combined with performance management helps reduce evaluator biases. The BetterWorks program offers a structured framework for setting analytical goals and evaluating progress. Regular feedback and instant performance evaluations are given. Employees are motivated to excel when they understand how their efforts impact the company's financial performance and help achieve its objectives. Employees are fairly rewarded for effectively completing important tasks, and vice versa. When an employee faces challenges in achieving their objectives, a prompt intervention is put into place.

Parrella et. al. [6] Companies are incorporating AI monitoring systems to oversee productivity, employee feedback, job contentment, potential misconduct, and behavioral concerns. Monitoring tools could potentially be installed and used on the user's computer without their knowledge. HebbianView, a software solution created by Hebbian Inc., is crafted to track and evaluate the time and effort employees dedicate to website maintenance. Moreover, they successfully balance surveillance and respecting employees' privacy in the workplace. Workmart, a productivity tool created by the talent management company Crossover, tracks employees by capturing images of their workstations along with other data every ten minutes. Interguard is a technology created by Awareness Technologies for monitoring employee activities.

Rayo et. al. [7] The use of document discovery technology has enhanced the process of finding crucial sources to bolster legal arguments. JPMorgan uses contract intelligence (COIN) software to effectively identify suppliers. Examining numerous documents, case files, and legal pleadings without artificial intelligence would demand 360,000 hours of labor from an attorney. The legal field utilizes artificial intelligence (AI) to automate documents, conduct legal analytics, verify background information, and handle invoices. Various industries, companies, and fields are witnessing significant growth in automation, technology, and digitalization [8].

As per Chikhale et al. [9], success in today's unpredictable business landscape requires an agile organization. In the future, HR operations will need to evolve quickly to keep up with Industry 4.0. The title of a PwC study predicts a significant and quick rise in digitalization across major industries by 2020. Human resource management is on the brink of evolving into a highly specialized field as a result of the swift and reliable resolution of common queries through conversational software and robotics [10].

When considering the skills revolution, a perfect blend of human capabilities includes digital, technical, and emotional skills. Skilled individuals must continuously acquire new knowledge and adapt [11]. Currently, companies highly value agility when hiring new employees. Being agile means an organization can quickly adjust to unforeseen changes [12]. The result can be attributed to accomplishments made possible by technological, organizational, and management capabilities, along with human skills, abilities, and motivations. There is a concern that advancements in technology could lead to complete automation of work, with robots replacing humans in jobs. There has been no increase in the number of human resources personnel with broad skill sets. Possible outcomes of the company's technological advancements involve issues related to privacy, security, and surveillance [13]. The way HR leaders and internal influencers communicate can greatly influence employees' positive perceptions of technology. The employees' discontent is worsened by their lack of experience with the system, leading to negative views of technology [14].

III. OBJECTIVES

The primary objective of this research is to investigate and address the workforce skills gap within the realm of human resource management (HRM) in the face of technological disruption. The research aims to provide a comprehensive understanding of the perceptions and experiences of employees regarding skill development initiatives, as well as the effectiveness of HRM strategies in fostering a skilled workforce. By utilizing survey data analyzed through SPSS, the study aims to identify key insights into current skill levels, the impact of technological changes in the workplace, and the role of HR departments in bridging skill gaps. Additionally, the research seeks to explore demographic factors such as age and gender that may influence confidence in existing skill sets and perceptions of HRM

IV. METHODOLOGY

The data for this research was collected through a structured survey, employing a quantitative research approach to delve into the intricacies of the workforce skills gap and the role of HRM strategies amid technological disruption. The survey questionnaire was meticulously designed to capture insights into participants' perceptions and experiences, with a focus on skill development initiatives and the efficacy of HRM practices. The survey was distributed among a diverse group of 80 respondents, and the data obtained was subsequently analyzed using the Statistical Package for the Social Sciences (SPSS). The survey encompassed various dimensions, including participants' confidence in their current skill sets, exposure to technological changes in their work environments, and opinions on HRM practices. Notably, mean values were employed to quantify the perceived confidence levels and effectiveness of HR divisions. Frequency bar graphs were utilized to visually represent demographic information, such as age and gender distribution, providing a comprehensive overview of the participant profile. The descriptive data analysis is shown in figure 1.

Statistics

		1. What is your Age?	2. What is your Gender?	3. How confident are you in your current skill set to meet the demands of your job in the face of technological advancements?	4. Have you received any formal training or education in the past year to enhance your technical skills relevant to your job?	5. Do you feel that your current job adequately utilizes your skill set?	6. How often do you encounter technological changes or updates in your current job role?	7. How effective do you believe your organization's HR department is in identifying and addressing skill gaps among employees?	8. Are you aware of any upskilling or reskilling programs offered by your organization to bridge skill gaps?	9. How supportive do you find your immediate supervisor or manager in facilitating your skill development?	10. In your opinion, what are the primary barriers preventing individuals from acquiring new skills in the workplace?	11. How important do you think it is for organizations to invest in continuous learning and development programs for their employees?	12. Do you believe that traditional educational institutions adequately prepare individuals for the rapidly evolving demands of the modern workforce?
N	Valid	80	80	80	80	80	80	80	80	80	80	80	80
	Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean		2.64	1.36	2.79	2.51	1.89	3.15	2.36	2.53	2.20	2.53	2.08	2.19
Std. Error of Mean		.111	.054	.105	.126	.119	.101	.096	.115	.116	.128	.129	.085
Median		3.00	1.00	3.00	2.00	1.50	3.00	2.00	2.50	2.00	2.50	2.00	2.00
Mode		3	1	3	2	1	4	2	2	1	4	1	3
Std. Deviation		.997	.484	.937	1.125	1.067	.901	.860	1.031	1.036	1.147	1.156	.765
Variance		.994	.234	.878	1.266	1.139	.813	.740	1.063	1.073	1.316	1.336	.585
Skewness		-.155	.583	-.315	.023	.870	-.836	.318	.002	.286	-.011	.607	-.334
Std. Error of Skewness		.269	.269	.269	.269	.269	.269	.269	.269	.269	.269	.269	.269
Kurtosis		-1.006	-1.703	-.762	-1.371	-.583	-.107	-.454	-1.126	-1.127	-1.424	-1.122	-1.208
Std. Error of Kurtosis		.532	.532	.532	.532	.532	.532	.532	.532	.532	.532	.532	.532
Range		3	1	3	3	3	3	3	3	3	3	3	2
Minimum		1	1	1	1	1	1	1	1	1	1	1	1
Maximum		4	2	4	4	4	4	4	4	4	4	4	3

Figure 1: Descriptive Analysis

The descriptive analysis of the survey responses mainly gives critical pieces of information into the perceptions and experiences of the participants concerning the workforce skills gap and HRM strategies in the face of technological disruption. The mean values show moderate levels of confidence in current skill sets (M = 2.79). It also with to some degree higher confidence in males (M = 2.64) diverged from females (M = 1.36) . This suggests anticipated aberrations in saw skill accessibility between genders.

Participants detailed a moderate repeat of encountering technological changes or updates in their current work environment roles (M = 3.15) which exhibited the undeniable thought of technological disruption in the workplace.

The clear sufficiency of HR divisions in perceiving and watching out for skill gaps was moderate (M = 2.36) which mainly proposed a valuable open door to get better in HRM strategies to traverse these gaps effectively.

The obvious consistent quality of brief supervisors or chairmen in working with skill development was rather lower (M = 2.20) when awareness of upskilling or reskilling programs was by and large high (M = 2.53) (Li, 2022). These elements a logical gap between progressive initiatives and very front power support in developing laborer skill development.

Primary barriers holding individuals back from getting new skills in the workplace varied with the nonattendance of time (Mode = 4), financial necessities (Mode = 1) and assurance from change (Mode = 4) being the most as rule referred to challenges.

Participants overall saw the meaning of improvements in placing resources into diligent learning and development programs (M = 2.08) mainly showing serious areas for an in the value of well-established learning in the face of technological disruption.
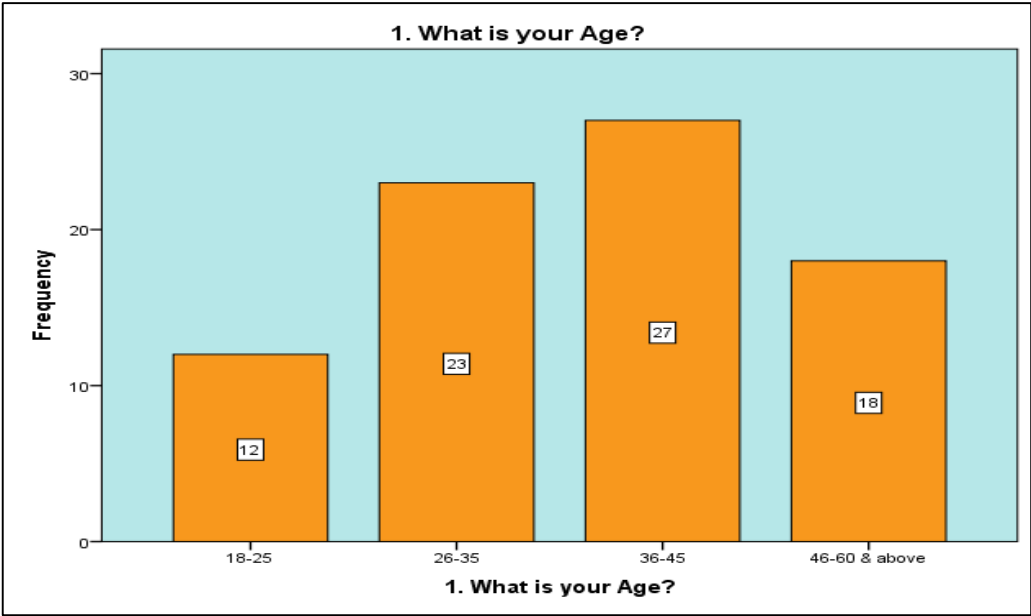

Figure 2: Frequency Bar Graph of Respondent's Age

The above figure shows the frequency graph of the participant's Age groups. It shows that most of the participants' ages are between 36-45 years.
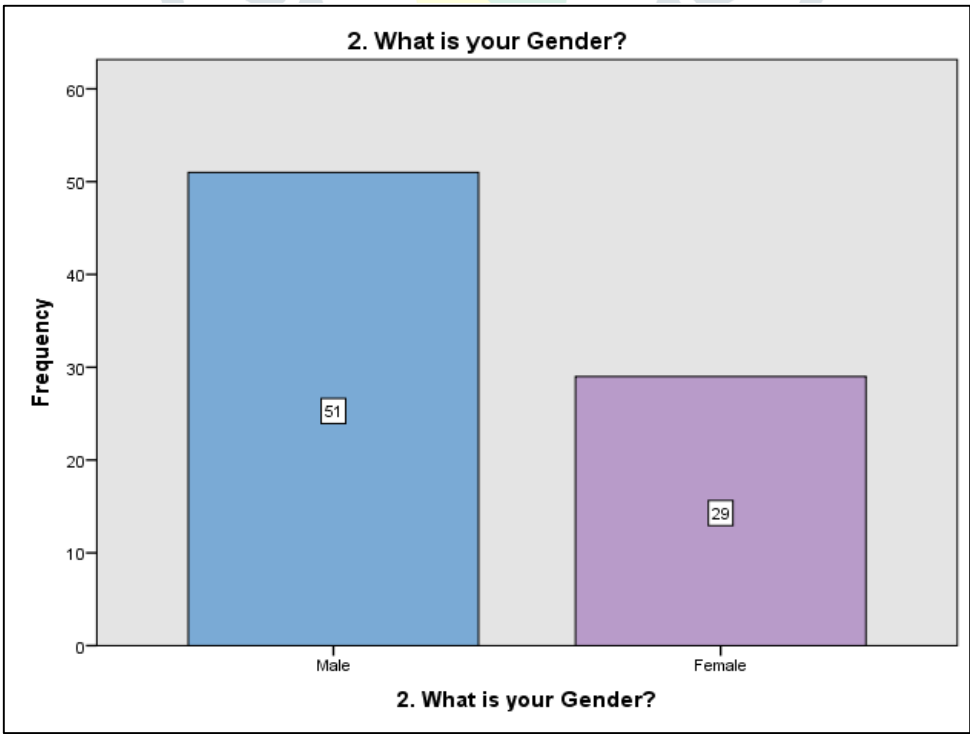

Figure 3: Frequency Bar Graph of Respondent's Gender

Figure 2 also clarifies the ratios of male and female participants in this survey. The majority of the participants are male here as the proportion stands at 51:29.
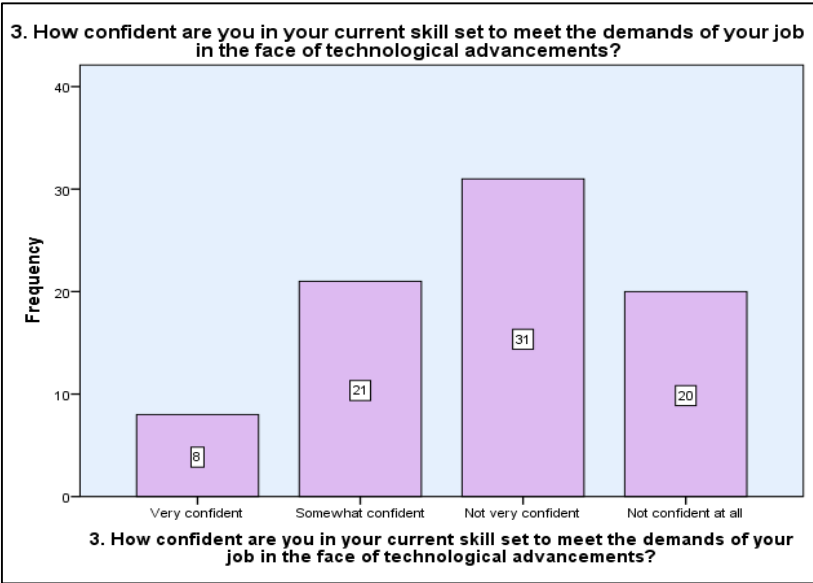

Figure 4: Frequency Bar Graph of Respondent's Confidence about Self Skills

This above figure shows the participants' confidence regarding their technological knowledge within their workplaces. It indicates that most of the participants are not confident properly regarding their self-knowledge of technology.
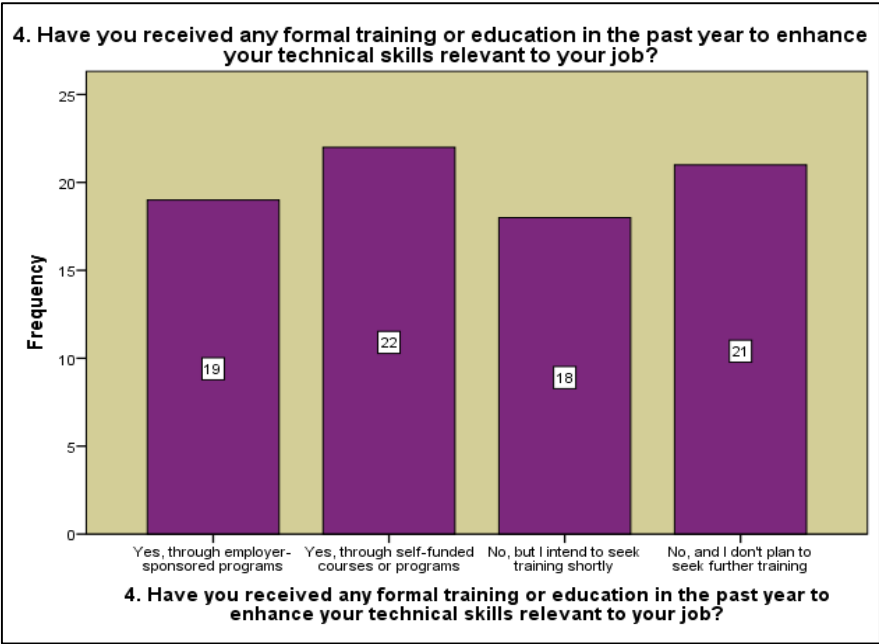

Figure 5: Frequency Bar Graph of Respondent's Formal Training about Technical Skills

Figure 5 concluded the factor about the participant's proper training on the technology. Almost half of the respondents got the training in their organizations. Also, the rest are not provided with any kind of these facilities.

Figure 6: Frequency Bar Graph of Respondent's Thaughts about Current Jobs

This figure shows the responses about the participant's opinions about the utilization of their skills in their job roles. It shows that most of the participants agreed about the full and partial utilization of their skills.
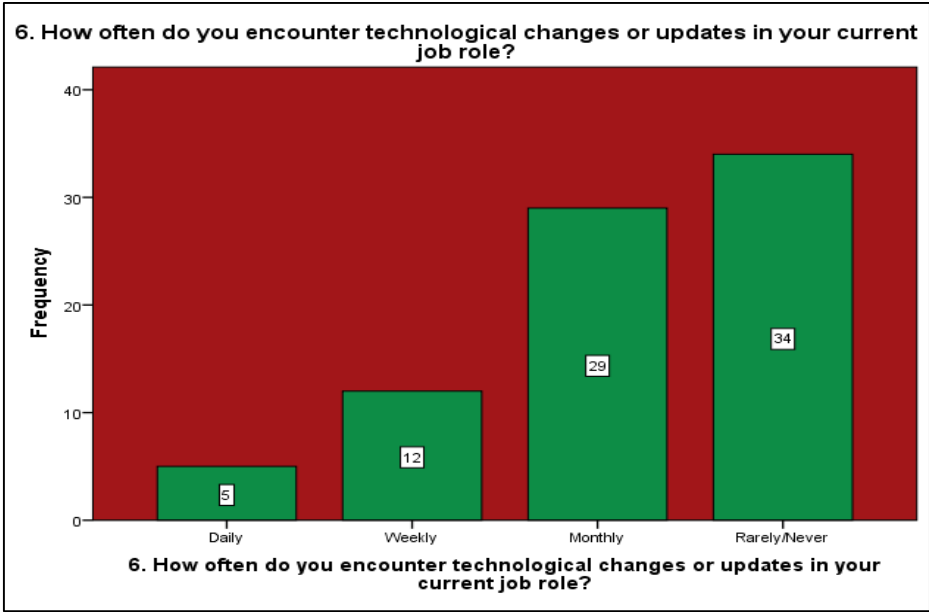

Figure 7: Frequency Bar Graph of Respondent's Experience with Technical Changes

Figure 7 visualize the frequency of the responses regarding participants' experience with technical changes. The majority of them rarely felt or never felt it.
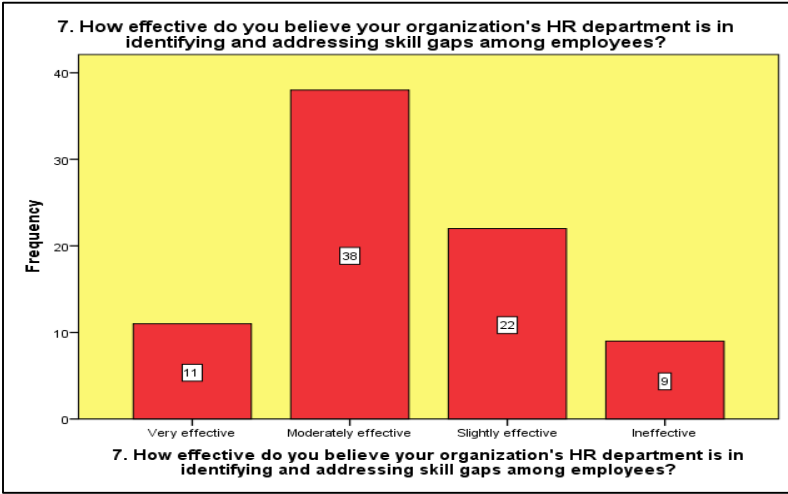
Figure 8: Frequency Bar Graph of Respondent's Beliefs in HR Departments

This graph shows the responses about the responders' HR departments within their organizations. A total of 49 out of 80 responders found it effective.
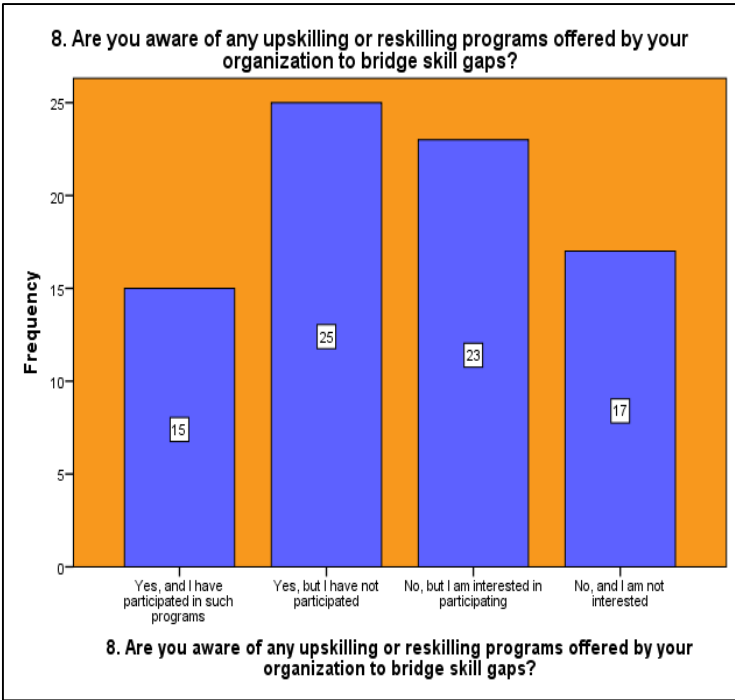

Figure 9: Frequency Bar Graph of Respondent's Awareness about Upskilling Programs

Figure 9 explains the responses about their upskilling awareness as well. It shows mainly mixed responses where various responders provide different responses.
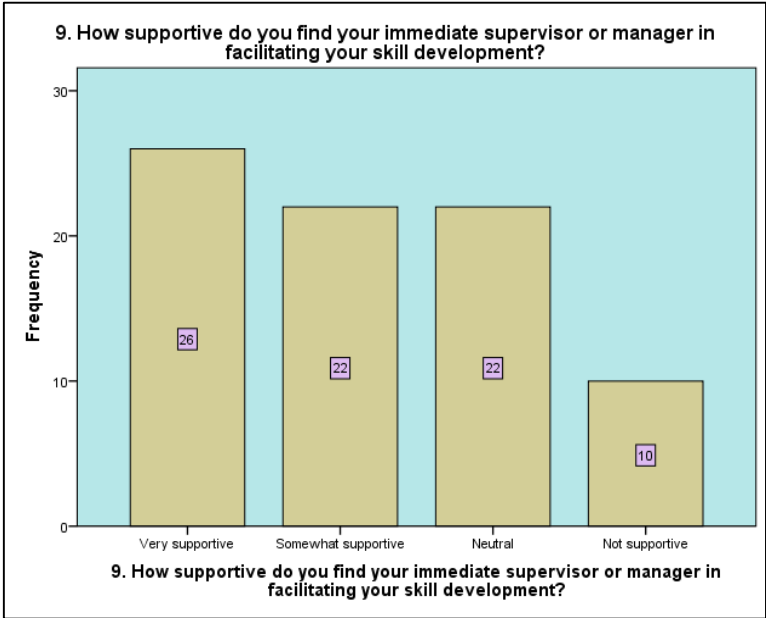
Figure 10: Frequency Bar Graph of Respondent's Thoughts about Current Manager

Figure 10 shows that major of the participants found their manager or supervisor Supportive in the workplace. However, some stayed neutral in this question's response and 10 people found it non-supportive.
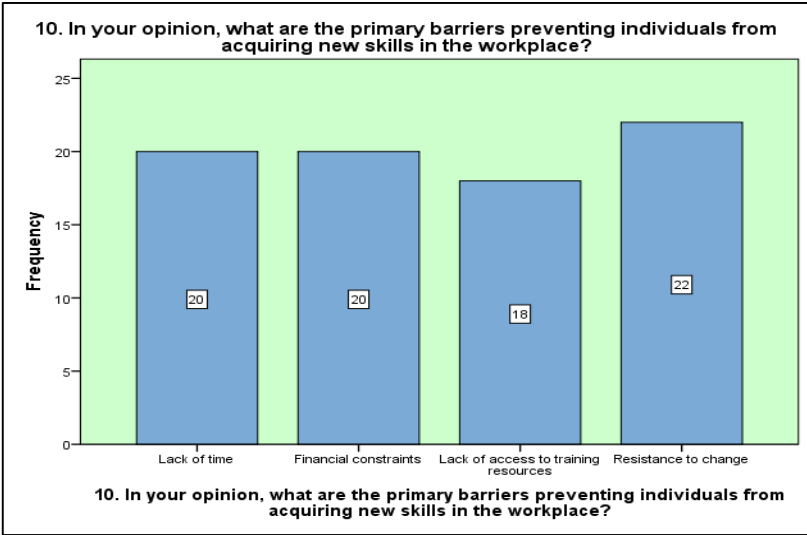

Figure 11: Frequency Bar Graph of Respondent's Opinion about Primary Barriers

This figure shows the response options about the primary barriers or difficulties in learning new skills. All of the respondents provide different responses in this matter.
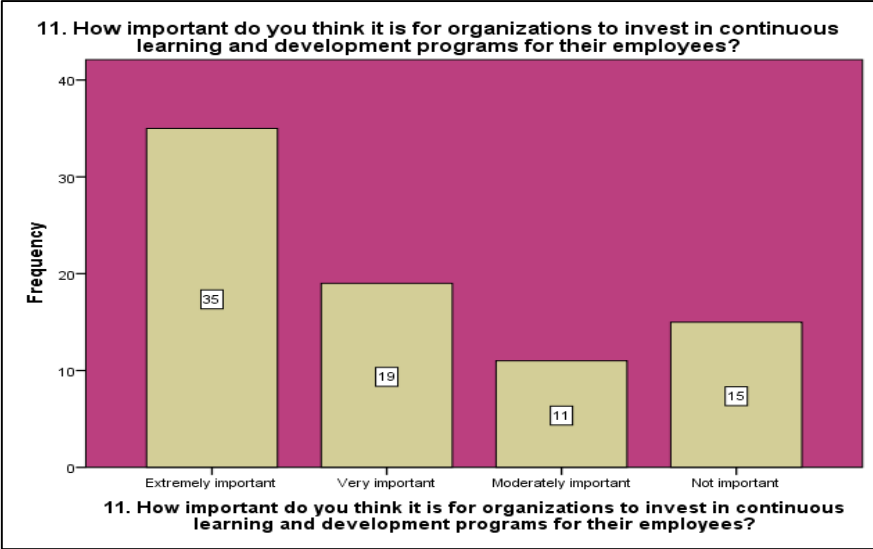

Figure 12: Frequency Bar Graph of Respondent's Thoughts about Learning and Development Programmes in their Organizations

The above figure shows that the responses of participants majorly support this factor. The majority of them think that it is extremely or very important for their organizations.
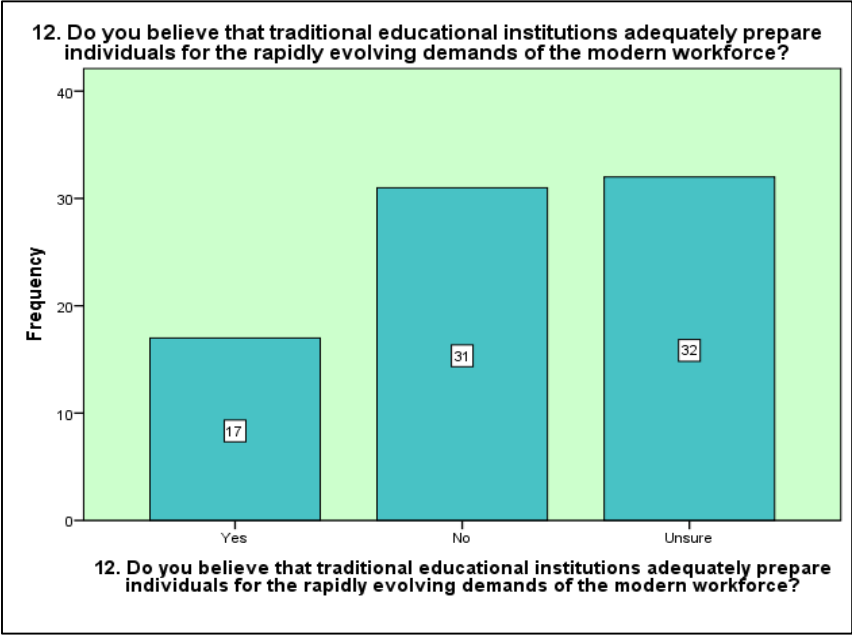

Figure 13: Frequency Bar Graph of Respondent's Belief about Traditional Educational Institutions

Figure 13 indicates that most of the participants do not believe in the traditional institutions or are unsure at all regarding these improvements in the work Skill process. Only 17 participants said yes. Overall, these findings mainly feature the multifaceted design of watching out for the workforce skills gap and also underline the meaning of proactive HRM strategies in exploring technological disruption and empowering a skilled workforce.

V. RESULTS AND DISCUSSION

The section unfolds a comprehensive examination of the research findings, employing a range of statistical analyses to unravel the intricate dynamics surrounding workforce skills, HRM strategies, and the impact of technological disruption. Employing regression analyses, t-tests, and chi-square tests, the study meticulously dissects the relationships and associations between various variables, shedding light on critical aspects that influence the workforce in the age of technological transformation.

Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.928^a	.861	.857	.377

a. Predictors: (Constant), 6. How often do you encounter technological changes or updates in your current job role?, 5. Do you feel that your current job adequately utilizes your skill set?

Figure 14: Model Summary of Regression 1

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67.542	2	33.771	237.563	.000^b
	Residual	10.946	77	.142		
	Total	78.488	79			

a. Dependent Variable: 1. What is your Age?

b. Predictors: (Constant), 6. How often do you encounter technological changes or updates in your current job role?, 5. Do you feel that your current job adequately utilizes your skill set?

Figure 15: ANOVA Table of Regression 1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.022	.160		-.136	.892
	5. Do you feel that your current job adequately utilizes your skill set?	.450	.057	.482	7.919	.000
	6. How often do you encounter technological changes or updates in your current job role?	.574	.067	.520	8.534	.000

a. Dependent Variable: 1. What is your Age?

Figure 16: Coefficient Table of Regression 1

The regression analysis examines the relationship between respondents' age and two predictor variables. The frequency of encountering technological changes in their job role and the perceived utilization of their skill set in their current job. The model demonstrates a high level of explanatory power with an R-squared value of .861 which shows that 86.1% of the variance in respondents' age can be explained by these predictors. Both predictor variables essentially contribute to the model ($p < .001$) with standardized coefficients of .482 for the perceived utilization of the skill set and .520 for the frequency of encountering technological changes. This also proposes that people perceive their skills to be more effectively utilized and encounter more frequent technological changes in their job roles. These findings underscore the importance of skill utilization and technological adaptation in shaping workforce demographics.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.922[a]	.851	.847	.299

a. Predictors: (Constant), 9. How supportive do you find your immediate supervisor or manager in facilitating your skill development?, 8. Are you aware of any upskilling or reskilling programs offered by your organization to bridge skill gaps?

Figure 17: Model Summary of Regression 2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.304	2	19.652	219.826	.000[b]
	Residual	6.884	77	.089		
	Total	46.188	79			

a. Dependent Variable: 12. Do you believe that traditional educational institutions adequately prepare individuals for the rapidly evolving demands of the modern workforce?

b. Predictors: (Constant), 9. How supportive do you find your immediate supervisor or manager in facilitating your skill development?, 8. Are you aware of any upskilling or reskilling programs offered by your organization to bridge skill gaps?

Figure 18: ANOVA Table of Regression 2

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.524	.089		5.877	.000
	8. Are you aware of any upskilling or reskilling programs offered by your organization to bridge skill gaps?	.375	.073	.505	5.097	.000
	9. How supportive do you find your immediate supervisor or manager in facilitating your skill development?	.326	.073	.442	4.464	.000

a. Dependent Variable: 12. Do you believe that traditional educational institutions adequately prepare individuals for the rapidly evolving demands of the modern workforce?

Figure 19: Coefficient Table of Regression 2

This other regression analysis explores the relationship between respondents' feelings about the ampleness of traditional instructive establishments in preparing people for the modern workforce and two predictor variables. The awareness of upskilling or reskilling programs offered by their organization and the perceived supportiveness of their nearby supervisor or manager in working with skill development. The model demonstrates a high level of explanatory power, with an R-squared value of .851. Both predictor variables essentially contribute to the model (p < .001) which shows that people perceive higher awareness of organizational programs and greater supervisor support. They are more obligated to accept the fact that traditional instructive foundations adequately prepare people for the propelling workforce demands.

t-Test Analysis

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
3. How confident are you in your current skill set to meet the demands of your job in the face of technological advancements?	80	2.79	.937	.105
5. Do you feel that your current job adequately utilizes your skill set?	80	1.89	1.067	.119
2. What is your Gender?	80	1.36	.484	.054

Figure 20: t-Test Statistics

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
3. How confident are you in your current skill set to meet the demands of your job in the face of technological advancements?	26.603	79	.000	2.788	2.58	3.00
5. Do you feel that your current job adequately utilizes your skill set?	15.818	79	.000	1.888	1.65	2.13
2. What is your Gender?	25.192	79	.000	1.363	1.25	1.47

Figure 21: t-Test One-Sample Test

The above one-sample t-tests evaluate whether the means of three variables significantly differ from a test value of 0. The results also indicate significant differences for all variables (p < .001). Participants reported moderate trust in their skill set's adequacy to meet job demands (M = 2.79, SD = 0.937) which also indicated a positive perception overall. However, they felt their current job underutilized their skills (M = 1.89, SD = 1.067) which mainly suggests potential dissatisfaction or mismatch between job requirements and individual capabilities. Additionally, the t-test on gender (M = 1.36, SD = 0.484) highlights a significant difference which indicates a higher prevalence of male respondents. It also implies potential gender-lopsided characteristics in the sample. These findings provide main insights into workforce perceptions and gender representation within the surveyed population.

Chi-Square Test

Crosstab

Count

		3. How confident are you in your current skill set to meet the demands of your job in the face of technological advancements?				
		Very confident	Somewhat confident	Not very confident	Not confident at all	Total
1. What is your Age?	18-25	8	4	0	0	12
	26-35	0	17	6	0	23
	36-45	0	0	25	2	27
	46-60 & above	0	0	0	18	18
Total		8	21	31	20	80

Figure 22: Crosstab of Chi-Square Test

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	162.649[a]	9	.000
Likelihood Ratio	151.309	9	.000
Linear-by-Linear Association	68.738	1	.000
N of Valid Cases	80		

a. 9 cells (56.2%) have expected count less than 5. The minimum expected count is 1.20.

Figure 23: Chi-Square Test

The above chi-square test examines the association between respondents' age groups and their certainty levels in meeting job demands amidst technological advancements. Results also indicate a significant association ($\chi2$ = 162.649, p < .001), which mainly suggests that age and certainty levels are not independent. Further analysis reveals a strong symmetric measure (Cramer's V = 0.823) which also indicates a substantial relationship between age and certainty levels. Additionally, the linear-by-linear association test similarly supports this finding ($\chi2$ = 68.738, p < .001). However, caution is warranted in light of certain cells having expected counts under 5 which indicates potential limitations in interpretation on account of sample size.

VI. CONCLUSION

The research findings underscore the multifaceted nature of the workforce skills gap and the role of HRM strategies in navigating technological disruption. The descriptive analysis provided insights into perceptions of skill readiness and the effectiveness of organizational initiatives. Regression examinations revealed significant relationships between various factors which mainly emphasized the importance of organizational support and individual perceptions in shaping workforce attitudes. The one-sample t-tests further highlighted significant differences in perceptions of main skill utilization and gender representation as well. The chi-square test also underscored the association between age and certainty levels in meeting job demands. Overall, these findings contribute to a comprehensive understanding of the workforce skills gap, informing the development of targeted interventions and policies to address this critical issue effectively.

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