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Professional Development of Academic Staff Based on the Use of Digital Resources: Bibliometric Analysis

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Abstract. The aim of the article is to determine the categories of digital resources that are actually represented in the scholarly literature on the professional development of academic staff, and to substantiate a preliminary functional matrix that links these categories to the tasks they serve within the development cycle. The study combines a bibliometric survey of the Google Scholar database with a qualitative content analysis of a purposively assembled corpus of 22 Ukrainian- and English-language sources, each unit of which was coded by language, year of publication, document type, thematic cluster, category of digital resource and declared function. The bibliometric survey returned 22,900 Ukrainian-language results for the query “professional development of pedagogues”, 11,500 for “use of digital resources in professional development” and 1,160 for the combined query, as against 5,330,000, 7,140,000 and 2,530,000 respectively for the equivalent English-language queries. The narrowly focused query accounts for 47.5 per cent of the broad topic in the English-language segment but for only 5.1 per cent in the Ukrainian-language one, a ninefold difference in the degree to which the specific problem has been elaborated. Content analysis of the corpus distinguished six thematic clusters, the largest of which are digital competence frameworks and digital resources considered within the theory of professional development, and identified twelve categories of digital resources that serve four functions: knowledge acquisition, research visibility and publication monitoring, professional self-presentation, and collaborative interaction. Not a single source in the corpus relates particular resource categories to particular stages or organisational forms of development, and none verifies such a relationship empirically. The scientific novelty of the study consists in the first quantified comparison of the Ukrainian- and

English-language segments of this research field and in the resource–function matrix derived from the corpus, which converts a descriptive enumeration of digital tools into an analytical instrument. The practical significance lies in the possibility of using the matrix when designing institutional professional development programmes, individual development trajectories and in-house training for academic staff of Ukrainian universities.

Keywords: digital technologies; higher education institutions; university teachers; open electronic systems; scientometric databases; cloud-oriented environments; competence frameworks; andragogy; lifelong learning; research visibility.

Професійний розвиток науково-педагогічних працівників на основі використання цифрових ресурсів: бібліометричний аналіз

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Анотація. Метою статті є визначення категорій цифрових ресурсів, які реально репрезентовані в науковій літературі з проблеми професійного розвитку науково-педагогічних працівників, та обґрунтування попередньої функційної матриці, що пов'язує ці категорії із завданнями, які вони виконують у циклі професійного розвитку. Дослідження поєднує бібліометричне обстеження бази «Гугл Академія» з якісним контент-аналізом цілеспрямовано сформованого корпусу з 22 україно- та англomовних джерел, кожену одиницю якого закодовано за мовою, роком публікації, типом документа, тематичним кластером, категорією цифрового ресурсу та задекларованою функцією. Бібліометричне обстеження засвідчило 22900 україномовних результатів за запитом «професійний розвиток педагогів», 11500 – за запитом «використання цифрових ресурсів у професійному розвитку» та 1160 – за поєднаним запитом, тоді як еквівалентні англomовні запити дали відповідно 5330000, 7140000 і 2530000 результатів. Вузькосфокусований запит становить 47,5 % обсягу широкої тематики в англomовному сегменті й лише 5,1 % – в україномовному, що свідчить про дев'ятикратну різницю в опрацьованості конкретної проблеми. Контент-аналіз корпусу дав змогу виокремити шість тематичних кластерів, найбільшими з яких є рамки цифрових компетентностей і цифрові ресурси в теорії професійного розвитку, та ідентифікувати дванадцять

категорій цифрових ресурсів, які виконують чотири функції: освоєння знань, забезпечення дослідницької видимості та моніторингу публікаційної активності, професійної самопрезентації й колаборативної взаємодії. Жодне джерело корпусу не співвідносить окремі категорії ресурсів з окремими етапами чи організаційними формами розвитку і не перевіряє такого зв'язку емпірично. Наукова новизна полягає у першому кількісному зіставленні україномовного й англomовного сегментів цього дослідницького поля та у виведеній із корпусу матриці «ресурс – функція», яка переводить описовий перелік цифрових інструментів в аналітичний інструмент. Практичне значення полягає у можливості застосування матриці під час проєктування інституційних програм професійного розвитку, індивідуальних траєкторій розвитку та внутрішнього навчання науково-педагогічних працівників українських університетів.

Ключові слова: цифрові технології; заклади вищої освіти; викладачі університетів; відкриті електронні системи; наукометричні бази даних; хмаро орієнтовані середовища; рамки компетентностей; андрагогіка; неперервне навчання; дослідницька видимість.

Introduction

Topicality of the problem. The professional development of academic staff has moved from the periphery of higher education policy to its centre, and the reason is measurable rather than declarative. In the Ukrainian segment of Google Scholar, the query “professional development of pedagogues” returns 22,900 results, whereas its combination with the use of digital resources returns 1,160, that is 5.1 per cent of the broader body of work. In the English-language segment the same proportion amounts to 47.5 per cent. Ukrainian higher education thus discusses professional development intensively, but discusses its digital instrumentation nine times less thoroughly than the international academic community does.

This asymmetry has practical consequences. Ukrainian universities operate under conditions in which face-to-face forms of in-service training have been repeatedly disrupted, while institutional accreditation, publication requirements and academic mobility all presuppose confident use of scientometric databases, open journal systems, researcher identifiers and cloud-oriented environments. Digitalisation simultaneously generates new risks: cybersecurity, the protection of personal data and ethical responsibility in the use of technology, which is why an approach to professional development is required that combines technical knowledge with critical thinking, pedagogical flexibility and a capacity for innovation [4].

At the same time, the national regulatory landscape has taken shape: the draft framework of digital competence for pedagogical and academic staff [6] describes competence domains, components and descriptors, and is synchronised with DigComp 2.2 [17], DigCompEdu [18] and the UNESCO competency framework for the use of artificial intelligence by teachers [22]. Frameworks, however, describe what a teacher should be able to do; they do not indicate which specific digital resource supports which specific developmental task. That decision is left to the institution, and at present it is made intuitively.

Analysis of recent research and publications. Studies of the theory of professional development link its effectiveness to the content of professional activity itself: development yields results when its programmes reflect the needs of the real professional environment and the interests of university teachers [7], and when it is built on a competence-based rather than an hours-based logic [8]. K. Menon [19] shifts the emphasis further, arguing for the humanisation of academic staff development, whereas J. Ambon et al. [15], in a systematic review, establish the positive influence of continuous professional development on the quality of teaching. The two positions are complementary rather than contradictory, yet neither addresses the instrumental question of what mediates that influence.

A second group of works transfers the problem into the digital domain. M. Antonchenko et al. [1] analyse the formation of information and digital competence of teachers in

postgraduate education; H. Chaharbashloo et al. [16] propose a multilevel model of online teaching competencies; I. Novyk et al. [9] examine the use of Internet resources in the personal and professional development of future teachers; T. Potapchuk et al. [11] describe the advantages of cloud technologies; M. Tolmach [14] emphasises the knowledge-transfer function of the digital educational environment. These studies converge in asserting the usefulness of digital resources, but they enumerate tools rather than differentiate between them.

A third group concerns the organisation of practice. T. Kaliuzhna [4] formulates practical guidelines for the use of digital technologies in the development of academic staff; T. Kaliuzhna et al. [5] describe technologies for constructing an individual development programme, a professional portfolio and case studies of online tools; L. Morrison and J. Hughes [20] generalise promising practices of online professional learning; S. Ivanova et al. [2] present a model for the use of open electronic scientific and educational systems for developing the information and research competence of researchers. The last of these is the closest to a systematic account of resources, since it explicitly names electronic libraries, open journal systems, scientometric databases, academic social networks, electronic testing systems and researcher identifiers.

A fourth group examines digital resources within professional activity itself: V. Osadchyi and I. Serdiuk [10] treat the personal website as a means of shaping a researcher's digital image, while M. Niewiadomski et al. [21] relate digital competencies to the work-life balance of academic staff. Finally, the structure of digital competence is described by Ye. Ivashev et al. [3] for vocational education and, at the level of policy documents, by the frameworks [6; 17; 18; 22]. The andragogical foundation of all these processes remains that formulated by S. Sysoieva [12], who insists on interactive, partnership-based adult learning, and by T. Sorochan [13], who connects educational reform with innovative professionalism.

Identification of the unresolved part of the problem. Notwithstanding this body of work, none of the sources analysed correlates particular categories of digital resources with particular stages, tasks or organisational forms of the professional development of academic staff. Resources are described either as an undifferentiated list of possibilities or through the prism of competence descriptors that say nothing about the choice of instrument. As a result, an institution designing a development programme has no analytical basis for deciding which resource to use for which task, and the choice is made by analogy or by the availability of a licence.

The aim of the article. The aim of the article is to determine the categories of digital resources represented in the contemporary scholarly literature on the professional development of academic staff and to substantiate a preliminary functional matrix linking these categories to the tasks of the development cycle.

Scientific novelty. The scientific novelty consists in the fact that, for the first time, the Ukrainian- and English-language segments of this research field have been compared quantitatively by means of a single set of bibliometric queries, and that a resource-function matrix has been derived from the source corpus which, unlike the existing enumerative descriptions, relates each category of digital resource to the function it performs and to the evidence base supporting that attribution.

Practical significance. The results may be used by centres for the professional development of academic staff, by heads of departments and by academic staff themselves when designing institutional development programmes and individual development trajectories: the matrix makes it possible to select resources according to the task being solved and to identify those functions of the development cycle which remain unsupported by digital instrumentation in a given institution.

Methodology

Research methods. The study was carried out in three stages, each with its own method. At the first stage, a bibliometric survey was used to measure the volume and structure of the research field. Three queries of increasing specificity were formulated: “professional development of pedagogues”, “use of digital resources in professional development” and “use of digital resources in the professional development of academic staff”, and each was run in two languages, Ukrainian and English, with identical settings. The number of results for each query was recorded, after which two derived indicators were calculated: the specificity ratio, that is the share of the results of the combined query in the results of the broad query within a single language, and the interlingual ratio, that is the number of English-language results per one Ukrainian-language result for the same query.

At the second stage, purposive sampling was used to assemble the analytical corpus. A source was included if it satisfied all of the following criteria: it addressed the professional development of teachers or academic staff, or the digital resources and digital competence employed in that process; it was published in a peer-reviewed journal, a collective monograph, a scholarly collection or as an official framework document; and its full text was accessible. Textbooks for students, encyclopaedic entries and popular publications were excluded. Four framework documents [6; 17; 18; 22] were retained despite not being research articles, since they constitute the normative reference points against which the reviewed studies define digital competence.

At the third stage, qualitative content analysis with a deductive-inductive coding scheme was applied to the corpus. Four categories were defined deductively, following the logic of the research question: language of publication, year of publication, document type and the presence of a digital object identifier. Two further categories were derived inductively from the texts themselves: the thematic cluster to which the source belongs and the category of digital resource that it describes, together with the function attributed to that resource. Coding was performed at the level of the whole source; where a source described several categories of resource, all of them were recorded. The results of the coding were then aggregated into frequency distributions and into a resource–function matrix. Comparative analysis and synthesis were used to interpret the distributions obtained and to relate them to the conclusions of the reviewed studies.

Data sources. The empirical basis of the study comprises two data sets. The first is the set of quantitative results of the six bibliometric queries described above, obtained from the Google Scholar database, which was chosen because it indexes Ukrainian-language pedagogical periodicals far more fully than Scopus or Web of Science and therefore permits an interlingual comparison that those databases do not support. The search was performed on a single date (23 July, 2026); the counts are those reported by the database at that moment.

The second data set is the analytical corpus itself: 22 sources, of which 14 are Ukrainian-language and 8 English-language publications, issued between 2013 and 2025, with the exception of two undated framework documents of the European Commission [17; 18]. The corpus includes 12 journal articles, 4 monographs, practical guides and scholarly collections, 2 chapters in collective works and 4 framework and policy documents. The full composition of the corpus coincides with the reference list of this article, so that every coded unit remains verifiable.

Analysis tools. The bibliometric queries were run through the standard Google Scholar web interface. The coding of the corpus, the calculation of frequency distributions, shares and ratios, and the construction of the resource–function matrix were performed in Microsoft Excel; the tables presented below were prepared using the same tool. No specialised bibliometric software (VOSviewer, Bibliometrix) was employed, since Google Scholar does not provide the structured export of metadata that such packages require.

Research limitations. Three limitations should be borne in mind when interpreting the results. First, the number of results reported by Google Scholar is an estimate rather than an exact count: it varies with the date of the search, the user's region and the indexing of new sources, and it includes duplicates, preprints and conference materials. The figures obtained should therefore be treated as indicators of the order of magnitude and of the proportion between segments, not as exact measures of the size of the literature.

Second, the corpus is purposive rather than exhaustive, and its volume (22 sources) permits qualitative content analysis but not statistical inference: the frequency distributions presented below characterise this particular corpus and cannot be extrapolated to the whole body of literature on the problem. Third, the resource-function matrix has been derived analytically from the texts of the sources and reflects the functions that the authors of those sources attribute to the resources. It has not been verified empirically in the practice of professional development, and its transfer to institutions with a different level of digital infrastructure requires adaptation and prior testing.

Results

The bibliometric survey established the volume of the research field and the proportions between its language segments. The results of the six queries and the derived indicators are presented in Table 1.

Table 1. Results of the bibliometric survey of the Google Scholar database
(three queries, two languages)

Query	Ukrainian-language results	English-language results	English: Ukrainian ratio
Professional development of academic staff	22,900	5,330,000	233: 1
Use of digital resources in professional development	11,500	7,140,000	621: 1
Use of digital resources in the professional development of academic staff	1,160	2,530,000	2,181: 1
Specificity ratio (combined query as a share of the broad query)	5.1 %	47.5 %	9.4 times

Two findings follow from these data. The interlingual ratio grows sharply as the query becomes more specific: for the broad topic of professional development there are 233 English-language publications for every Ukrainian-language one, for the intermediate query 621, and for the combined query 2,181. The gap therefore is not a uniform consequence of the different sizes of the two academic communities, since in that case the ratio would remain approximately constant. It widens precisely where the two subjects intersect. The specificity ratio makes the same point from within each segment: the narrowly focused topic occupies 47.5 per cent of the broad one in the English-language literature and 5.1 per cent in the Ukrainian-language literature, a difference of 9.4 times.

The content analysis of the corpus produced a distribution of sources across six thematic clusters, which is given in Table 2. The clusters were formed inductively, based on the research question stated in each source, and every source was assigned to a single cluster corresponding to its principal focus.

Table 2. Distribution of the sources of the corpus across thematic clusters and languages of publication (n = 22)

Thematic cluster	Sources	n	%	UA	EN
Theoretical foundations of the professional development of academic staff	[7; 8; 15; 19]	4	18.2	2	2
Andragogical foundations of adult learning	[12; 13]	2	9.1	2	0
Digital resources within the theory of professional development	[1; 9; 11; 14; 16]	5	22.7	4	1
Organisational practice of digitally supported development	[2; 4; 5; 20]	4	18.2	3	1
Digital resources in the professional activity of academic staff	[10; 21]	2	9.1	1	1
Digital competence and competence frameworks	[3; 6; 17; 18; 22]	5	22.7	2	3
Total		22	100.0	14	8

The distribution is uneven in a way that is itself informative. Two clusters are the largest and contain five sources each: digital competence and competence frameworks, and digital resources considered within the theory of professional development. The first of them is the only cluster in which normative documents predominate over research studies. The clusters devoted to the andragogical foundations of adult learning and to digital resources in the professional activity of academic staff, as distinct from their development, contain two sources each, although it is precisely the latter that supplies evidence on how resources function in everyday academic work.

The distribution of the corpus across languages within the clusters is likewise uneven. The cluster of andragogical foundations consists exclusively of Ukrainian-language sources, and in the cluster of digital resources considered within the theory of professional development, four of the five sources are Ukrainian-language. English-language sources, conversely, are concentrated in the cluster of competence frameworks, where they constitute three of the five positions, and in the cluster of theoretical foundations, where they constitute one half. The eight English-language sources of the corpus are distributed across five of the six clusters, the andragogical cluster being the only one in which they are not represented at all.

The formal characteristics of the corpus, which determine the extent to which its conclusions may be regarded as current, are set out in Table 3.

Table 3. Formal characteristics of the corpus (n = 22)

Characteristic	Category	n	%
Language of publication	Ukrainian	14	63.6
	English	8	36.4
Year of publication	2013	1	4.5
	2018	2	9.1
	2019	2	9.1
	2021	4	18.2
	2022	1	4.5
	2024	6	27.3
	2025	4	18.2
Document type	undated (framework documents)	2	9.1
	journal articles	12	54.5

	monographs, practical guides, scholarly collections	4	18.2
	chapters in collective works	2	9.1
	framework and policy documents	4	18.2

Fifteen of the twenty-two sources, that is 68.2 per cent, were published within the last five years, and a further two are undated framework documents whose current versions remain in force. The share of English-language sources is 36.4 per cent. Journal articles constitute somewhat more than half of the corpus, which reflects a characteristic feature of the Ukrainian segment of this field: a substantial part of the results is published in the form of monographs, practical guides and scholarly collections rather than in indexed periodicals.

The central result of the content analysis is the identification of the categories of digital resources actually described in the corpus, together with the functions attributed to them. Twelve categories were distinguished, each of which is named explicitly in at least one source; categories mentioned only in passing, without any indication of their purpose, were not recorded. The categories, their functions and the sources in which they are described are presented in Table 4.

Table 4. Categories of digital resources identified in the corpus, their functions and the sources describing them

No.	Category of digital resource	Function in professional development	Sources
1	Scientific electronic libraries	Knowledge acquisition	[2]
2	Open journal systems	Research visibility	[2]
3	Bibliometric and scientometric databases	Research visibility; monitoring of publication activity	[2]
4	Academic social networks	Professional self-presentation	[2]
5	Electronic testing systems	Assessment and self-assessment	[2]
6	Digital researcher identifiers	Research visibility	[2]
7	Cloud-oriented environments	Collaborative interaction; continuous updating of resources	[5; 11]
8	Online platforms	Collaborative interaction	[5; 11]
9	Digital professional portfolio	Professional self-presentation; self-assessment	[5]
10	Personal researcher website	Professional self-presentation	[10]
11	Online courses and professional learning environments	Knowledge acquisition	[16; 20]
12	Digital educational environment and the Internet resources used within it	Knowledge acquisition; knowledge transfer	[9; 14]

The twelve categories serve four principal functions. Knowledge acquisition is supported by scientific electronic libraries, by online courses and professional learning environments, and by digital educational environments together with the Internet resources used within them. Research visibility and the monitoring of publication activity are supported by open journal systems, by bibliometric and scientometric databases, and by digital researcher identifiers. Professional self-presentation is supported by the personal researcher website, the digital portfolio and academic social networks. Collaborative interaction is supported by cloud-oriented environments and online platforms. Electronic testing systems stand apart, since the assessment and self-assessment they provide accompany all four functions rather than constituting a separate stage.

The distribution of sources across these functions is markedly uneven. Six of the twelve categories are described in a single source [2], which is the only work in the corpus offering a systematic account of open electronic scientific and educational systems. Knowledge acquisition is the best documented function, resting on five sources, while professional self-presentation rests on three and collaborative interaction on two. Research visibility, despite its direct relevance to the accreditation and certification requirements applying to Ukrainian academic staff, is supported by the evidence of a single work.

The final result concerns what the corpus does not contain. None of the twenty-two sources relates the categories of digital resources to the stages of the professional development cycle: the diagnosis of needs, the design of an individual trajectory, the mastering of content, its application in professional activity, and the assessment of results. Nor does any source relate these categories to the organisational forms of development, whether formal in-service training, non-formal courses or informal self-education. Two sources come close to such a correlation: [2] links open electronic systems with the research component of professional activity, and [5] links cloud-oriented environments and portfolio technologies with the construction of an individual development programme. Neither, however, generalises the connection into a typology, and neither verifies it empirically. Consequently, the resource-function matrix presented in Table 4 constitutes the maximum degree of systematisation that can be extracted from the current state of the literature.

Discussion

Interpretation of the results. The ninefold difference in the specificity ratio between the two language segments admits of several explanations, and they are not mutually exclusive. The first is institutional: the English-language literature on professional development has largely been produced within university teaching and learning centres, for which digital instrumentation has been a working condition for at least two decades, so that the topics of development and of digital resources merged early. In Ukraine, professional development has traditionally been organised through the system of postgraduate education, where the object of study is the system rather than the instrument, which is why the two subjects have long developed in parallel.

The second explanation is terminological. The Ukrainian tradition uses a range of partially overlapping terms (information and communication technologies, digital technologies, digital resources, Internet resources, the digital educational environment), which are not standardised, so that a query formulated with one of them does not capture works using another. This inflates the gap to some extent, although it cannot account for a difference of an order of magnitude, all the more so because the same terminological variety exists in English.

The third and, in our view, decisive explanation is the object of description itself. The Ukrainian sources in the corpus describe digital resources as an aggregate of possibilities, which is entirely appropriate to the stage of mastering a new field, but which does not generate the research questions from which a specialised literature grows. The moment a researcher asks not “what can be used” but “what should be used for this particular task”, the topic ceases to be a subdivision of the general problem of digitalisation and becomes an independent object of enquiry. The concentration of the corpus in the cluster of competence frameworks (Table 2) is a symptom of the same stage: the field is being normalised through descriptions of what a teacher should be able to do, before an instrumental basis for reaching those abilities has been established.

Comparison with the findings of other studies. The results obtained agree with the conclusion of J. Ambon et al. [15] that continuous professional development positively affects the quality of teaching, but they specify the conditions under which that effect is achieved: in our corpus, the effect is documented for development programmes designed around a particular task, whereas the mere availability of digital resources is nowhere shown to be

sufficient. They likewise agree with the multilevel model of online teaching competencies proposed by H. Chaharbashloo et al. [16], and the resource–function matrix may be regarded as complementary to that model: [16] describes the levels of competence to be attained, while the matrix describes the instruments by which movement between the levels is supported.

A divergence emerges in relation to the framework documents. DigCompEdu [18] treats digital resources as one of six domains of teachers' competence, that is as an object which the teacher masters. In our corpus, however, digital resources appear predominantly in a different role, as the means by which the teacher masters all the other competences, including those which are not digital at all. The distinction is not merely terminological: if a resource is an object of mastery, it is legitimate to assess the level of proficiency in it, whereas if it is a means of development, what has to be assessed is the appropriateness of its choice for the given task. The Ukrainian draft framework [6] reproduces the logic of DigCompEdu in this respect and therefore inherits the same limitation.

The finding that the function of research visibility rests on a single source [2] contrasts with the position of V. Osadchyi and I. Serdiuk [10], who, as early as 2019, argued for the importance of the personal website in shaping a researcher's digital image. The two works approach the same function from opposite directions: through institutional open systems and through the individual instrument respectively, and the fact that in six years these two lines have not converged into a single description of the function is itself indicative. A further contrast concerns the results of M. Niewiadomski et al. [21], who relate the digital competencies of academic staff to their work-life balance: this is the only work in the corpus to consider the cost of digital instrumentation for the individual, whereas the remaining sources evaluate resources solely by their benefit. Any practical recommendation derived from the matrix must take that asymmetry of evidence into account.

Finally, the humanising perspective on the development of academic staff advanced by K. Menon [19] and the andragogical principles formulated by S. Sysoieva [12] set a limit to the instrumental interpretation of the results. The matrix answers the question of which resource supports which function, but the choice of function belongs to the teacher, and the partnership-based nature of the interaction, which [12] describes as a condition of effective adult learning, is not reducible to any category of resource. In this respect T. Sorochan's observation [13] that professionalism is a capacity to act within an innovative environment retains its force: an environment is a condition, not a substitute for agency.

Scientific novelty. For the first time, the Ukrainian- and English-language segments of research on the professional development of academic staff by means of digital resources have been compared through a single set of bibliometric queries with the calculation of derived indicators, which has made it possible to move from a general statement about the smaller volume of Ukrainian scholarship to a quantified characterisation of the difference: the gap widens as the topic becomes more specific, from a ratio of 233:1 to one of 2,181:1, and the degree of elaboration of the specific problem differs by a factor of 9.4.

The approach to the systematisation of digital resources in the professional development of academic staff has been improved: instead of an enumeration of tools, a resource–function matrix has been proposed in which each of the twelve categories is related to the function it performs and to the sources documenting that attribution, so that the density of the evidence base for each function becomes visible and the weakly supported positions can be identified.

The characterisation of the state of the field has undergone further development: it has been established that the absence of a link between resource categories and the stages of the development cycle is not a lacuna in individual publications but a systemic feature of the corpus, and that the two sources approaching such a link [2; 5] do so from different starting points and without empirical verification.

Practical significance. The results may be applied at three levels. At the institutional level, the resource–function matrix may serve as a checklist when designing a programme of

professional development for academic staff: by relating the tasks of the programme to the four functions identified, an institution can establish which of them are supported by the resources actually available to it and which remain unsupported. In Ukrainian universities, the function of research visibility is typically the best equipped, since work with scientometric databases and researcher identifiers is required by accreditation procedures, whereas the function of collaborative interaction is frequently left to the initiative of individual departments.

At the level of the individual development trajectory, the matrix allows a member of academic staff, together with the head of the department, to select instruments according to the task rather than according to their availability, which is particularly relevant for the certified programmes of advanced training in which a specified number of hours has to be filled with meaningful content. At the level of educational policy, the results indicate a concrete direction for the refinement of the national framework of digital competence [6]: the framework would benefit from a section describing digital resources not only as an object of mastery but also as a means of professional development, since it is in that second role that they predominantly appear in the research literature.

Conclusions

1. It has been established that the research field under consideration is distributed extremely unevenly between its language segments, and that the unevenness increases with the specificity of the topic: the interlingual ratio rises from 233:1 for the broad problem of the professional development of academic staff to 2,181:1 for its combination with the use of digital resources, while the share of the specific topic within the broad one amounts to 47.5 per cent in the English-language segment and 5.1 per cent in the Ukrainian-language segment.

2. Twelve categories of digital resources have been identified in the analysed corpus, and they perform four functions in the professional development of academic staff: the acquisition of knowledge, research visibility and the monitoring of publication activity, professional self-presentation, and collaborative interaction. Six of the twelve categories are described in a single source, which indicates the fragmentary character of the evidence base rather than the limited use of those resources in practice.

3. It has been determined that the corpus is concentrated in the cluster of competence frameworks and the structure of digital competence, and that this is the only cluster in which normative documents predominate over research studies. The field is thus being normalised through descriptions of the abilities required of a teacher before an instrumental basis for attaining them has been formed.

4. It has been shown that none of the sources analysed relates the categories of digital resources to the stages of the professional development cycle or to its organisational forms, and that the two works approaching such a correlation [2; 5] proceed from different starting points and offer no empirical verification. The resource–function matrix accordingly represents the limit of the systematisation attainable on the basis of the current literature.

5. It has been substantiated that digital resources appear in the reviewed literature predominantly as a means of professional development rather than as an object of mastery, whereas the frameworks of digital competence [6; 18] describe them chiefly in the second role. This discrepancy has consequences for assessment: proficiency in an instrument may be measured by level, whereas its use as a means of development requires the appropriateness of the choice to be assessed against the task.

Prospects for further research consist in the empirical verification of the resource–function matrix through a survey of academic staff of Ukrainian higher education institutions concerning the resources they actually use at each stage of their professional development; in a comparative analysis of the applicability of the matrix in universities differing in profile and in the level of their digital infrastructure; and in the elaboration, on that basis, of

recommendations for the inclusion of a resource-oriented section in institutional programmes of professional development and in the national framework of digital competence.

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