AHFE International

Human-Technology Interactions in Vocational Training: Insights From Italian Craft and Industrial Education

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ABSTRACT

Although "Made in Italy" craftsmanship remains economically and symbolically central, vocational careers are undervalued and poorly understood by adolescents. This paper reports an observational study in a vocational–technical institute in Italy's footwear district, at the intersection of vocational education, human–technology interaction, and the future of work. A 31-item questionnaire was administered to third- and fourth-year students in technical and vocational tracks to examine how they perceive craft professions, the local footwear industry, and their own career futures, with subgroup comparisons by gender, track, and year. Results show strong enthusiasm for craftsmanship and innovation but patchy knowledge of local firms, persistent stereotypes, and unequal access to internships and company visits. Perceived barriers—including low wages, unclear job roles, and limited family dialogue—contribute to uncertainty about craft-related pathways. The paper offers (i) an empirical characterization of students' perceptions in a key manufacturing district, (ii) a workflow that combines conventional statistics with large language model–assisted survey analysis, and (iii) design implications for technology-mediated vocational guidance, highlighting how virtual reality experiences and AI-driven recommendation systems can make vocational opportunities more visible, equitable, and better aligned with regional industry needs.

Keywords: Vocational education and training, Career guidance, Digital sustainability, Craft professions, Footwear industry

INTRODUCTION

Across Europe, persistent skills mismatches continue to affect craft and industrial sectors despite sustained demand for qualified workers (McGuinness, Pouliakas and Redmond, 2018). In Italy, the paradox is especially evident: the cultural and economic weight of "Made in Italy" craftsmanship is widely celebrated (Roberts, 2019), yet vocational careers remain socially undervalued and poorly understood by adolescents nearing school completion (Bugliesi and Micelli, 2024); (Webster-Wright, 2009). At the same time, rapid digitalization is reshaping both educational expectations and industrial practices. Students raised in media-rich environments increasingly anticipate interactive, technology-enhanced learning, whereas artisanal trades typically rely on prolonged, hands-on skill acquisition (Yalamu, Mahmud and Chua, 2025); (Ratten, 2022). From a human–technology interaction perspective,

this tension raises a central question: how can emerging technologies help align learners' expectations, vocational identities, and regional labor-market needs?

Two technological trajectories are particularly salient. First, VR has shown efficacy for domain learning, psychomotor skill development, and motivation in VET contexts (Kablitz, Conrad and Schumann, 2023); (Yang et al., 2024). Second, AI is gaining traction in career guidance through adaptive feedback and personalized skill pathways, supporting mobility and labor-market alignment (Rahman et al., 2023); (Mullens and Shen, 2025). Together, these streams suggest a design space in which cyber-physical experiences and data-driven guidance could make vocational opportunities more visible, equitable, and attractive to young learners.

This paper contributes to that design space by reporting an observational study conducted in March 2025 at the "Marie Curie" Vocational Institute (Savignano sul Rubicone, Italy), within the *Craft Trainer* project. We administered a 31-item questionnaire to $N = 147$ third- and fourth-year students across Technical (Mechanics/Energy) and Vocational (Fashion/Footwear) tracks and analyzed responses with contingency tables, Pearson's χ^2, Cramér's V, and logistic regression (IBM SPSS 30.0). Guided by an HCI lens on human–technology interaction and the future of work, we ask:

- **RQ1 —** How do students perceive craft professions and the local footwear industry?
- **RQ2 —** How do gender, curricular track, and year group shape awareness, aspirations, and perceived barriers?
- **RQ3 —** Which cross-cutting skills (e.g., creativity, digital competence) and experiential factors (e.g., internships, factory visits) are associated with more positive or informed orientations?

Anticipating the results in brief, we find high enthusiasm for craftsmanship (69.4% *positive/very positive*) alongside limited knowledge of local firms (about one third reporting little awareness). Exposure matters: internships and workplace visits are associated with more informed perceptions, yet access is uneven—technical-track students report significantly fewer opportunities. Post-diploma trajectories diverge by subgroup: males and technical-track students tend toward direct employment/ITS, whereas females and fashion-track students more often indicate university. Creativity and digital competence emerge as cross-cutting abilities valued across groups.

RELATED WORK

This study intersects two primary research strands: VET studies and student perceptions of craft and industrial occupations.

Vocational Education and Student Perceptions

Vocational students' identities and aspirations are shaped by a complex interplay of experiential learning, family influence, and perceived educational trajectories. Prior studies underscore the importance of workplace exposure

and guided experiences in fostering self-efficacy. For example, (Pylväs, Nokelainen and Rintala, 2022) highlights how mentorship and social support in TVET contexts build student confidence, while (Rintala and Nokelainen, 2019) emphasizes the value of integrated curricula and workplace learning. Parental involvement is another key factor. Boonk et al. (2020) found that educational discussions and parental aspirations positively correlate with student motivation, whereas overbearing reinforcement at home can have the opposite effect. These results help explain the motivational differences observed in our sample, where students who reported open family dialogue often demonstrated clearer vocational goals. Finally, vocational education is increasingly viewed as a "stepping stone" toward higher education. O'Shea et al. (2012) reveals how this transitional role is experienced differently across students, depending on background and expectations. This aligns with our observation that some students view VET as a launchpad for future opportunities, while others see it as a final destination, underlining the need for guidance that addresses both immediate vocational outcomes and longer-term educational pathways.

Vocational Guidance and Local Industry Knowledge

Despite their natural affinity, vocational education and career guidance often operate in silos. Zelloth (2014) argues that guidance services frequently neglect the realities of TVET, due to structural barriers, outdated paradigms, and a systemic bias favoring academic pathways. Billett and Le (2024) emphasizes the need for local engagement to encourage vocational participation, noting that informing and motivating students requires collaboration across educators, industry, and families. Inderanata and Sukardi (2023) shows that demonstration-based vocational guidance significantly improves student work readiness over traditional explanation-based methods. This helps explain why students in our study, who had little hands-on exposure, struggled to envision themselves in industry roles. Finally, Kolhe and Bhat, (2024) outlines how AI technologies can enhance guidance through personalized counseling and predictive job matching.

Collectively, these works underscore the need for locally grounded, experiential, and technologically supported guidance. Our study adds empirical evidence that inadequate exposure and weak school–industry integration hinder students' understanding and interest in regional manufacturing careers.

METHODOLOGY

This Section describes the development and administration of the survey instrument, the characteristics of the sample, and the statistical procedures employed to analyze the resulting data.

Survey Instrument and Data Collection

The questionnaire consists of 31 items, reported in Table 1, divided into eight groups, including three demographic questions used to describe the sample: gender, year group, and field of study. The items were developed specifically for this study, based on expert input and a review of existing literature. Then,

it underwent expert review. Question types included: i) Binary closed–ended questions; ii) Multiple–choice questions (single–answer and check–all–that–apply); iii) Open–ended questions; iv) Reverse-scored ordinal Likert items (range one to seven). An additional question was included to obtain consent for participation in the study. Anonymity was guaranteed. To improve response completeness, only one mandatory question was set for each group. Special emphasis was placed on open-ended responses to capture aspects that might not have been addressed in the predefined answer options.

Table 1: Survey questions (English version).

Survey Item
What is your overall impression of manual or craft work?
Which skills do you believe are required to work in the craft sector?
Would you like to learn a craft trade?
Please briefly justify your previous answer.
In your opinion, which skills are most important for working in the craft sector?
What do you know about the footwear industry in our area?
What types of occupations do you think exist within the footwear industry?
How do you foresee the footwear sector evolving in the coming years?
Which educational track are you currently enrolled in?
Why did you choose this programme?
What do you hope to learn during this course of study?
What or who most influenced your decision to attend this programme?
What would you like to do after graduation?
Would you like to work in the craft sector?
Please explain your previous answer.
Do you perceive any difficulties in working in this sector? If so, which?
What do you think might discourage young people from working in the craft sector?
Have you ever visited a footwear company? (Select all that apply)
If yes, what did you like most about the company?
If yes, what did you like least about the company?
Would you be interested in using new technologies in the footwear (or craft) sector?
What interests you most about the footwear (or craft) sector?
Year of study
Gender
Has anyone in your family ever worked in the footwear sector?
If yes, who?
How does your family perceive employment in the footwear sector?
Does your family encourage you to work in the footwear sector?
How relevant is the opinion of these people to your future choices?
What is the highest level of education completed by your parents?
What is the highest level of education completed by your siblings, if any?

The questionnaire was administered in the morning during regular class hours, in two sessions, each preceded by a one-hour seminar in which the project manager introduced the key concepts of the *Craft Trainer* initiative. The survey targeted third- and fourth-year students and was delivered via Google Forms, accessed on students' smartphones through a QR code. Participation was voluntary, and respondents were free to complete the form outside school hours.

A total of 157 students accessed the survey; 147 provided valid responses (**93.6 %** consent rate). Table 2 reports the characteristics of the sample. It is worth noting that students in the vocational Fashion/Footwear track were almost exclusively female, whereas those in the technical track were predominantly male—a pattern confirmed by the data. Only a handful of respondents identified as non-binary or left the gender item blank. This strong overlap between gender and field of study resurfaced throughout the analysis: contingency tests repeatedly highlighted a robust association, and logistic-regression models frequently exhibited collinearity between the corresponding predictor variables.

Table 2: Sample characteristics (n = 147).

Variable	Value	n	%
Field of study	Technical (Mechanics–Energy)	72	49
	Vocational (Fashion–Footwear)	71	48
	Other / unspecified	4	3
Gender	Female	65	44
	Male	66	45
	Other / unspecified	16	11
Year group	Third year	90	61
	Fourth year	54	37
	Other / unspecified	3	2

Statistical Analysis

The statistical analysis proceeded in two stages. First, frequencies and basic descriptive measures were computed for each questionnaire item and compared across responses. Second, in order to detect significant differences among the subgroups, gender, year group (third vs. fourth year), and field of study (technical track vs. vocational fashion track), two more advanced inferential techniques were applied. The former are contingency tables. Pearson's χ^2 test for association and Cramér's V (equivalent to the ϕ coefficient for 2×2 tables) were applied to detect significant differences across gender, year-group, and field-of-study subgroups. The latter is logistic regression. It is used to test main effects and to corroborate findings from the χ^2 analyses. All analyses were conducted in SPSS version 30.0.

RESULTS

This Section presents the statistical outcomes for each thematic block of the questionnaire. The core inferences rely on Pearson's χ^2 tests, Cramér's V, and inspection of adjusted standardised residuals. Where appropriate, these findings are corroborated with item-level logistic regression models. Only effects reaching $p < .05$ are discussed; non-significant comparisons are marked as n.s. for brevity. Descriptive figures generated during the preliminary LLM pass guided the confirmatory analysis but are omitted here for space.

Perception of Craft Professions

The first section explored students' general impressions of craft professions. Overall, 69.4 % of respondents described their view as *positive* or *very positive*, and only 1.4 % as negative. Gender was significantly associated with this perception ($\chi^2(2) = 40.24$, $p < 0.001$, Cramér's $V = 0.523$), indicating a large effect. However, the cell-level contribution for *female–positive* responses did not reach conventional significance ($z = 1.8$).

Manual dexterity emerged as the most frequently cited skill (43.5 %), followed by creativity, commitment, and experience. No significant subgroup differences were observed for skill preferences. A large majority (78.9 %) expressed a desire to learn a craft, with motivations centred on personal interest and skill development. Creativity ranked as the most valued ability for success, particularly among fashion-track students. Among technical-track students, digital competence showed increased relevance, explaining an additional 3 % of variance in Likert rankings.

These findings confirm the enduring appeal of manual professions among Generation Z. Although female students showed marginally more positive attitudes, the effect appears generalised across gender and track.

Perception of the Footwear Sector

The second section examined awareness and perceptions of the footwear industry, with a focus on the *San Mauro Pascoli Footwear District*. Overall, 34 % of students reported little or no knowledge of local firms, especially technical-track students ($p < .05$, $z = 3.7$). Conversely, 13.6 % recognized local companies, slightly more among fashion-track females ($p < .05$), and 11.6 % were aware of the district's national and international reputation.

In terms of job associations, 30.6 % mentioned manufacturing, notably fashion-track females ($p < .05$, $z = 3.7$). Design roles were mentioned by 15 %, chiefly by technical-track males ($p < .05$, $z = 2.2$), and 13.6 % cited roles like cobbler or craftsperson, especially fourth-year students ($p < .05$, $z = 3.4$). Future prospects were seen as *positive/growing* by 31.3 %, and *negative/declining* by 23.8 %. Automation and technological change were cited by 17 %, more often among males ($p < .05$) and third-year students ($p < .05$).

While enthusiasm for learning a trade was widespread, more than half of the students admitted to limited knowledge of the local industry, suggesting that career enthusiasm is not yet matched by sector-specific literacy.

Motivation for Study Track

Students most often cited general interest (23.1 %), fashion/footwear (23.1 %), or mechanics (19 %) as their main reason for selecting a study track. Those expressing sector-specific interests generally chose the corresponding track. Expected learning outcomes reflected these choices: technical–mechanical skills (23.1 %), fashion/footwear skills (16.3 %), and uncertainty (19.7 %). The latter was more common among third-year students ($p < .01$, $z = 2.9$).

Track choice was most influenced by school open days (26.6 %) and family (26 %), with friends, lower-secondary guidance, and online sources playing smaller roles. Creativity emerged as the most important cross-cutting ability, followed by technical and digital competence. The increased weight of digital skills in the technical track reflects growing alignment with Industry 4.0.

Post-Diploma Plans

Regarding future plans, 47.2 % of students preferred direct employment—especially third-years ($p < .001$, $z = 2.1$). University study was the next most cited option (30 %), followed by training courses (9.4 %) and ITS/IFTS pathways (8.3 %), with the latter favoured by fourth-years ($p < .001$, $z = 4.5$). Interest in learning a craft remained high (62 %), with motivations including creativity, manual skill, and sector interest. Deterrents included perceived low wages (23.4 %), preference for other jobs (14.7 %), misconceptions (14.7 %), and low self-confidence (14.4 %). Reported difficulties were relatively low; only 12.9 % mentioned physical demands, and 8.2 % cited skill requirements. A clear divide emerged between immediate employment and further study, with gender and track differences shaping preferences. Female and fashion-track students leaned toward university, while males and technical-track students preferred employment or ITS programmes.

Knowledge of Local Companies

Over half of respondents had visited a footwear firm, predominantly fashion-track students ($p < .001$, $z = 10.1$). Most visits occurred during internships (44.1 %) or school trips (17.4 %). Few technical-track students had similar exposure. Asked about their impressions, 46.3 % gave no or vague responses—mainly males ($p < .001$) and technical-track students. Positive aspects included the experience itself (13.6 %), work atmosphere (12.9 %), production process (8.2 %), and professionalism (3.4 %). Negative comments (12.9 %) focused on noise, space, and perceived exploitation, primarily among fashion-track students. The asymmetry in experiential learning opportunities is noteworthy. Technical-track students, despite interest in mechanics or technology, reported less engagement with relevant industries.

Technology and Innovation

Interest in footwear-related innovation was affirmed by 67.3 % of students, mostly third-years ($p < .05$, $z = 2$). Key interests included creativity (28.4 %), marketing (18.1 %), manual work (15.3 %), and machinery/technology (13.4 %). Interest in sustainable materials (10 %) and business management (12.8 %) also emerged. Innovation was largely viewed as a competitiveness driver. Notably, fourth-year students expressed more scepticism, likely shaped by internships and exposure to real-world constraints. Approximately one third of students anticipated growth in the footwear industry, while one quarter foresaw decline. Automation was frequently mentioned (17 %), especially by males and technical-track students—highlighting the central role of industrial narratives in vocational education.

Family Context

Some 40.1 % of students had a family member with experience in the footwear sector—most often a parent (35.1%). Using an inverted Likert scale (1 = very relevant), close relatives had the most influence on career choices ($MR = 2.33$), followed by friends ($MR = 3.48$), other relatives, teachers, and social contacts ($MR = 4.79$). The highest parental education levels were upper-secondary school (52.4 %), followed by lower-secondary (23.8%). Family influence was relatively homogeneous across gender and tracks, with school open days and family advice being the dominant drivers of track selection. The educational profile of families—mostly capped at upper-secondary school—suggests medium-to-low cultural capital. Female students were slightly more likely to come from less-educated households, in line with prior vocational education research.

DISCUSSION

This Section discuss the answers the RQs and details ethical considerations and limitations of this Work.

Synthesis of Findings

Across the three research questions, the findings indicate that students hold broadly positive views of craft professions (**RQ1**), grounded in creativity and personal interest rather than concrete sector knowledge. Awareness of the local footwear industry remains limited, suggesting that enthusiasm for craftsmanship coexists with shallow familiarity with actual firms and career pathways. Gender, curricular track, and year group shape these orientations in nuanced ways (**RQ2**): female and fashion-track students show slightly more positive attitudes and greater exposure through visits, whereas males and technical-track peers emphasize technological innovation but report lower direct knowledge of local companies. Fourth-year students, after internships, appear more realistic and occasionally more sceptical about sector prospects. Regarding cross-cutting competences and experiences (**RQ3**), creativity and digital skills emerge as key enablers of positive and

informed orientations, bridging traditional craft and innovation narratives. Experiential learning (e.g., internships and factory visits) enhances awareness but can temper optimism when students confront real-world constraints. Overall, the evidence suggests a need for structured, equitable exposure to local industries and stronger integration of reflective, skill-based experiences within vocational curricula to convert abstract enthusiasm into informed, sustainable career intentions.

Ethical Considerations

The study followed the ethical standards of the University of Bologna and complied with the EU General Data Protection Regulation (GDPR) and Italian privacy laws. It was conducted for educational and social purposes to inform vocational orientation practices. Participation was voluntary and anonymous, with students receiving clear, age-appropriate information about the study and providing informed consent prior to participation. As minors were involved, procedures adhered to institutional and school regulations, with formal approval from the school administration and supervision by teaching staff. Only consenting students were included, and no personally identifiable or sensitive data were collected.

Limitations

This study provides valuable insight into student perceptions of craft professions and local industry but faces several methodological constraints. Data were drawn from a single vocational–technical institute in Emilia-Romagna, limiting external validity and regional generalisability. The use of contingency analyses (χ^2 tests and residuals) offers clear descriptive contrasts but cannot capture interaction effects and may be sensitive to outliers. Logistic regressions added depth but were constrained by the modest sample size (N = 147) and collinearity between gender and curricular track, reducing statistical power and stability. Moreover, as data were collected within a single school year, findings represent a contextual snapshot shaped by local conditions and timing. Future research should expand the sample, include multiple institutions, and apply stronger multivariate and longitudinal designs to test interaction effects and temporal trends.

CONCLUSION

This study offered an exploratory, HCI-oriented snapshot of how vocational–technical students perceive craft professions and the regional footwear industry. Survey data from $N = 147$ students show that, despite widespread enthusiasm for craftsmanship, sector-specific knowledge remains limited and uneven (**RQ1**). Gender, curricular track, and year group influence aspirations and exposure (**RQ2**): female and fashion-track students report greater workplace contact and higher interest in university study, while male and technical-track peers lean toward direct employment and exhibit stronger attention to technological aspects. Creativity and digital competence emerge

as shared cross-cutting skills linked to more informed orientations, whereas experiential learning enhances understanding but not necessarily optimism (**RQ3**). Together, these findings reveal a mismatch between students' creative interest and their concrete awareness of local opportunities, underscoring the need for more equitable, technology-supported guidance and exposure within vocational education.

From a human–technology interaction perspective, the findings suggest several design-oriented implications. Technology-mediated experiences, such as VR-based explorations of craft workflows, could enhance visibility of local industries where direct exposure is limited. AI-driven guidance tools may further reduce informational gaps by matching students' interests and skills with regional opportunities. Such interventions should be designed to ensure equitable access across genders and tracks while highlighting creativity and digital competence as shared enablers of modern craftsmanship. These propositions remain exploratory, calling for future longitudinal and experimental studies to assess how VR- and AI-supported guidance influences students' knowledge, self-efficacy, and career decisions.

ACKNOWLEDGMENT

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