Understanding the Future Green Workforce through a Corpus of Curricula Vitae from Recent Graduates

Francesca **Nannetti**[2], Matteo **Di Cristofaro**[1]

[1] *Department of Studies on Language and Culture, University of Modena and Reggio Emilia, 41121, Italy, IT*

[2] *Marco Biagi Department of Economics, University of Modena and Reggio Emilia, 41121, Italy, IT*

Abstract

In view of the much-heralded ecological transition, to stay competitive and participate in the collective effort to face global warming and climate change, organisations need to select employees interested in and able to develop environmentally sustainable and innovative ideas. The existing literature however does not present consistent nor concordant results on the effective interest, involvement and expertise of *Generation Z* members – namely, the newest entrants into the workforce – in *green* issues. This study presents a corpus-assisted methodology to explore the profile of the upcoming workforce expected to present itself to companies. With CVs as one of the first interfaces between candidate and company in the recruitment process, a purpose-built corpus consisting of Curricula Vitae from recent graduates of the University of Modena and Reggio Emilia was collected. Data is investigated through a Corpus-Assisted Discourse Studies (CADS) framework, proposing a novel interaction between structured metadata and textual information. The original contribution of this approach lies in the extraction of information from the narrative structure of CVs which, guiding the evaluation and exploration of metadata, ensures that the knowledge value of the data can be explored in a discursive manner and not reduced to lists of competences and qualifications.

Keywords

Corpus-Assisted Discourse Studies, Corpus Linguistics, Curriculum Vitae, Green Workforce

1. Introduction

The pursuit of environmentally sustainable growth is now more prominently featured on the global policy agenda than ever before [1], and the efforts to fight climate change and to support transition towards low or net-zero carbon energy systems have manifested over the last decade through the increasing release of international agreements and strategies striving for a more sustainable future [2].

Achieving a successful transition to a more sustainable economy, however, requires not only government intervention policies, but also a new generation workforce [3] that should be composed of individuals able to deal with complex issues and ambiguous situations associated with sustainable development in unpredictable and often rapidly changing circumstances [4]. Consequently, to stay competitive and participate in the collective effort to face global warming and climate change, organisations need to attract, identify, select and attempt to retain individuals interested in and able to develop *green* and innovative solutions [5]. Even though by 2025 27% of the workforce will be comprised of individuals from *Generation Z* [6] - namely, those born roughly between the mid-1990s and the early 2010s –, and despite the growing body of research on this topic [7], the existing literature does not present consistent nor concordant results on the effective interest, involvement and expertise of *Generation Z* in sustainable and environmental issues [8, 9]. Therefore, this study proposes a corpus-assisted methodology to explore the *Gen Z* members' profile as the newest entrants into the workforce, particularly considering the need for a large and well-qualified workforce to effectively manage the ecological transition. Given the crucial role played by

0000-0001-7027-2894 (M. Di Cristofaro); 0009-0005-9197-869X (F. Nannetti)

universities in educating and shaping the next generation of professionals [10], a sample of recent graduate (2022-2023) has been identified as consistent and representative. Moreover, since in the very early stages of the selection process screening applicants' Curricula Vitae (CVs) is a widely used recruitment practice to shortlist the best candidates [11], CVs constitute the first documented interface between people and companies.

Hence, this research is based on a purpose-built corpus [12] consisting of 8,096 Curricula Vitae from students who received a certified title at the University of Modena and Reggio Emilia during the 2022/2023 academic year, collected from the AlmaLaurea database. AlmaLaurea is an interuniversity Consortium representing 82 Italian universities, aimed at facilitating graduates' access to the job market by helping them to connect with companies. In this regard, one of the main services is the database of students' Curricula Vitae.

Data is investigated through a Corpus-Assisted Discourse Studies (CADS) framework - that "set of studies into the form and/or function of language as communicative discourse which incorporate the use of computerised corpora in their analyses" [13] - serving a novel methodological approach impinging on the interaction between CVs structured metadata and textual information.

2. Background

The present research draws from previous studies and theoretical frameworks related to skills and jobs geared towards environmental sustainability; the attitude of *Generation Z* towards the ecological transition; and CVs research value.

The multiple dimensions discussed in the literature as *green knowledge*, *green skills*, *green abilities*, *green attitudes*, *green behaviour* and *green awareness* [14] fall under a comprehensive *green competence*, the cognitive aspect of which seems to be the most universally recognised and emphasised. In particular, the technical and analytical expertise on *green issues*, along with problem solving, system thinking, futures thinking and strategic thinking constitute the core of this competence [15, 16, 17, 18].

Considering that *Generation Z* represents "an essential stakeholder in building a sustainable future" [8], much discussion still revolves around whether this generation effectively has higher pro-sustainable and pro-environmental attitudes than the older generations [8, 9].

In this regard, Curricula Vitae are a source of information since they involve detailed and longitudinal data about individuals' educational and professional backgrounds, work attitudes, personal interests and expectations [19, 20].   According to [21], since applicants' qualifications and experiences are acquired over time, their personal, educational and employment histories are typically presented as a sequential progression over time. Interestingly, the author argues that this "introduces into the CV a temporal dimension that suggests a narrative" [21]. Consequently, the structure of a CV is designed to convey this narrative dimension through the co-presence of metadata with biographical information and free fields that give the candidates the opportunity to express themselves and reflect on their path. Moreover, [22] suggests that writing a CV implies becoming involved in acts of engagement and alignment to a specific landscape of practice.

Precisely with the aim of enabling a discursive perspective on a corpus of CVs, it was essential to imagine a data structure that would make them readable by linguistic tools.

3. Methodology

As mentioned, the corpus for this study was built from the AlmaLaurea CVs' database, which serves as the only CV form certified by Italian universities. As such it was considered the repository offering the highest degree of authenticity and consistency of the information reported by recent graduates. In addition, this made it possible to obtain a considerable amount of documents with the same format, thus avoiding critical issues related to the variability of available templates.

3.1. Corpus building workflow

The AlmaLaurea Information Systems Department at UniMoRe extracted from its database all CVs containing at least one degree certified by the University of Modena and Reggio Emilia during the 2022/2023 academic year. More specifically, all those students whose CVs contain at least one <field name="DATALAU"> with a value between January 1, 2022, and August 31, 2023, and at least one <field name="UNIV_DESC"> with a value equal to University of Modena and Reggio Emilia.

Dealing with biographical data however raises critical ethical and privacy issues; for this reason AlmaLaurea conducted a preliminary data cleaning, removing all personal references and contact details. Before transmitting the files, further adjustments were made based on the CVs' structure, in order to ensure further anonymisation of the corpus. The remaining personal data included only gender, date of birth, and province of birth. Based on this information, it is not possible - in the workflow described in this paper - to identify the individual to whom it refers, either directly or indirectly.

Once defined which details to include from each CV and the fields for the extraction, in December 2023

Almalaurea provided for this study 8,096 CVs structured as XML.

3.2. Data extraction and formatting

Extraction and formatting of the data was conducted through the use of a custom Python script, whose function was that of producing a machine-readable XML structure [23] preserving both metadata and textual contents. The definition of the structure was informed by two different but complementary needs: first, to allow #LancsBox X (v. 4.0.0, [24]) to manage the resulting corpus; second, to ensure that contextual and textual information in the original dataset could be correctly queried and retrieved during the linguistic analysis.

As suggested in [25, 26], metadata were left in the corpus to allow for filtering and querying procedures, thus exploiting the possibilities provided by the (expected) coexistence in each CV of free fields with textual content and structured metadata. In this respect, it was found that a significant issue existed in the form of the incomplete compilation of the CVs by a considerable number of individuals. Only the year and province of birth, nationality (unspecified in 4 CVs) and sex are mentioned in all 8,096 CVs.

By executing the Python script, two corpora were obtained – one in English (CV_En) and one in Italian (CV_It) – to accommodate the use of POS tagging.

Using Lingua as language detector and SpaCy as tokenizer, a check was made on the language used in each textual content of the two corpora. Results are in Table 1.

Table 1
Tokens by language

Corpus	Tok_En	Tok_It	None	Tot
CV_it	208,233	2,771,282	36	2,979,551
CV_En	233,038	271,256	4	504,298

The relatively small percentage of Anglicisms in the Italian corpus is largely justified by the well-known presence of "English-induced lexical borrowing into Italian" [27], in particular since the most common domains being affected by English loanwords in the 21st century are economy, technology, the internet and the environment [27], where it is used as a "lingua franca of communication" [28]. On the other hand, it is the presence of several textual fields identically collected in each corpus but in most cases actually compiled only in Italian, along with textual fields effectively filled out in English, that leads to a high percentage of Italian tokens in the English corpus. Because of this incoherence the English corpus was excluded from the analysis.

Subsequently, the Italian corpus was loaded on #LancsBox X, which was chosen on the basis of its distinguishing feature, including its efficient metadata management. Indeed, due to the nature of the dataset, which includes 8,096 text files each one representing the CV of a single graduate, it was necessary to rely on a tool designed to analyse linguistic data with the ability of filtering through contextual information contained in the metadata.

The software, however, does not allow the inverse procedure, i.e. doing quantitative analysis that is not linguistic but rather informed by linguistic evidence. Thus, it is necessary to make use of data science techniques, which allow a tabular structure to be built from the narrative dimension [21] of CVs. Using a custom Python script, a first attempt was made to produce a data frame recording the progressive sequence of events and details described in each CV. This structure, although still preliminary, allows the extraction of quantitative and scalar indicators, to be combined with linguistic ones.

An interesting example is the case of digital skills, which are widely assumed to be crucial for the present and future of occupations [29]. As shown in Tables 2 and 3, the majority of CVs did not include these competences. Of those who assessed their digital skills, most considered themselves to be autonomous and not advanced users.

Table 2
Digital competences

	Communication	Content creation	Information processing
No Answer	4,835	4,856	4,820
None	8	40	6
Basic user	281	888	267
Autonomous user	1,594	1,800	2,037
Advanced user	1,378	512	966
Tot	8,096	8,096	8,096

Table 3
Digital competences

	Problem solving	Safety
No Answer	4,850	4,878
None	34	106
Basic user	836	973
Autonomous user	1,831	1,754
Advanced user	545	385
Tot	8,096	8,096

The final corpus loaded on #LancsBox X consists of 8,096 texts, 2,597,760 grammar tokens and 2,520,735 space tokens. Texts were annotated (tagged) for part of speech, headword and grammatical relation with SpaCy model it_core_news_md v.3.7.0, while semantic tagging was performed with PyMUSAS model it_dual_upos2usas_contextual v0.3.3. Accordingly, some well-known tools in the literature have been used to apply a corpus-assisted methodology to the analysis of curricula vitae, thereby combining "the investigation of vast quantities of digital textual data with linguistics-informed tools and frameworks of interpretation" [30].

3.3. Data structure

The AlmaLaurea CV contains textual fields aiding reflections on one's social, organisational, technical and artistic competences and outlining a personal description of oneself. In addition, applicants are asked to indicate their professional objective and desired occupation. With regard to the educational and professional pathway, it is required to reflect on the competences acquired during these experiences. An emphasis is also placed on the thesis work, for which the title, keywords and abstract are requested. For example, Figure 1 and Figure 2 show excerpts from CVs in which the sections relating to the professional objective and desired occupation have been filled.

```
▼<p type="persona">
    <u type="obj_prof_it">Vorrei riuscire ad applicare le mie
    conoscenze economiche, gestionali e sociali in una azienda
    legata al mondo HR o all'amministrazione del personale la cui
    cultura organizzativa sia orientata allo sviluppo
    sostenibile.</u>
    <u type="lavdesiderio_it">Responsabile risorse umane,
    Consulente del Lavoro</u>
```

Figure 1: Professional objective and desired occupation in 006101_it.

```
▼<p type="persona">
    <u type="obj_prof_it">Vorrei arrivare a ricoprire ruoli che
    uniscano le mie conoscenze di Economia e Marketing
    Internazionale acquisite durante gli studi alle mie passioni
    in ambito artistico e sociale. Al tempo stesso ambisco anche
    a ricoprire ruoli nell'organizzazione, pianificazione e
    contabilità aziendale.</u>
    <u type="lavdesiderio_it">Professione nell' Economia e
    gestione delle arti e attività culturali/ Marketing/
    Contabilità</u>
```

Figure 2: Professional objective and desired occupation in 002746_it.

As shown in Figure 1 and 2, the wealth of available metadata - biographical information, the educational and professional background, self-assessment of personal attitudes and also preferences with respect to professional career development - arguably represents a powerful resource for screening biographical information through textual information and vice versa.

It is in fact the combination of the two (textual data and metadata) that enables a linguistic analysis of the underlying narrative of CVs; a procedure that mixes both qualitative and quantitative perspectives, and that can be summarised as follows. First CVs are filtered by candidates' characteristics, starting from those graduates that wrote a thesis concerning environmental sustainability - and are therefore potentially engaged with topic; then the details as to how they self-assessed themselves regarding two of the most required competences in the frame of an overall *green competence* - capacity of initiative and problem solving - are acquired, and triangulated with corpus analysis.

Hence, drawing on a comprehensive review of the intense academic and non-academic debate on green issues, it was possible to identify some recurrent and significant topic that would return abstracts relevant to the present analysis. Once a subcorpus with all abstracts (3,724) was created on LancsBox X, through wildcard searches in both English and Italian, the following words and their derivatives from the same root were identified: *sostenibilità/ sustainability* (sostenibil*/ sustainab*), *cambiamento/ change* (cambiament*/ change*), *transizione/ transition (transizion*/ transition*), energia/energy (energ*).* Results are summarized in Table 4.

Table 4
Wildcard searches in thesis abstracts

Value	Hits	Texts
sostenibil/sustainab*	789	439
cambiament/change*	640	474
energ	569	356
transizion/transition*	152	102
Tot	2,150	1,371

Therefore, since collocates are "words which frequently co-occur, more often than would otherwise be expected by chance alone" [31] and collocation analysis is often used to identify discourses in corpus linguistics, collocates of the aforementioned occurrences are presented in Figure 3, 4, 5, 6. Given the prevalence of Italian occurrences, apart from the search for *energ*, in all the other cases the collocates of the Italian terms are shown. More specifically, the first 20 are displayed, with stop words removed, Freq.(collocation) >5 and Log Dice >6.
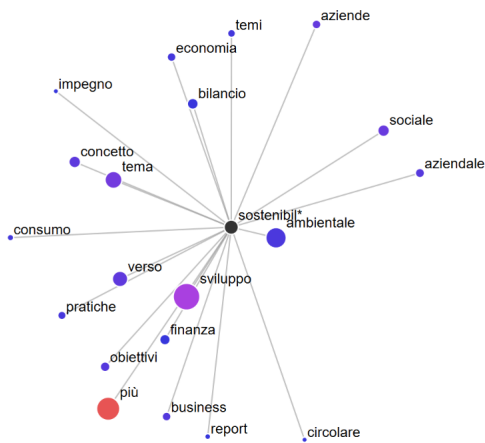
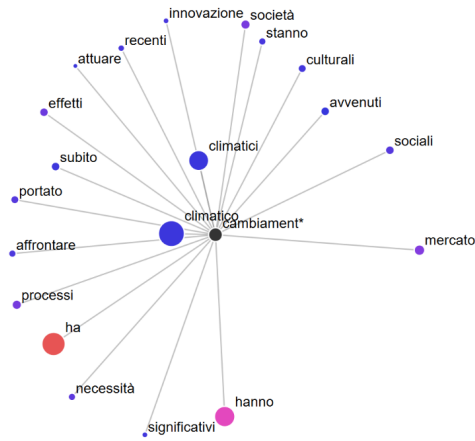**Figure 3**: GraphColl for *sostenibil** in subcorpus "tesiabstract_it"

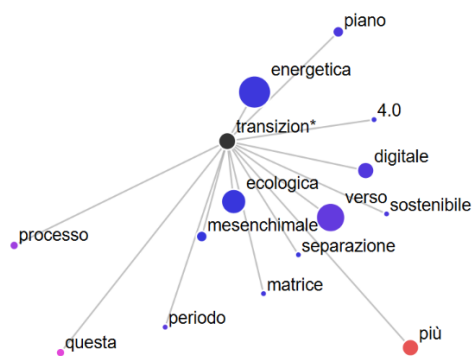**Figure 4**: GraphColl for *cambiament** in subcorpus "tesiabstract_it"

Figure 5: GraphColl for *transizion** in subcorpus "tesiabstract_it"
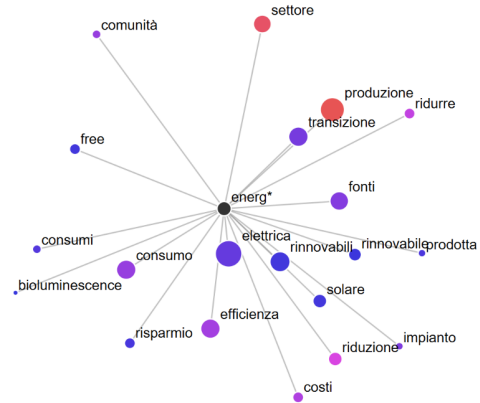

Figure 6: GraphColl for *energ** in subcorpus "tesiabstract_it"

From collocation analysis it emerged that, ranked by Log Dice, the first 4 collocation are: *transizione energetica* (11,6) *transizione ecologica* (11,4), *cambiamento climatico* (11,4) and *sostenibilità ambientale* (10,8). Deeply zooming in into candidates' characteristics, the analysis moved to observing how graduates that included these phrases into their CV's textual fields - and therefore seem to be involved in the topic - self-assessed themselves regarding capacity of initiative and problem solving. Results are in Figure 7.

Phrase	self asssesment (0-10)	Problem solving	Capacity for initiative
transizione energetica	0	5	5
	6	1	1
	7	0	2
	8	4	4
	9	5	3
	10	3	3
transizione ecologica	0	5	5
	7	1	1
	8	5	5
	9	3	3
	10	2	2
cambiamento climatico	0	14	14
	5	0	1
	7	5	1
	8	11	15
	9	8	7
	10	7	7
sostenibilità ambientale	0	11	11
	6	1	3
	7	6	6
	8	18	11
	9	12	17
	10	6	6
Tot_CVs		133	133

Figure 7: Self-assessment scores for capacity for initiative and problem solving

It is worth noting that many students did not fill these fields, despite their widely recognised importance. Among those who did fill them in, there does not appear to be a prevailing feeling of excellence in these skills, but rather a cautious confirmation.

Examples provide evidence of the possibilities of the proposed approach, with the process of zooming in and zooming out of data enabled by the interface between metadata and textual information.

4. Methodological contribution

The current contribution of this paper is mainly methodological and theoretical, since, starting from a gap in the literature, it proposes to collect and analyse a large number of Curricula Vitae with a novel approach impinging on the underlying narrative dimension of these documents, a procedure that requires to triangulate metadata and textual information, and to make use of both linguistic tools and data science techniques.

Despite the reliance on standard approaches, the resulting combination offers both linguists and data scientists a novel perspective on CVs, ensuring that the knowledge value of the data can be explored in a discursive manner and not reduced to lists of competences and qualifications. Preliminary examples show the ability of this method to provide the means to build a profile of the generation described by the data. Additionally, the resulting details may provide interesting insights to companies seeking to engage recent graduates in supporting the ecological transition.

5. Current limitations and further research

The inherent complexity of extracting and exploring data from CVs requires innovative, analytical techniques, but the insights gained can provide a relevant contribution to the employment landscape's understanding. The goal currently being worked on is to refine the interplay between the tabular and the narrative structure of the CVs in order to exploit as far as possible their knowledge value.

Moreover, the adoption of a CADS approach to the analysis of CVs may come in contrast compared with the growing employment of machine learning approaches to CVs screening and evaluation [32, 33, 34]. The problematic reductionism of human competence at work, resulted by the widespread inclination to the codification of know-how [35], is potentially amplified by the use of AI tools in hiring processes, especially because of their quantification and categorization processes [36, 37]. Scholars also found that candidates may perceive algorithms as not able to see how unique they are, not considering certain qualitative and contextual information [37, 38].

Therefore, further research is being conducted to determine whether and how an approach that relies on the narrative dimension of CVs can be a valid alternative, or integration, to such systems.

Acknowledgements

References

[1] D. Consoli, G. Marin, A. Marzucchi, F. Vona, Do green jobs differ from non-green jobs in terms of skills and human capital?, Research Policy 45 (2016) 1046-1060. doi:10.1016/j.respol.2016.02.007.

[2] R. Bray, A. Mejía Montero, R. Ford, Skills deployment for a 'just'net zero energy transition, Environmental Innovation and Societal Transitions 42 (2022) 395-410. doi:10.1016/j.eist.2022.02.002.

[3] R. Vakulchuk, I. Overland, The failure to decarbonize the global energy education system: Carbon lock-in and stranded skill sets, Energy Research & Social Science 110 (2024) 103446. doi: 10.1016/j.erss.2024.103446.

[4] T. Lans, V. Blok, R. Wesselink, Learning apart and together: towards an integrated competence framework for sustainable entrepreneurship in higher education, Journal of Cleaner Production 62 (2014) 37-47. doi:10.1016/j.jclepro.2013.03.036.

[5] S. Ogbeibu, C. J. C. Jabbour, J. Gaskin, A. Senadjki, M. Hughes, Leveraging STARA competencies and green creativity to boost green organisational innovative evidence: A praxis for sustainable development, Business Strategy and the Environment 30 (2021) 2421-2440. doi:10.1002/bse.2754.

[6] I. Marchioni, G. Moretti, G. Tossici, Il valore non ha età: Persone e organizzazioni oltre il divario generazionale, EGEA spa, Milano, 2024.

[7] M. D. Benítez-Márquez, E. M. Sánchez-Teba, G. Bermúdez-González, E. S. Núñez-Rydman, Generation Z within the workforce and in the workplace: A bibliometric analysis, Frontiers in psychology 12 (2022) 736820. doi:10.3389/fpsyg.2021.736820.

[8] T. Yamane, S. Kaneko, Is the younger generation a driving force toward achieving the sustainable development goals? Survey experiments, Journal of Cleaner Production 292 (2021) 125932. doi: 10.1016/j.jclepro.2021.125932.

[9] B. M. Brand, T. M. Rausch, J. Brandel, The importance of sustainability aspects when purchasing online: comparing generation X and generation Z, Sustainability 14 (2022) 5689. doi:10.3390/su14095689.

[10] Y. -C. Wu, J. -P. Shen, Higher education for sustainable development: a systematic review, International Journal of Sustainability in Higher Education 17 (2016) 633-651. doi:10.1108/IJSHE-01-2015-0004.

[11] M. S. Cole, R. S. Rubin, H. S. Feild, W. F. Giles, Recruiters' perceptions and use of applicant

résumé information: Screening the recent graduate, Applied Psychology 56 (2007) 319-343. doi: 10.1111/j.1464-0597.2007.00288.x.

[12] P. Baker, G. Brookes, D. Atanasova, S. W. Flint, Changing frames of obesity in the UK press 2008–2017, Social science & medicine 264 (2020) 113403. doi:10.1016/j.socscimed.2020.113403.

[13] A. Partington, A. Duguid, C. Taylor. Patterns and meanings in discourse, John Benjamins Publishing Company, Amsterdam, 2013.

[14] C. Cabral, R. Lochan Dhar, Green competencies: Construct development and measurement validation, Journal of Cleaner Production 235 (2019) 887-900. doi:10.1016/ j.jclepro.2019.07.014.

[15] S. Wilhelm, R. Förster, A. B. Zimmermann, Implementing competence orientation: Towards constructively aligned education for sustainable development in university-level teaching-and-learning, Sustainability 11 (2019) 1891. doi: 10.3390/su11071891.

[16] A. Wiek, L. Withycombe, C. L. Redman, Key competencies in sustainability: a reference framework for academic program development, Sustainability Science 6 (2011) 203-218. doi: 10.1007/s11625-011-0132-6.

[17] S. L. Pan, R. Nishant, Artificial intelligence for digital sustainability: An insight into domain-specific research and future directions, International Journal of Information Management 72 (2023) 102668. doi: 10.1016/j.ijinfomgt.2023.102668.

[18] K. Brundiers, M. Barth, G. Cebrian Gisela, M. Cohen, L. Diaz, S. Doucette-Remington, W. Dripps Weston, G. Habron, N. Harre, M. Jarchow, Key competencies in sustainability in higher education—toward an agreed-upon reference framework, Sustainability Science 16 (2021)13-29. doi: 10.1007/s11625-020-00838-2.

[19] M. S. Cole, H. S. Field, W. F. Giles, S. G. Harris, Recruiters' inferences of applicant personality based on resume screening: do paper people have a personality?, Journal of Business and Psychology 24 (2009) 5-18. doi: 10.1007/s10869-008-9086-9.

[20] J. Dietz, I. Chompalov, B. Bozeman, E. Lane, J. Park, Using the curriculum vita to study the career paths of scientists and engineers: An exploratory assessment, Scientometrics 49 (2000) 419-442. doi: 10.1023/a:1010537606969

[21] C. Lipovsky, The CV as a multimodal text, Visual Communication 13 (2014) 429-458. doi: 10.1177/147035721349786.

[22] G. M. Fillenwarth, M. McCall, C. Berdanier, Quantification of engineering disciplinary discourse in résumés: A novel genre analysis with teaching implications, IEEE Transactions on Professional Communication 61 (2017) 48-64. doi: 10.1109/TPC.2017.2747338.

[23] A. Hardie, Modest XML for Corpora: Not a standard, but a suggestion, ICAME journal 38 (2014) 73-103. doi:10.2478/icame-2014-0004.

[24] V. Brezina, W. Platt, #LancsBox X [software], Lancaster University, 2024. URL: http://lancsbox.lancs.ac.uk.

[25] M. Bondi, M. Di Cristofaro, MoReThesisCorpus: Documenting academic language as used in the theses submitted to the University of Modena and Reggio Emilia, Iperstoria 21 (2023) 9-30. doi: 10.13136/2281-4582/2023.i21.1265.

[26] N. Lorenzo-Dus, M. Di Cristofaro, I know this whole market is based on the trust you put in me and I don't take that lightly': Trust, community and discourse in crypto-drug markets, Discourse & Communication 12 (2018) 608-626. doi:10.1177/1750481318771429.

[27] V. Pulcini. The Influence of English on Italian: Lexical and Cultural Features, Berlin\ Boston, De Gruyter, 2023.

[28] P. Vettorel, V. Franceschi, English and other languages in Italian advertising, World Englishes 38 (2019) 417-434. doi: 10.1111/weng.12432.

[29] P. Rikala, G. Braun, M. Järvinen, J. Stahre, R. Hämäläinen, Understanding and measuring skill gaps in industry 4.0—a review, Technological Forecasting and Social Change 201 (2024) 123206. doi:10.1016/j.techfore.2024.123206.

[30] M. Di Cristofaro, Corpus Approaches to Language in Social Media, Routledge, New York, 2023. doi:10.4324/9781003225218.2023.

[31] M. Gillings, G. Mautner, P. Baker, Corpus-assisted discourse studies, Cambridge, Cambridge University Press, 2023.

[32] B. Cowgill, Bias and productivity in humans and algorithms: Theory and evidence from resume screening, Columbia Business School 29, Columbia University, 2020.

[33] G. Abitova, A. Serikov, V. Nikulin, M. Rakhimzhanova, G. Shuteyeva, K. Kulniyazova, System for Talent Acquisition: Integrating AI, Automation, and Data Analysis in HR, in: International Conference on Artificial Intelligence in Information and Communication ICAIIC, Osaka, Japan, 2024, pp. 792-799. doi:10.1109/ICAIIC60209.2024.10463365.

[34] V. Dishankan, A. R. F. Shafana, AI-Driven Candidate Profiling: A Comprehensive Review of Methodologies, Technologies, and Future Directions, Journal of Information and Communication Technology (2023) 9-12.

[35] G. de Terssac, Come cambia il lavoro, 1st it. ed., Etas Libri, Milano, 1993.

[36] D. Pessach, G. Singer, D. Avrahami, H. C. Ben-Gal, E. Shmueli, I. Ben-Gal, Employees recruitment: A prescriptive analytics approach via machine learning and mathematical programming, Decision Support Systems 134 (2020) 113290. doi: 10.1016/j.dss.2020.113290.

[37] D. T. Newman, N. J. Fast, D. J. Harmon, When eliminating bias isn't fair: Algorithmic reductionism and procedural justice in human resource decisions, Organizational Behavior and Human Decision Processes 160 (2020) 149-167. doi: 10.1016/j.obhdp.2020.03.008.

[38] M. Lavanchy, P. Reichert, J. Narayanan, K. Savani, Applicants' fairness perceptions of algorithm-driven hiring procedures, Journal of Business Ethics 188 (2023) 125-150. doi: 10.1007/s10551-022-05320-w.