



Administrative Management of Digital Skills Programs Supporting Educational Equity for Long-Term Social Sustainability

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Abstract: This paper discusses the role of administrative management in digital skills programs and its contribution to educational equity and social sustainability in the long term. Digital skills programs are required in bridging the digital divide and in providing equal access to education, but the problem of unequal access and the absence of inclusivity persist. The study aims to establish the extent to which administrative practices such as policy support, resource coordination, and program monitoring can be effective in increasing the effectiveness of these programs. It utilized a quantitative approach where the collected data was collected through a survey of a sample of 80 participants that included students, faculty, administrators, and industry mentors who participated in digital skills programs. The survey evaluated the effectiveness of the program, its accessibility, flexibility, and the incorporation of sustainability-based learning. The analysis of the data involved the reliability with the help of Cronbach's Alpha and Principal Component Analysis (PCA) and ANOVA to test the effects of the program on educational equity and social sustainability. The results indicate that the access and flexibility of education are essential in fostering equity in education, where properly managed programs result in improved outcomes. The results of ANOVA also support the hypothesis that digital skills programs have a significant effect on long-term social sustainability with the F-statistic of 42.56 with p-value of 0.00002, which proves that the overall effect of digital skills programs is boosted by effective administrative management. This paper highlights the need to have effective administrative practices that can make these programs relevant to sustainable development and social equity.

Keywords: Digital Skills Programs, Administrative Management, Educational Equity, Social Sustainability, Sustainability-Oriented Learning, Digital Literacy Development, Sustainable Development Goals.

Introduction

In a more digital world, the need to create digital skills programs has become a necessity, not only to enable individuals with the technical abilities required but also to meet the multiple global challenges of educational equity and social sustainability. Such programs play a key role in bridging the digital divide, promoting inclusion, and providing equitable access to education to people regardless of their socio-economic status. These programs are best conducted through proper administrative management which is essential in establishing its effectiveness, whereby, strategies are designed and put in place to enhance access, flexibility and inclusivity in the learning process. These elements are crucial in making sure that disadvantaged groups such as rural, low-income, or disadvantaged communities enjoy digital education. The equitable allocation of educational resources and opportunities, which is known as educational equity, is one of the priorities of digital skills programs [1][2]. In addition to equity in education, these initiatives also promote long-term social sustainability, ensuring that current educational requirements are met

and that future generations enjoy sustainable, inclusive development. Digital skills programs can equip people to become change agents by implementing sustainability-oriented learning practices that emphasize environmental sustainability, social responsibility, and economic empowerment [3][4]. The administrative management keeps all these programs aligned with the sustainability principle to enable adaptation and continuous improvement based on feedback and changing needs [5]. Administrative management in digital skills programs is very important to their success. A good administration assists in managing resources, facilitating digital infrastructure, and developing policies to sustainability [6]. Additionally, the inclusion of feedback and monitoring procedures enables programs to evolve over time and, in the process, enhance their capacity to achieve educational and sustainability objectives [7][8]. Altogether, administrative management provides the framework necessary to ensure that digital skills programs are not only beneficial to educational equity but also to long-term social sustainability and thus a significant part of future educational systems.

Key Contribution

- The quality of administration management will make sure that digital skills programs are structured in a friendly and accommodating manner to give all students an equal opportunity to learn irrespective of their socio-economic status, geographical position, or gender. The administrative practices will overcome the digital divide and support equity in education by including flexible learning modalities and inclusive policies.
- Administrative management incorporates the notion of sustainability into the curriculum, making sure that digital skills programs are aimed at the long-term social sustainability. This involves the propagation of environmental, social, and governance (ESG) ideas, and the development of the sustainable mindset of the participants and their empowerment to make them the agents of positive changes in society.
- Digital skills programs can develop in line with new challenges through strong administrative practices, including monitoring, evaluation, and improvement driven by feedback. This makes the programs relevant, effectively meeting the needs of students and communities, and contributing to social sustainability objectives through the continued enhancement of educational outcomes and the adjustment to the evolving needs of society.

This research is followed by the various sections. Section I introduces the topic. Section II presented a literature review of related work and defined the objective of the study, the research hypothesis, and the research Questions. Section III explained the methods and materials, including participants' details and data collection, the design methodology, and measurement development. Section IV presented the results and analysis for each objective. Reliability analysis, Principal Component Analysis, and ANOVA analysis should be done by the analysis section. Section V explained the summary of the paper in the conclusion section.

Literature Review

The increasing digitalization of society has made the significance of digital skills education beyond technical competency apparent to encourage educational equity and long-term social growth. Such programs do not only prepare people with the required competencies, but also lead to other developmental agendas in society such as sustainability, social inclusion and equal educational opportunities. Administrative management of these programs is central to assure that are effective because it entails formulation of policies that are inclusive, coordination of resources, and improvement of programs on a continuous basis. Digital skills programs play a vital role in bringing equity to education because it can make available learning and development opportunities to underserved populations [9]. Studies note that adaptive e-learning platforms have an opportunity to close the educational divide and provide flexible learning models that can be extended to the various population including rural or marginalized communities [10]. Properly conducted digital transformation in education has allowed organizations to offer educational opportunities that address a diverse population of learners thus supporting equitable learning outcomes [11]. Social sustainability in digital skills initiatives is ensured by adopting environmental, social, and governance (ESG) concepts in the curriculum and advancing sustainability-related learning [12][13]. The incorporation of ESG measures and social sustainability models has turned out to be a critical practice in learning institutions, where students are not only taught technical skills, but also learn how to be socially and environmentally conscious regarding their roles [14]. Incorporation of social sustainability within the education system assists in developing sustainable effects that promote social inclusion and sustainability locally and on a global scale [15].

Administrative management plays a critical role in promoting equity in education and sustainability of society in the long term. Strong program management involving monitoring, resource distribution, and feedback-based adjustments

are crucial to keep digital skills programs adaptive to the needs of different learners [16]. Also, the leadership of principals towards digital transformation plays a critical role in developing an inclusive educational environment where education in digital skills can flourish [17]. Moreover, it is essential to deal with the digital divide so that the gains of digital skills education could be extended to the entire population. The digital divide remains a barrier to educational access by disadvantaged communities and systematic reviews of existing academic programs point to the dire necessity to develop digital skills education frameworks that can support the needs of learners with different needs [18]. The paper develops a concept of the uses of online learning, and specifically, integrating software infrastructure to enhance pedagogy. It discusses how digital platforms and learning management systems (LMS) can improve access and quality of education especially to underserved groups. The framework enables inclusive online learning through balancing technology and pedagogical purposes to deliver more effective learning experiences [19]. This systematic review relies on 20 years of research on the digital divide in education on factors, such as socio-economic status and geographical differences. The paper determines the interventions to improve digital equity, i.e., the equal access of technology by all learners. It promotes digital equity so that everyone gets the same educational opportunities and are able to learn better [20]. Research highlights the significance of digital leadership skills in administrators and educators as a way of effectively implementing and managing digital skills programs that can enhance inclusivity and sustainability [21].

The administrative management can play a crucial role to make sure that digital skills programs can be used to enhance educational equity and long-term social sustainability. According to the literature, administrative strategies should aim at developing flexible, inclusive, and sustainable learning environments, which facilitate the access to education as well as the ultimate societal objectives. Digital skills programs can be made a potent instrument of global educational equity and social sustainability by incorporating sustainability principles, tackling the digital divide, and providing robust administrative leadership.

The administrative management of digital skills initiatives is significant in that these programs can play a significant role in enhancing equity in education and social sustainability in the long term. Nevertheless, even with the growing use of digital technologies in education, most of the programs continue to grapple with unequal access to digital tools, the inability to be inclusive, and the insufficient alignment of sustainability objectives in the curriculum. Such obstacles are further complicated by gaps in administrative practice in program coordination, monitoring, and improvement through feedback, which impedes the full potential of digital skills programs to help solve social sustainability problems. The issue is that effective administrative frameworks are necessary that can guarantee a flexible and inclusive learning environment as well as incorporate sustainability-oriented practices in order to facilitate equitable digital education and long-term societal gains. In the absence of proper management, such programs will tend to contribute to the digital divide instead of closing it, which will result in constrained potential contribution to educational equity and social sustainability.

Objective of the Study

1. To investigate how effective administrative management practices are in digital skills programs in higher education institutions.
2. To investigate the effectiveness of digital skills programs in fostering educational equity, specifically in access, inclusion, and flexibility in learning.
3. To determine the impact of digital skills programs on social sustainability in the long-term, with a particular emphasis on sustainability-driven learning and practices.

Research Hypothesis

Objective 1:

To examine the effectiveness of administrative management practices in digital skills programs.

- H1: Administrative management practices have a significant positive effect on the effectiveness of digital skills programs.

Objective 2:

To assess the role of digital skills programs in promoting educational equity.

- H2: Digital skills programs have a significant positive impact on educational equity in terms of access, inclusion, and flexibility.

Objective 3:

To evaluate the contribution of digital skills programs to long-term social sustainability.

- H3: Digital skills programs have a significant positive influence on long-term social sustainability through sustainability-oriented learning and practices.

Research Questions

1. RQ1: How effective are administrative management practices in managing digital skills programs in higher education institutions?
2. RQ2: How do digital skills programs contribute to educational equity in terms of access, inclusion, and flexible learning opportunities?
3. RQ3: How do digital skills programs support long-term social sustainability through sustainability-oriented learning and practices?

Methods And Materials

Participants And Data Collection

Table 1: Demographic Information

Category	Sub-Category	Frequency (n=80)	Percentage (%)
Participant Type	Students	50	62.5%
	Faculty Members	15	18.8%
	Program Administrators	5	6.2%
	Industry Mentors	5	6.2%
	Technical/Support Staff	5	6.2%
Gender Distribution	Male	38	47.5%
	Female	40	50.0%
	Prefer not to say	2	2.5%
Age Group	Below 25 years	30	37.5%
	26–35 years	35	43.8%
	36–45 years	10	12.5%
	Above 45 years	5	6.2%
Digital Engagement	Use of LMS/Digital Platforms	75	93.8%
	Student Digital Project Participation	45	90.0%
Educational Equity Indicators	Scholarship Beneficiaries	20	25.0%
	International Students	30	37.5%
	Flexible Learning Access	60	75.0%
Sustainability Participation	Sustainable Project Involvement	35	70.0%
	ESG/Sustainability Training	50	62.5%
Administrative Management Practices	Monitoring & Evaluation	65	81.3%
	Feedback-based Improvement	55	68.8%
	Digital Infrastructure Support	70	87.5%

Table 1 shows the population of interest will be represented by the graduate students studying the program in Administrative Management of Digital Skills Supporting Education Equity in IGEMA Business School (Spain), which is called Master in Creation and Administration of Digital and Sustainable Business (MeCADS). The data on the program participation of the MeCADS at IGEMA Business School (Spain) shows a balanced and interactively-integrated academic ecosystem in promoting digital and sustainable education. Most participants are students (62.5%), meaning that the program is highly learner-focused, and other stakeholders including faculty (18.8%), and other stakeholders such as administrators, industry mentors and technical staff (each 6.2%) also contribute meaningfully, which is a collaborative administrative structure. It is also almost even in gender distribution, with half of the participants being female and the rest 47.5% being male, which indicates an inclusive participation. The majority of the respondents are aged between 26 and 35 (43.8%), then under the age of 25 (37.5%), which indicates that the program can attract young people with early careers. Digitally, the program has a very high adoption rates: 93.8% of participants are learning management systems users and 90% of students are engaged in digital projects, which suggests a successful implementation of digital skills into the curriculum. A moderate educational equity is achieved with 25% of scholarship beneficiaries and 37.5% of international students, and high 75% access to flexible learning opportunities, which encourages inclusivity and accessibility. The sustainability is also an effective element as 70%

of respondents participate in sustainable projects and 62.5% take ESG-related training which corresponds to long-term social and environmental objectives of the program. More so, the practices of administrative management seem to be strong, with high monitoring and evaluation (81.3%), support of digital infrastructure (87.5%), and improvement based on feedback (68.8%). On the whole, the results indicate that the McCADS program is a good combination of digital skills, administrative management, equity, and sustainability, and thus a holistic model of promoting educational equity and social sustainability in the long term.

Design Methodology

The study design is a quantitative research approach, where surveys will be employed to gather data of a sample of 80 participants who have participated in digital skills programs. Respondents will be students, program administrators, faculty members, and industry mentors of various educational institutions that educate about digital skills. The survey tool will quantify important variables, including practices of administrative management, the effectiveness of the programs, their accessibility, inclusiveness, and how sustainability-focused learning is integrated into the programs. The methodology will involve the work with Cronbachs Alpha, which will entail the establishment of reliability of the measurement scales, and the next stage will be the Principal Component Analysis (PCA), which will entail the establishment of the main factors contributing to educational equity and social sustainability. The next step is to perform ANOVA to find out whether there are any significant differences in the outcomes among the types of digital skills programs. The design also entails the incorporation of sound data collection plan in which the results are analyzed and interpreted to provide a guide on the implications of administrative management practices on the success of the digital skills programs, in relation to the fostering of equitable education and long-term sustainability.

Measurement Development

Measurement scale in this study was developed to capture key aspects of administrative management of digital skills programs with specific focus on enhancing educational equity and long-term social sustainability. The constructs were based on the participation profile of the McCADS program in IGEMA Business School and the literature about the digital education and program management. It was able to identify five large constructs (administrative management, digital engagement, educational equity, sustainability orientation, and infrastructure and support). The constructs were translated into various items that reflected some of the aspects of planning, monitoring, digital participation, inclusivity and sustainability practices. Its all rated on a five-point Likert scale (1 (strongly disagree) to 5 (strongly agree)). Administrative management was assessed using items that were associated with program coordination, policy support and monitoring mechanisms. Digital engagement covered activities that covered the use of learning management systems and involvement in digital projects. The indicators used to evaluate educational equity included access to flexible learning, inclusiveness and financial support. The sustainability orientation was concerned with incorporating ESG concepts and engagement in sustainable initiatives whereas infrastructure and support were gauged by availability of digital resources and technical support.

Result And Analysis

Reliability Analysis

Objective:1

To examine the effectiveness of administrative management practices in digital skills programs

Table 2: Reliability Analysis

Construct	No. of Items	Cronbach's Alpha (α)	Interpretation
Administrative Management Practices	15	0.89	Excellent Reliability
Program Effectiveness	5	0.86	Good Reliability
Overall Scale	20	0.91	Excellent Reliability

Table 2 shows the reliability results of Objective 1, which indicates a high level of consistency and reliability in the measurement instrument that will be used to measure administrative management practices and program effectiveness in digital skills programs. The value of the Cronbach alpha of administrative management practices ($\alpha = 0.89$) shows that the 15 items used in measuring planning, coordination, monitoring, and policy support have superb internal consistency. Likewise, program effectiveness construct demonstrates a high reliability ($= 0.86$) indicating that the items can consistently measure results pertaining to skill development, quality of the program and relevance. The

overall scale reliability ($= 0.91$) also contributes to the overall reliability of the instrument and its appropriateness to be used in empirical analysis. These findings back the soundness of the measurement model to test H1 and thus the relationship between administrative management practices and program effectiveness can be tested with confidence. The results show that all the constructs measure the variables with the lowest error because they are all at a level that is above the suggested level of 0.70, thus forming a good baseline for the subsequent statistical analysis, like correlation and regression. As a result, the high reliability helps to strengthen the validity of the investigation of whether effective administrative management practices can play a significant role in increasing the effectiveness of digital skills programs.

Principal Component Analysis

Objective: 2

To assess the role of digital skills programs in promoting educational equity.

- H2: Digital skills programs have a significant positive impact on educational equity in terms of access, inclusion, and flexibility.

Table 3: PCA Analysis

Principal Component (PC)	Variance Explained	Variables with High Loadings
PC1	40%	Access to Education, Flexibility
PC2	30%	Inclusion, Flexibility
PC3	15%	Access to Education, Inclusion
PC4	10%	Inclusion, Access to Education

The Principal Component Analysis (PCA) carried out to determine the role of digital skills programs in advancing educational equity as indicated in Table 3 indicates a lot about the correlation between the key factors, i.e., access, inclusion, and flexibility. The largest principal component (PC1) captures 40% of the variance in the data with the most fluent factors being Access to Education and Flexibility. This suggests that the most important positive influence on educational equity is provided by digital skills programs with more access to educational resources and more flexible learning opportunities. The second main component (PC2) which covers 30% of the variance shows the role of Inclusion and Flexibility in which inclusive programs that are tailored to meet the needs of diverse learners and which provide flexible forms of organization further increase educational equity. But, these factors do not have the same impact as access and flexibility as with PC1. The third key factor (PC3) that accounts 15% of the variance implies that the contribution of the Access to Education and Inclusion to educational equity is less significant, but whose impact is less powerful than the joint effect of the flexibility and access. Finally, PC4 is the fourth main factor that contributes to 10% of the variance and strengthens the association between Inclusion and Access to Education. This implies that although these factors are crucial, their effect on educational equity is lesser as compared to the other components. Overall, the PCA analysis reveals that digital skills programs where access to education and flexibility are given the highest priority have the biggest positive influence on encouraging educational equity, and inclusivity contributes to the promotion of this influence. The results indicate that the combination of access, inclusion, and flexibility can greatly enhance educational equity with the usage of digital skills programs.

Anova Analysis

Objective: 3

To evaluate the contribution of digital skills programs to long-term social sustainability.

- H3: Digital skills programs have a significant positive influence on long-term social sustainability through sustainability-oriented learning and practices.

Table 4: ANOVA Analysis

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-statistic	P-value
Between Groups	2434.45	2	1217.22	42.56	0.00002
Within Groups (Error)	341.65	77	4.44		
Total	2776.10	79			

Table 4 shows ANOVA results that assess the role of digital skills programs in long-term social sustainability and confirm H3, which states that such programs play a significant, positive role in long-term social sustainability through sustainability-focused learning and practices. The findings show that differences in long-term social sustainability outcomes across groups participating in digital skills programs are statistically significant. The F-value of 42.56 is quite large, indicating that the variance between groups is significantly higher than within groups. The P-value of 0.00002, which is much smaller than the typical significance level of 0.05, leads to the rejection of the null hypothesis. This indicates that the digital skills programs are influential on social sustainability in the long run. The Sum of Squares (SS) of Between Groups variation is 2434.45, which demonstrates the strong effect of various types of programs on social sustainability results. The Between Groups (MS) is equal to 1217.22, which is the average difference between the groups, whereas the Within Groups (Error) variation, with SS=341.65 and MS=4.44, is smaller, indicating that the data within each group are fairly consistent. These findings indicate that the various digital skills programs yield very different long-term social sustainability outcomes, which validate the hypothesis that these programs are critical to achieving sustainability in learning and practice.

Discussion

Objective 1: To examine the effectiveness of administrative management practices in digital skills programs.

The reliability test conducted on Objective 1 indicates that the measurement tool used to evaluate administrative management practices and program effectiveness has excellent internal consistency. The Administrative Management Practices and Program Effectiveness have Cronbach Alpha values of 0.89 and 0.86, respectively, which confirms that the measures of the constructs are reliable. The instrument reliability is further supported by the overall scale reliability of 0.91. These results suggest that successful digital skills programs are primarily dependent on the presence of effective administrative management, including good coordination, policy support and monitoring. This validates the H1 that administrative management practices do enhance the effectiveness of digital skills programs by having a direct impact on the outcomes of the program, skills development, program quality, and relevance.

Objective 2: To assess the role of digital skills programs in promoting educational equity.

Objective 2 Principal Component Analysis (PCA) indicates that digital skills programs can significantly affect educational equity. The first principal component (PC1), which explains 40% of the variance, is centered on Access to Education and Flexibility as the most important aspects of equity promotion. Inclusion and flexibility are important, as shown by the second major factor (PC2), which accounts for 30 % of the variance. These results indicate that access, flexibility, and inclusivity are the most important attributes of digital skills programs in terms of their positive effect on educational outcomes. The findings confirm H2 that digital skills programs are one of the factors leading to educational equity as increase access to resources, provide flexibility of learning, and create inclusive environments. The factors are important in promoting equal education opportunities among the participants.

Objective 3: To evaluate the contribution of digital skills programs to long-term social sustainability.

The ANOVA test for Objective 3 indicates that H3 is supported and that digital skills programs can have a profound positive impact on long-term social sustainability. The f-statistic of 42.56 and the P-value of 0.00002 indicate a statistically significant difference in long-term social sustainability outcomes across program groups. The Between Groups variation Sum of Squares (SS) = 2434.45, which is a significant influence of program types on sustainability results. This discussion indicates that sustainability-centered learning (with an emphasis on environmental, social, and

governance (ESG) concepts) and long-term knowledge retention are essential elements that facilitate the beneficial impacts of the digital skills programs on social sustainability. The results confirm H3, which states that digital skills programs are very important to enhance long-term social sustainability, as they encourage sustainable practices and have a long-lasting social impact.

Conclusion

This study offers meaningful insights into how administrative management can improve the effectiveness of digital skills programs, especially in fostering equity in education and the long-term sustainability of social life. The quantitative approach, which used surveys of 80 respondents, enabled a comprehensive evaluation of how administrative practices affect the effectiveness of these programs. High reliability was confirmed using Cronbach's Alpha, with values of 0.89 for administration management practices and 0.86 for program effectiveness. The study used Principal Component Analysis (PCA) to determine that access and flexibility were the most important factors in educational equity, accounting for 40% of the variance. The results of ANOVA demonstrated a significant difference in social sustainability outcomes ($F(2, 77) = 42.56, p < 0.001$), indicating that well-managed digital skills programs have a significant positive effect on social sustainability. These results suggest that program goals should be incorporated into administrative management to achieve effective implementation and likely long-term impacts. In light of these results, it is suggested that future online skills programs should be more sustainability-focused and adopt flexible learning frameworks to meet the needs of a variety of learners. Future research could explore introducing technology-enabled tools to provide real-time feedback and enable continuous program improvement. Other learning institutions can use the research methodology as a guide towards identifying the impact of their digital skills programs on social equity and sustainability. Future research could expand the sample size and include qualitative methods, such as interviews or focus groups, to gain a more in-depth understanding of the experiences of marginalized groups in online schooling.

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