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Editorial message

Dear Colleagues,

It is with pleasure to welcome you again to a new start of our former publishing endeavour. The **Journal of Integrated Information Management (JIIM)**, after three years of silence is making a dynamic comeback in academic publishing, under the auspices of the Department of Archival, Library and Information Studies, coinciding with the founding of the University of West Attica and the nesting of the Department in it.

JIIM is a multidisciplinary, blind peer-reviewed journal that publishes original research on all aspects and issues regarding Information Science and Integrated Information Management.

Based on the common ground of cultural organisations (Libraries Archives Museums) informational functions, JIIM expands its interest to scientific, administrative and business aspects of Information Science & Management, as well as to related social sciences and the humanities. JIIM provides immediate open access to its content abiding to the principle that making research freely available to the public supports a greater global exchange of knowledge.

Thus, I am taking this opportunity to express my gratitude to the Advisory Board and the Editorial team for their contribution, their trust and eagerness to participate.

We are aiming at making JIIM a reputable scientific communication channel and we are now welcoming submissions for the upcoming journal issues.

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Towards Reinvigorating Academic Library Use Data Capabilities: a Library and Information Science Senior Student Workshop Experience

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Abstract:

Purpose *- This paper seeks to encourage reflections on the extent to which a one-shot workshop can help about-to-be information Professionals understand and appreciate the gamut of complexities and challenges associated with library position in the emerging Learning Analytics (LA) ecosystem.*

Design/methodology/approach *– It focuses on the description of the experience in organizing a workshop at the Department of Archival, Library & Information Studies (ALIS) of the University of West Attica. Building upon desk and primary research findings, organizers envisioned providing a valuable opportunity for senior students to collaboratively help identify the hidden value of student generated data for the support of their success and retention. Analyses of lessons learned, student viewpoints and recommendations for the future, all aim contributing knowledge to the meta-community of Higher Education library professionals that are exploring ways to streamline their smooth integration into the educational process taking full advantage of new ICT capabilities.*

Findings *- Students seemed to have quickly developed a substantial understanding of risks and opportunities involved in this type of innovation as reflected on detected differences between a set of pre and post-workshop survey indicators. Furthermore, student evaluations on workshop design, delivery and content quality have provided valuable input on its usefulness and a set of recommendations for change.*

Originality/value *- It presents and analyses observations of the first Greek LIS community initiation experience to current Learning Analytics landscape, a topic germane to university libraries that could eventually influence New Information Professionals' mindset and aspirations.*

Index Terms **—** Academic Libraries; Learning Analytics; Workshop; New Critical Skills; Library Data Capabilities.

I. Introduction

A. Brief workshop overview

The workshop held late February 2018 at the University of West Attica Department of Archival, Library & Information Studies was designed to establish a strong basis for understanding challenges facing in-library use data collection. Special emphasis was placed on ways these data can be further capitalized through integration in wider institutional learning analytics initiatives as a response to calls for accountability and to providing proof of library impact on student outcomes.

Building upon research, experience and expert advice and combining in a two and a half (2 ½) hour duration format the flexibility of one-shot workshops with in-depth content and hands-on practice opportunities, generally offered by credit courses, it covered a variety of subtopics among which:

a. Initiation to the variety and scope of Analytics use in Higher Education (HE),
b. Overview of Library-Learning Analytics joint initiatives in the U.S., U.K. and Australia,
c. Presentation of Library integration in Learning Analytics (LLA) topic related research future directions,
d. Discussion of University stakeholder perceptions towards LLA,
e. Exploration of LLA associated risks and challenges and its potential impact on university student success and retention and
f. Introduction to strategizing LLA interventions, recommendations and best practices.

B. Conceptual Framework

"The present is already, future-bound. Not only can we use the past to understand the present, but we can use the future to understand it too. We need to study the future to take better decisions today. Human and social sciences should move from being primarily past-oriented sciences to become primarily future-oriented sciences" [1].

In our constant renewal and re-invention era [2],

accountability calls keep rising and new educational theories are driving or even dictating new library, faculty and academic advisor interactions within informal learning spaces where most learning actually takes place. Within this context, there is an acute need for the academic librarian, grappling with his emerging role in bridging teaching and self-oriented study spaces [3], to become more actively involved in the assessment conversation by embracing transformational changes and adopting proactive intervention strategies [4].

Despite the opportunity offered by current higher education environment to accelerate change [5], librarians still cannot develop a higher profile within the context of the institutional mission and as surveys indicate [6] impact assessment is a field still in its infancy for the research library. A series of face-to-face interviews late 2016 with library executive staff and students [7], brought to light the lack of familiarization with new trends and developments in academic library practices and emerging tech capabilities to showcasing and evidencing library's contribution to student success; these findings making the introduction to this new and quite promising line of research even more necessary now than ever before.

In the face of existing ambiguity and lack of consensus about New Information Professional (NIP) specific skills and attributes [8], [9], [10] leading to a dramatic growth in the size, complexity and diversity of course offerings, curriculum developers often find themselves "adrift in an ocean of information" [11], [12]. With curricular reform still being a slow-paced and time-consuming process and, according to [13], library education being reproached for not properly preparing its students for their subsequent job responsibilities, a growing number of experts agree upon the following priorities: (1) the urgency to preparing inventive, proactive and forward-looking professionals able to explore and develop "new models, new skills and attitudes, new metrics, new ways of looking at old problems, and new approaches for new problems" in a partnership fostering way [14], (2) the need for LIS program reorganization and alignment [15] and (3) the necessity to refresh librarian skills with new understandings around a number of aspects among which the intangible value of in-library use generated data neither explicitly nor implicitly listed on academic libraries balance sheets and potentially conducive to making the library attractive and meaningful to its stakeholders; a necessity that is often reflected in students' expressed interest in pursuing postgraduate studies [16], improving curricula and restructuring contents. According to LIS community 'movers and shakers', in-depth reconsideration of the entire environment of professional practice and knowledge, skills and attitudes (KSA) that LIS program developers currently regard as necessary to professional competence [16] will ensure in the medium and long run a pipeline of ambidextrous Information Professionals with the abilities necessary to:

- adopt flexible and agile approaches towards user evolving needs,
- ask "hard deeply intense" if not disturbing questions about our profession in order to fully understand and formulate our new image [18],
- move from the predominant collection-focused worldviews to outcomes and learning,
- contribute to improving institutional culture and
- participate in governance, privacy and decision-making conversations.

C. LLA topic importance and relevance

These context changes have forced Information Science professional associations to start consolidating guidelines [19] around inter alia encouraging partnerships within structures that support the academic community and developing library professional skills to support the educational process, including the reshaping of the diverse workforce qualifications charter by taking a flexible and dynamic holistic approach that if not adopted could sooner or later put librarians on the spot.

As the field is apparently in transition with exclusively library-centered views losing their significance, South European academic community, following a HE curricula reform process [20], is already confronted with a series of critical questions regarding ways to support the New Information Professional (NIP) against:

- the underrepresentation of New Critical Skills (NCS) in undergraduate curricula that do not exceed 19% of the entirety of official LIS programs [21],
- the incapacity of early adopting systematic changes before it becomes absolutely necessary [22],
- the predominance of a traditional library core operations-oriented LIS undergraduate study agenda and
- the universal paradox of developing tools before skills [23].

In these turbulent times, the adoption of self-regulated flexible solutions driven by (1) recent findings on LIS education's adequacy to current job market requirements [24], [25], (2) curricula evaluation reports that emphasize the pressing need to reconceptualize librarian knowledge acquisition and skills development practices [26], [2], [27] as well as (3) "a systematic and ongoing engagement with the international research in the field…", could offer "…some of the best defenses against both extremes". (Humboldt University) [28].

D. LIS Undergraduate Curricula addressing New Critical Skills and the role of co-curricular formative activities

As undergraduate degree programs are quite demanding but often lack the necessary flexibility to address new emerging fields, LIS Schools around the globe more frequently nowadays are delivering seminars and workshops ranging from drop-in one-shop instruction to mandatory week-long introductions to cutting-edge research and technologies, adopting an open pluralistic policy where complementing official curricula is concerned.

Within this realm and, although workshops and seminars are more common for master degree programs in Library and Information Studies (MLIS), offering brief however in-depth examinations of specific aspects of the profession, the Academic Committee had decided to authorize delivery of the iSlaC workshop entitled "Unlocking the potential of library data integration in Learning Analytics initiatives" seen as one of these situations in which a workshop would be the best choice to get future LIS professionals ready for the change, that is the beginning of something new as in reconceptualization of the role of academic librarian in a flexible and time efficient way. It aimed to offer students, especially final year undergraduates that already have a thorough knowledge of LIS fundamental concepts, the opportunity to go beyond the horizons of textbooks and understand and learn different ways of thinking by means of a participatory, time limited, self-contained workshop that created an intensive educational experience, forming part of the activities of a short doctoral research stay for the purposes of a thesis revolving around library use data collection practices and its potential ICT assisted capitalization prospects.

Our workshop aimed to familiarize participants with:

- the new and exciting opportunities provided by the systematization of in-library use data collection as seen through the Big Data and Analytics lenses in response to today's academic library's weaknesses and external pressures to justify its budget and prove its strategic alignment with wider institutional goals [29],
- the new informational scenario where data intensive computing has considerably broadened the scope for data collection and sharing and
- the growing number of organizations that have already started to include library input (e.g. in-house consultation, reference, writing labs, seminars, workshops, study room use, equipment use data) along with other datasets produced by and gathered on behalf of students from across the institution in Learning Analytics comprehensive platforms that help predict and advice on learning and contribute to creating more complete learner profiles [21].

Our paper documents major issues discussed during the workshop that attracted a total of thirty senior students over two separate sessions. Aiming to (1) help participants grow an understanding of the existing diversity of LLA projects and related technologies, (2) guide them through the process of conceptualizing challenges and benefits associated with the design and development of similar projects and (3) co-construct a strong knowledge base that will enable New Information Professionals to cope with the future academic library requirements, it was comprised of the following three sub-modules:

a. the first focusing historical context and background material,
b. the second showcasing library-specific primary research findings and expert viewpoints on the topic and
c. the third revolving around HR development and ways librarians can become actively involved in the institutional LA conversation.

II. Workshop Settings

A. Techniques and strategies

Workshop content, activities and presentations gravitating between instruction and introduction, so that participants learn by listening, seeing, reflecting, and acting [30], were designed to gradually initiate participants to in-library use data collection changing landscape. All modules held in a projector equipped computer lab, consisted of lecturettes, short discussions and student feedback to keep everyone focused. Completion of digital surveys and flipchart dot rating over a number of different topic-specific aspects intended creating an interactive environment and provide valuable feedback on both the workshop effectiveness and the topic under discussion, allowing for general patterns to be more easily observed and discussed.

III. Design

A. Planning

After having carefully considered the topic and the audience's preconceived attitudes (by means of a pre-workshop questionnaire) as well as contextual information regarding workshop attendance circumstances, organizers prepared a range of materials and activities, to enhance student experience and knowledge retention. The design phase was driven by the generally acknowledged fact that a medium size workshop no matter how ideal it might seem for presenting both context and specifics of the topic, is however more than long enough for attendees to get bored or overwhelmed.

Furthermore, cognizant of one-shot sessions associated frustrations and limitations as they are difficult to assess, typically cover too much information and rely on passive learning, the organizing team decided to (1) include a set of Active Learning Techniques (ALT), by incorporating assessment to measure student retention of basic concepts and organizing content into manageable "learning conducive" chunks [31] - each "chunk" providing an extra opportunity for learners to reflect.

ALT design was also supported by structuring the workshop in a way that made students accountable for attendance. This involved short multiple-choice questionnaires, incorporating team flip charts for dot-voting (an engaging way to providing participant involvement that facilitates understanding and retention), idea collection and window pane grids, in a combination of lecture, active engagement and discussion, thus enhancing the likelihood that students will better respond to our training approach.

Finally, publication of a set of workshop-related material on the eClass platform prior to participation,

besides introducing trainees to the workshop scope and contents through video, presentation slides, bibliography and previews of the flipcharts to be used during sessions, was intended to spur their interest to investigating the topic further on their own.

B. Group size

With regards to workshop size, we considered, 15 participants per session would be an ideal size as it's small enough so that everyone takes the opportunity to have his questions answered and get some individual attention from the presenter, but still large enough to generate some lively discussion.

C. Marketing

As for promoting the workshop, our decision to market it directly to course instructors as well as advertising on the ALIS Department e-Class in an open call format to the 201 senior students boosted participation that soon fulfilled the organizing team's initial expectations.

IV. WORKSHOP CONTENTS

Following a quick overview of recurring library innovation and sustainability related but not necessarily Library Science field-derived terminology and concepts, the facilitator moved on to a brief nevertheless concise reference to the changing academic librarianship landscape by presenting recent publications and showcasing projects, reports and primary research findings on organizational forces and operational hurdles in the way of a more dynamic and pervasive integration of library service in the educational process.

Sharing knowledge of Higher Education institutions' initiatives around the globe aimed to kickstart the conversation on practices and prospects of new library use data recording and sharing capabilities.

Participants were also provided with the opportunity for an initiation to Learning Analytics and Student Success Technologies and further exploration of what their association with information libraries currently collect or potentially could collect actually entails.

Exploration of prerequisites, challenges and issues associated with the capitalization of the significant in-library student activity derived data intangible asset, helped attendees better appreciate whether and to what extent this may be the solution to current metrics and statistics' inadequacy to demonstrating librarian contribution to student success and retention.

Potential benefits of the envisioned value co-creation opportunity, ways librarians can partake in these innovative interventions, Higher Education community stance towards upcoming developments and the extent to which official LIS Curricula respond to LLA perspective were among critical questions investigated during the seminar. During all three modules, organizers pursued student active participation through engaging students in constructive discussions on the topic within the intention to making their considerations, in a collaborative and interaction fostering way, part of the wider topic specific dialogue. To this end, participants were also given the opportunity to contribute to the processing of a Roadmap to Library involvement in Learning Analytics initiatives (LLA).

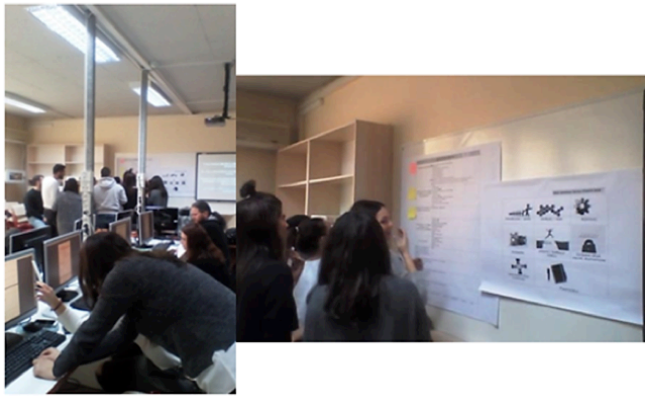

Figure 1. Workshop snapshots

Before the end of the workshop, major findings were briefly reviewed and summarized. Soon after, attendees were sent the link to a post-workshop evaluation form where they were kindly requested to record their opinion on several different aspects that could help better design and implement similar future interventions.

V. DISCUSSION

Before and during the intervention, an online set of survey instruments was made available in order to record preconceptions and student post-module viewpoints and thus give organizers the opportunity to evaluate whether the intervention has had some positive effect to the participant attitude towards upcoming developments. Analysis of questionnaire item responses of the rather homogeneous participant pool sharing similar (1) career aspirations, revolving mostly around research libraries, cultural, archival material digitization, management and preservation, and digital content curation, and (2) LIS knowledge update preferences, namely seminars, social networks and e-learning, reveal as illustrated in Figure 2:

- a slight increase in rating the necessity of library data integration in LA systems that however could be very well attributed to the increase in the numbers of pre-workshop and post-workshop survey participants (28 respondents against 30 attendees translated into a 7% difference); however, as attitudinal changes exceed by far this 7% rate for the rest of the cases presented in the graph therefore this respondent-attendee sample size difference cannot bear any noteworthy effect on the results' validity,
- a considerable rise in the number of respondents envisioning library use data as educational data,
- a decrease in the extent to which they believe that library culture is supportive of LLA initiatives and that librarians can adequately cope with such interventions and finally
- an increase in the percentage of responses judging current library-use data collection practices inadequate in

supporting student progress.

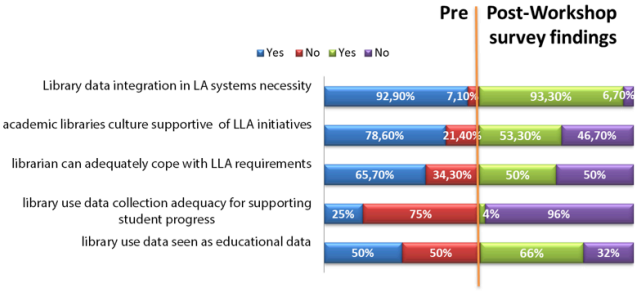

Figure 2. Juxtaposing Pre/Post-workshop survey findings

Additionally, a slight but noteworthy rise can be noted in both priority and student outcomes expectations associated with in-library use data collection systematization. There was also a change in student-defined hindering factors to the systematic academic library student activity recording with privacy issues outpacing funding concerns.

It's worth mentioning that although post-workshop survey responses suggest a higher positive attitude toward student activity tracking via smart card use, overall students seem more reluctant to welcoming the systematization of student workflows data collection than before the workshop, which could be partially attributed to the fact that they gradually became more cognizant of complexities this type of innovation entails. Although, according to all 28 pre-workshop survey responses students believed libraries could eventually contribute data to a student success technology platform, in the post-workshop survey, about 1/3 of them do not seem to be sharing anymore the same optimism where libraries actual readiness degree to getting involved in LA initiatives is concerned. As mentioned before, user privacy is by far acknowledged as their primary consideration around the systematic recording of student activity within the library walls while their opinion around usefulness of in-library use data collection shifted from support of (1) student success and (2) institutional efforts to evaluating library impact, towards (1) increase in service effectiveness and productivity and (2) support of collaborative approaches to dealing with HE challenges.

VI. Limitations, Value

Without forgetting in our analysis of the workshop findings, Norbert Schwarz's [33] argument that attitudes are "conceptualized as evaluative judgements formed on the spot" and Tourangeau's [34] similar observation on the nature of attitude expressions as being specific responses to specific questions at specific time in a particular way, our seminar can be seen as an organic, transdisciplinary alternative to learning formalization framed within a wider heutagogical approach that saw participants, in their triple capacity of students, library users and future information professionals, as content and meaning contributors, inviting them to record their viewpoints and making them part of a wider research community conversation around LLA potential.

Overall, this interdisciplinary workshop adding to the gamut of critical questions around library use data capabilities helped:

- raise future library staff and administrator analytics IQ,
- familiarize NIPs with NCS decisive role to making Academic libraries the new learning gravity center,
- change participant worldview with regard to library data collection capabilities and
- instill the necessary spark and energy in them to become "cooperation brokers" [32], helping reinvent the academic library work within changing informational scenarios.

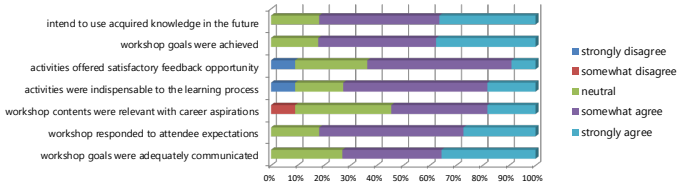

Figure 3. Workshop evaluation items

Overall, their impression was positive in terms of content, presentation and outcomes. They also expressed a number of valuable comments in the survey free text boxes that could take this educational activity one step further. Following their recommendations, a next possible action therefore could or should be focusing:

- adding video and enhancing interactivity,
- developing an online electronic course (e-course) available through the e-Class platform,
- adopting a Flipping the classroom format by providing more orientation material beforehand and
- even considering transforming it into a semester-wide course.

The increasing tension between undergraduate LIS program's moderate compliance with new developments in the field on one hand, frequently falling short of enhancing future librarian innovative capacities and data capabilities, and the envisioned new teaching paradigm-driven pervasive library integration in the educational process on the other, has instigated lately an increasing focus of attention on at least the following aspects: (1) academic librarian co-creation, co-development and co-evaluation activities and (2) the need to equipping New Information Professionals with both the theoretical knowledge and practical know-how to effectively support student learning and demonstrate library value in response to internal and external pressures to relate, converse and change. Therefore, a course framed within a broader set of LIS programmatic changes that would inspire new ways of capturing library intrinsic value and diffusion of creative ideas and influences occurring anytime through communication and exchange processes that govern library workflows, would foster new worldviews, well beyond LRRC traditional scope and mission, making conversation and data-informed innovation a central component of a new

kind of professional profile.

VII. Closing remarks and Future directions

Although it has been challenging to design a balanced module to benefit everyone within limited timeframes, judging by participant feedback, it has met its objectives and, despite the fact that this all-at-once introduction to the LLA landscape was a zero-credit activity, it seemed to have been very positively received. Its duration allowed introducing a fuller set of topics and helping participants become more comfortable with new concepts while repetition and sum up favored learning and knowledge retention.

Organizers viewed their interaction with students as an opportunity to learn directly from the Library School community. Workshop activities and post-workshop feedback gave the team a better understanding of the current state of LIS undergraduate curricula accommodation of library metrics research and teaching. They also underscored the importance of framing this activity within a broader awareness-raising campaign on the risks and benefits associated with LLA interventions and possibly extending its reach to wider multidisciplinary audiences. Above all, they sparked a campus-based conversation around the necessity to revitalize the program with new components that will open new avenues in the exploration of library use data potential to reshaping academic librarian remit and functions.

References

[1] **Crowe, K. (2015).** Libraries and Student Success: A Campus Collaboration with High Impact Educational Practices. Proceedings of the Association of College and Research Libraries National Conference.

[2] **Bitter-Rijpkema, M. E., Verjans, S., & Bruijnzeels, R. (2011).** The Library School: empowering the sustainable innovation capacity of new librarians, Library Management, 33(1/2), 36-49.

[3] **Tevaniemi, J., Poutanen, J., & Lähdemäki, R. (2015).** Library as a partner in co-designing learning spaces: A case study at Tampere University of Technology, Finland, New Review of Academic Librarianship, 21(3), 304-324.

[4] **Ewell, P., & Wellman, J. (2007).** Enhancing student success in education. National Postsecondary Education Cooperative (NPEC). [Online]. Available at: https://nces.ed.gov/npec/pdf/Ewell_Report.pdf

[5] **Rader, H.B. (2004).** Building Faculty-Librarian Partnerships to Prepare Students for Information Fluency: The Time for Sharing Expertise is Now, College and Research Libraries News 65 (2004).

[6] **Koltay, Z., & Li, X. (2010).** Impact Measures in Research Libraries. SPEC Kit 318. Washington, DC: Association of Research Libraries, September 2010. https://doi.org/10.29242/spec.318

[7] **Sant-Geronikolou, S. (2017).** Challenges Affecting In-library Use Data Integration in Learning Analytics Initiatives: The Greek and Spanish University Community Perspective [Preprint]. Available at: http://hdl.handle.net/10760/31959

[8] **Brine, A., & Feather, J. (2003).** Building a skills portfolio for the information professional, New library world, 104(11/12), 455-463.

[9] **Dali, K., & Caidi, N. (2016).** A two-way street: building the recruitment narrative in LIS programs. New Library World, 117(7/8), 499-539.

[10] **Choi, Y., & Rasmussen, E. (2009).** What qualifications and skills are important for digital librarian positions in academic libraries? A job advertisement analysis, The journal of academic librarianship, 35(5), 457-467.

[11] **Shum, S. B., & Ferguson, R. (2012).** Social learning analytics, Journal of educational technology & society, 15(3), 3. [Online]. Available at: https://pdfs.semanticscholar.org/3864/1a9e8445149c9ff7a14e4b587c709fc63a5f.pdf

[12] **Paulin, D., & Haythornthwaite, C. (2016).** Crowdsourcing the curriculum: Redefining e-learning practices through peer-generated approaches, The Information Society, 32(2), 130-142.

[13] **O'Connor, D. and Mulvaney, P. (2013).** LIS accountability & accreditation, Library Journal, Vol. 138 No. 14, p. 40.

[14] **Mathews, B. (2014).** Librarian as futurist: changing the way libraries think about the future. portal: Libraries and the Academy, 14(3), 453-462. Available at: https://vtechworks.lib.vt.edu/bitstream/handle/10919/49667/Librarian_as_Futurist_Mathews_July2014.pdf?sequence=1

[15] **Chow, A. S., Shaw, T. L., Gwynn, D., Martensen, D., & Howard, M. (2011).** Changing Times and Requirements: Implications for LIS Education, LIBRES: Library & Information Science Research Electronic Journal, 21(1).

[16] **Matousidou, A. (2007)**. Librarianship & Information Systems student opinion on their undergraduate studies. Department of Library and Information Systems, Alexander Technological Educational Institution of Thessaloniki. [Thesis] Available at: http://eureka.lib.teithe.gr:8080/handle/10184/321. [In Greek]

[17] **Varlejs, J. (2016).** IFLA Guidelines for Continuing Professional Development: Principles and Best Practices. International Federation of Library Associations and Institutions (IFLA), The Hague. Available at: https://www.ifla.org/files/assets/cpdwl/guidelines/ifla-guidelines-for-continuing-professional-development.pdf

[18] **Salter, A. (2003)**. Wanted – new creations: dinosaurs need not apply. In Karl Bridges (Eds) Expectations of Librarians in the twenty-first century. Greenwood Press: Westport, Connecticut.

[19] **Sanches, T., & Costa, M. T. (2017).** Guidelines for Higher Education, Libraries in Portugal. Liber Quarterly, 27(1).

[20] **Rauhvargers, A., Deane, C., & Pauwels, W. (2009).** Bologna Process Stocktaking Report. [Online]. Available at:

http://www.conservatorio.trieste.it/intern/ects/Informazioni_generali/stocktaking-report-2009-final.pdf

[21] **Sant-Geronikolou, S. (2017).** Out-of-the-box thinking around in-library use data collection: the case of Spanish University Libraries. Poster session presented at LIBER Annual Conference 2017, Patras, Greece. [Poster] Available at: http://liber2017.lis.upatras.gr/wp-content/uploads/sites/6/2017/04/PosterFV_Sant.pdf

[22] **Deiss, K., & Petrowski, M. J. (2009).** ACRL 2009 strategic thinking guide for academic librarians in the new economy. Available at: http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/value/acrlguide09.pdf (Accessed March, 25, 2015).

[23] **Bergquist, W. H., & Pawlak, K. (2008).** Engaging the six cultures of the academy: Revised and expanded edition of the four cultures of the academy, John Wiley & Sons.

[24] **Moreiro-González, J.A., Azcárate-Aguilar-Amat, P., Marzal-García-Quismondo, M.A., Tejada-Artigas, C.M., &Vergueiro, W. (2008).** Desarrollo profesional y opinión sobre la formación recibida de los titulados universitarios en información y documentación de las universidades públicas de Madrid (2000-2005). El profesional de la información, vol. 17, n. 3, pp. 261-272. Available at: http://eprints.rclis.org/23354/

[25] **Lorring, L., & Kajberg, L. (Eds) (2005).** European curriculum reflections on library and information science education, Royal School of Library and Information Science. Available at: https://www.asis.org/Bulletin/Dec-06/EuropeanLIS.pdf

[26] **Mack, D. (2011).** Libraries and Museums in an Era of Participatory Culture, Salzburg Global Seminar, Session 482 Report. Available at: http://www.salzburgglobal.org/fileadmin/user_upload/Documents/2010-2019/2011/482/SessionReportPrint482.pdf

[27] **Boyd, R. (2008).** Staffing the Commons: job analysis in the context of an Information Commons, Library Hi Tech, 26(2), 232-243.

[28] **Humboldt-Universität zu Berlin, LIS Department Information brochure**. Available at: https://www.hu-berlin.de/de/pr/medien/publikationen/pdf/hu-fak-info

[29] **Hoel, T., Mason, J., & Chen, W. (2015).** Data sharing for learning analytics–Questioning the risks and benefits. In Proceedings of the 23rd International Conference on Computers in Education. China: Asia-Pacific Society for Computers in Education

[30] **Chapman, A. (2005).** Kolb learning styles, BusinessBalls.Com [online]. Leicester, England, (Accessed: September 26, 2017). Available at: http://www.businessballs.com/kolblearningstyles.htm.

[31] **Houlson, V. (2007).** Getting results from one-shot instruction: a workshop for first-year students, College & Undergraduate Libraries, 14(1), 89-108.

[32] **Shank, J. D., Bell, S., & Zabel, D. (2011).** Blended librarianship: [re]envisioning the role of librarian as educator in the digital information age. Reference and User Services Quarterly, 51(2), 105-110. doi:10.5860/rusq.51n2.105

[33] **Schwarz, N. (2007).** Attitude construction: Evaluation in context. Social cognition, 25(5), 638-656.

[34] **Tourangeau, R., Rips, L. J., & Rasinski, K. (2000).** The psychology of survey response, Cambridge University Press.

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Comparing and evaluating an interactive, subject-based search system with the traditional digital library's search functionality

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Abstract:

Purpose *- The purpose of this paper is to compare and evaluate the usability, usefulness and effectiveness of an Interactive, Information Retrieval – IIR system with a DSpace-based digital library.*

Design/methodology/approach *– The proposed evaluation approach consists of two subcomponents. The first one refers to a log file analysis capable of revealing quantitative features of the systems' usage. The second part refers to a user survey that compares the new IIR system against the traditional subject-based search functionality provided by DSpace in terms of usefulness and effectiveness.*

Findings *- Based on the evaluation results, it seems that users are very interested in employing new methods and techniques in information seeking and retrieval, especially when such new tools and methods help them in fulfilling their information needs accurately and timely. The results also revealed that the users are more satisfied when employing the new search functionality and the search and retrieval process is improved.*

Originality/value *- A novel IIR system for subject-based browsing was evaluated and interesting results for the future of such tools are shown.*

Index Terms — evaluation, questionnaire, user survey, IIR system, simulated work task scenario

I. INTRODUCTION

Nowadays, searching for information is beyond any doubt very common and it is exercised widely not only from search professionals, but also from average users [1] [2]. Yet, the effective use of the corresponding search technologies is still challenging [3][4].

The most recent Information Retrieval - IR systems provide functionalities and search capabilities that a few years ago would be beyond any imagination. However, in many cases they do not support searchers in finding the right tactic in order to satisfy their information needs with accuracy and in a short time [5]. Quite often, average users try to express their information needs as a search query that may contain several meanings, thus failing in accurately specifying their requests and accordingly fulfilling their information needs [6]. In case of an unsuccessful search, average users reformulate their query by adding, deleting or replacing terms [7]. This could be interpreted that searchers may spend too much time in finding the right terms that will satisfy their information needs [8].

Average users rarely employ sophisticated search strategies, as compared to expert searchers [9]. Furthermore, they usually do not know how and when to use advanced search features in order to achieve the best result [10]. In this direction, IR systems evolved over time towards the direction of aiding their users in satisfying their information needs with accuracy in a short time. Thus, they do not only invest on providing advanced functionality, but they also strive in assisting and guiding users in finding the information they need through some kind of interactive process. Thus, it seems that old-fashioned IR systems are stepping back in favor of Interactive Information Retrieval – IIR systems.

In order to examine the effectiveness and usefulness of such systems, a number of evaluation measures and standards have been established. These evaluation measures and standards take into account not only the IIR system itself, but also the users' interactive process of information searching [11][12]. Generally, the more effective a system is, the less time a user needs in order to satisfy their information needs. The time a user spends using such a system includes the time that is spent learning it. Thus, it is important for an IIR system to help average users improving their searching capabilities over time [13].

Along these lines, Borlund [14] argues that "*the purpose of IR evaluation is twofold, i.e. to determine a) how well the system satisfies the information needs of actual and potential users; and b) how to improve the information retrieval process, both at a particular installation level and at a more general level*".

Having the above thoughts in mind, a subject-based IIR system was created and accordingly integrated to the DSpace-based, digital library of University of Piraeus. The system gave the opportunity to its users to find the assets they were looking for by browsing through the subject headings of the underlying collection based on the syndetic structure of the subject headings (i.e. broader, narrower and

related terms).

In order to assess whether the aforementioned IIR system was useful, effective and satisfied the users' information needs, an evaluation procedure was performed. The evaluation procedure consisted of two parts. The first part contained the log files analysis of the system's use in a period of 6 months. The second part referred to a user survey that was based on a comparison of the traditional subject-based search functionality of DSpace against the new IIR system.

The rest of the paper is structured as follows: The next section contains a detailed description of the IIR system. Then, the measures and standards that should be kept in mind in order to create an effective and accurate evaluation procedure for an IR system are stated. The next section outlines a number of IR system evaluation frameworks. In the following sub-section, some individual efforts regarding the evaluation of IIR systems are presented. Section 4 describes the approach that is followed in order to evaluate the new IIR system. Finally, in section 5 the conclusions of the evaluation process that was followed and suggestions for future work are stated.

II. The System

In this section the IIR system under evaluation is presented. More specifically, the system enriches the subject-based search functionality of the DSpace-based Digital Library of University of Piraeus, Dione [15], which contains subject headings deriving from the Library of Congress Subject Headings – LCSH [1] vocabulary. It is comprised of an auto-suggest search box on the upper part of the screen where the users are prompted to type in the first letters of the words that best describe their information needs (see figure 1). The widget returns a list of subject headings that contain the string provided by the user.

Figure 1. Autosuggest search box

Upon selection of a subject heading, a box is sketched below representing their selection (see figure 2). The box contains the subject heading in English, possibly followed by its translation in Greek. The box also contains the relations of the subject heading as imposed by the underlying extended syndetic structure (i.e. namely broader, narrower, related and subdivision term).

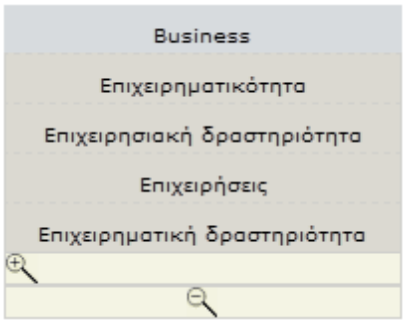

Figure 2. Box with the selected subject heading "Business"

If the user clicks on a relation, a list of subject headings appears, each of which is associated with the sketched one through the selected relation (see figure 3).

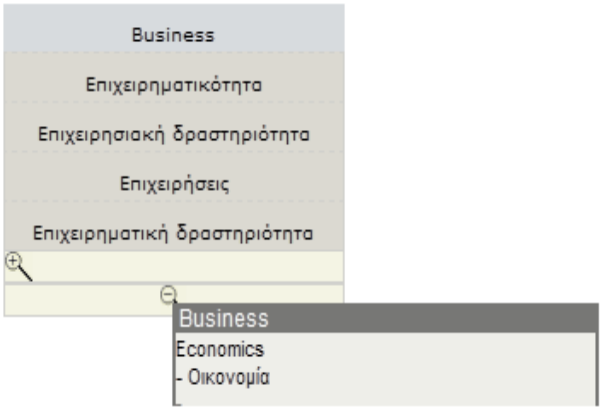

Figure 3. Broader terms for the selected subject heading "Business"

Then, by clicking on one of the subject headings presented in the list, another box is sketched next to the first one (see figure 4). The two boxes are connected with a labeled line containing the description of the selected relation.

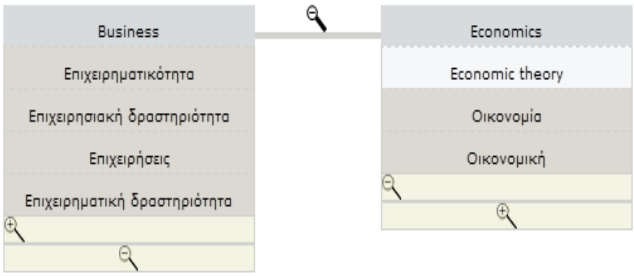

Figure 4. Depiction of the broader term relation for the two subject headings "Business" and "Economics"

On the lower part of the screen, the user is presented a list containing the assets of the digital library that are assigned to the selected subject heading (see figure 5). The whole process can be repeated until the user locates a subject heading that satisfies his information needs.

[1] Library of Congress Subject Headings, available at: http://authorities.loc.gov Date retrieved: 15/5/2018

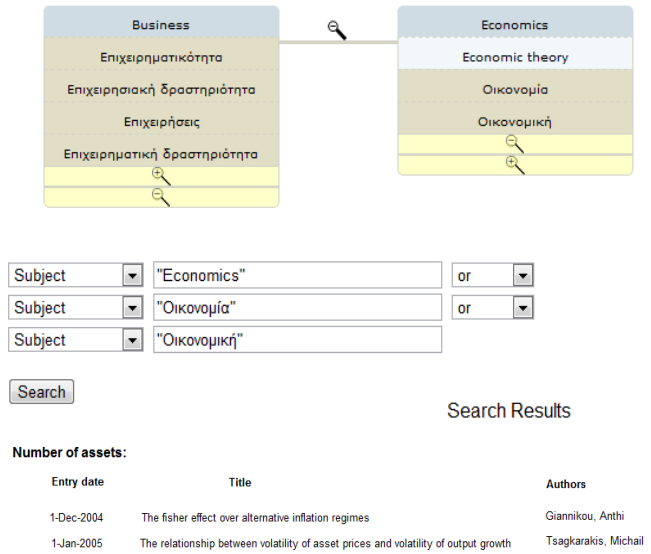

Figure 5. Screenshot from the IIR system depicting the whole functionality

A detailed description of the system is provided in Papadakis et al. [15].

In order to evaluate this IIR system, the corresponding evaluation literature is examined. In this context, the following section presents some important measures for an effective usability evaluation.

III. Important Measures for an Effective Usability Evaluation

Effective and accurate evaluation of IIR systems usability should be based on the examination of a number of adequate measures. IIR systems are usually evaluated in terms of three main aspects of usability: effectiveness, efficiency and user satisfaction [16]. These measures are defined by ISO 9241-11[2], as:

- **Effectiveness** is the "*accuracy and completeness with which users achieve specified goals*". In other words, a tool is effective if it helps users accomplish particular tasks.
- **Efficiency** is the "*resources expended in relation to the accuracy and completeness with which users achieve goals*." A tool is efficient if it helps users complete their tasks with minimum waste, expense or effort.
- **Satisfaction** is the "*freedom from discomfort, and positive attitudes of the user to the product*". Satisfaction can be understood as the fulfillment of a specified desire or goal. It is often the case that when people discuss satisfaction they speak of the contentment or gratification that users experience when they accomplish particular goals.

Based on the aforementioned ISO standard for usability, a number of researchers have proposed various evaluation measures and processes that should be considered for the evaluation of an IIR system.

The most common evaluation measures seem to be "*Precision*", "*Recall*" and the deriving "*F-measure*". These measures have been employed for quite a long time [11]. Precision is the fraction of retrieved documents that are relevant to the query. Recall is the fraction of documents that are known to be relevant to the query and have been successfully retrieved. In order to balance between these two measures, the F-measure was introduced. According to traditional IR algorithms, the more documents an algorithm retrieves, the more likely is to increase recall. But on the other hand, this augmentation to the search results could bring more irrelevant documents. In order to address this issue, F-measure is defined as the combination of precision and recall as shown in the equation below.

$$F = 2 * \frac{precision * recall}{precision + recall} \quad (1)$$

Some researchers believe that the above measures are not the best option in order to make an accurate evaluation of an IIR system. Borlund [17], for example, endorses the idea that precision and recall are insufficient for evaluating IIR systems. The above two measures cannot quantify the "*informativeness*" of interaction which is exhibited in the case of users wishing to modify or develop their initial queries and strategies during a search process.

In order to come up with more suitable measures for the evaluation of IIR systems, other researchers propose alternative solutions. Some of these measures are stated below:

According to Su [18], users consider "*Task Completion Time*" as critical to successful IIR. In the same line of thoughts, Dunlop [19] proposes a measure called "*Expected Search Duration*" and creates an interface-based predicted-time model, which measures the time that a user needs in order to view a set of assets and concludes to a relevant asset.

Belkin, Cole and Liu [20] and Hienert and Mutschke [21] propose another measure for evaluation of IIR systems, namely "*Usefulness*". Usefulness can be used to evaluate system support from the aspects of both outcome and process in the accomplishment of a task.

In another approach, Cheng, Hu and Heidom [13] suggest two new measures to evaluate IIR systems, the "*Normalized Task Completion Time*" and the "*Normalized User Effectiveness*". These two measures take into account the familiarity of users with the use of such systems, the capability of the user to retrieve information with the use of IIR systems and the expertise in the domain of the given task and thus the ability to create good queries.

Lastly, Borlund and Ingwersen [17] introduce the concept of "*Simulated Work Task Situation*" or "*Scenario*" and the involvement of real end users as test persons. Their method is designed to collect two types of data, the cognitive data

[2] Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 11: Guidance on usability (1998). Available at: http://www.iso.org/iso/catalogue_detail.htm?csnumber=16883 Date retrieved: 15/5/2018

and the system-oriented data. The former refers to the collection of qualitative and quantitative data from the user's experience with the system. The latter refers to the collection of IR performance data. The whole process requires the involvement of real users who are performing searches of their own and for simulated tasks.

The next section contains several frameworks that are widely used in order to evaluate IR and IIR systems.

A. Previous IR system evaluation frameworks

Evaluation of IR systems has intrigued researchers for many years, since evaluation is considered an integral part of system development. In order to perform such evaluations, a number of well-known test collections are employed.

During the 60's, the Cranfield model was introduced. The indexing experiments of the Cranfield model are often considered as the beginning of the modern era of computer-based IR system evaluation [22]. In the Cranfield studies, retrieval experiments were conducted on a variety of test databases. In the second series of experiments, known as Cranfield II, alternative indexing languages constituted the performance variable under investigation. The aim of the research was to find ways to improve the relative retrieval effectiveness of IR systems through better indexing languages and methods [23]. A small test collection of documents, a set of test queries, and a set of relevance judgments (i.e. a set of documents judged to be relevant to each query) were the components of the Cranfield experiments. End users, their interaction with the system, their interpretations of the query were not calculated and taken into account in the experiments [24]. The measures used in the Cranfield experiments were recall and precision. Nowadays, the Cranfield model is still in use for the most elementary pilot experiments [25].

The Cranfield model inspired in some way the Text Retrieval Conference – TREC[3]. Within this model, there have been many tracks over a wide range of different test collections. Nevertheless, the marquee task of TREC is the ad-hoc retrieval track, in which systems compete in ranking documents according to relevance judgments [26]. Participants over the years have examined a wide variety of retrieval techniques and retrieval environments, including cross-language retrieval, retrieval of web documents, multimedia retrieval, and question answering. Recently, the interactive TREC – iTREC was introduced in order to develop better methodologies for evaluation of IIR systems [14].

During the last two decades, the Cross-Language Evaluation Forum – CLEF[4] emerged, aiming in developing an infrastructure for the testing, tuning and evaluation of information retrieval systems operating on European languages in both monolingual and cross-language contexts.

As far as the evaluation of digital libraries is concerned, one major evaluation model is the Distributed Agents for User-Friendly Access of Digital Libraries - DAFFODIL model. DAFFODIL is a system for integrated search within the heterogeneous digital libraries of a scientific community, with merging of results. At this time, a prototype for the area of Computer Science exists that allows searching within more than ten different digital libraries and other sources of information [27]. The DAFFODIL framework consists of two major parts: the graphical user client and a set of agent-based services in the back-end [28]. The DAFFODIL framework also provides an integrated questionnaire tool and a logging facility to help gathering the data.

In a more recent approach, Wei, Zhang and Gwizdka [29] proposed YASFIIRE as a system that is capable of supporting IIR user studies on the Web. The system supports user and task management, for processing web-based task specific interfaces and for web-event logging.

To sum up, all these efforts have a specific aim; to measure the effectiveness of an existing IR or IIR system via test collections.

In the next section, individual evaluation efforts are presented and the most suitable is selected for the evaluation of the IIR system that is described earlier in this paper.

B. Individual evaluation efforts

In order to evaluate the specific IIR system, the aforementioned frameworks are considered. However, none of them can be applied as-is for a number of reasons.

The Cranfield framework cannot be used because of its inflexibility to deal with dynamic information needs. Cranfield treats information needs as a static concept entirely reflected by the search statement (query) [25].

The next options are the iTREC and CLEF evaluation frameworks. Both approaches adopt a methodology that provides a set of predefined queries for which the corresponding relevant results are known in advance. When an IR system addresses such queries to the underlying dataset, precision and recall are measured and accordingly compared against the pre-calculated metrics. However, in an IIR system like the one that is under evaluation in this paper, users are prompted to choose a predefined query that best suits their information needs, which acts as an entry point to the IIR system. Trained personnel have already determined the relevant assets that correspond to such a query. Thus, the quality of the proposed approach does not depend on precision/recall [30] but on its ability to provide the users with an entry point that is as closer as possible to their information needs.

The last option is the adoption of the DAFFODIL framework, which requires the integration of the system under evaluation with the DAFFODIL User Interface. However, such an approach would result in the assessment of the integrated system, not the original one.

Thus, in order to evaluate the IIR system that is described

[3] Text Retrieval Conference. Available at: https://trec.nist.gov Date retrieved 15/5/2018

[4] Cross Language Evaluation Forum. Available at: http://www.clef-campaign.org/ Date retrieved: 15/5/2018

earlier in this paper, some hybrid procedures and efforts are considered. The first effort is the evaluation procedure of the Concept-based Information Retrieval Interface – CIRI [31]. The authors use the "Simulated Work Task Situation" to make their searching situations realistic. Their system contains an ontology-based query interface, which is constructed for searching a digital newspaper archive. In order to assess their system, they use a similar search interface without ontology support.

The second effort that is taken under consideration is the evaluation procedure that is followed by Suomela and Kekalainen [31]. They aim to evaluate their system through searches based on three different task types and accordingly study how college users interact with highly structured data. This experiment is applied to the Initiative for the Evaluation of XML - INEX interactive track (iTrack[5]). The overall goal of INEX [32] is to experiment with the potential of using XML to retrieve relevant parts of documents. During the evaluation process, the searchers are given brief online questionnaires in order to support the analysis of log data.

Lastly, Kriewel and Fuhr [33] evaluate an adaptive search suggestion system that is based on case-based reasoning techniques. They develop a suggestion tool for the DAFFODIL system to support users with useful strategic search advice. The aim of the evaluation is to learn whether an adaptive search suggestion system could help users in searching and whether it could teach users how to use the advanced capabilities of a complex search system. The corresponding evaluation approach dictates the assignment of a number of complex search tasks to the participants that should be carried out separately in two systems. Both of the systems are identical and based on DAFFODIL. The only difference is that one of them does not include the suggestion tool. The DAFFODIL logging framework is then used to capture all users' activities during the task.

IV. Our approach

Having the aforementioned approaches in mind, we concluded that the most appropriate method for the evaluation of the IIR system would be a comparison against the traditional, subject-based browsing functionality of the DSpace's digital library of the University of Piraeus in Greece, Dione[6]. More specifically, the IIR system provides another option to the library's users that wish to perform subject-based search within the underlying resources.

Following the steps of Borlund [25][34], the comparative evaluation process consists of a quantitative log file analysis regarding a period of 6 months and a user survey employing an adequately designed questionnaire. The former is anticipated to measure the overall performance of the IIR system and the later aims in estimating its impact to the end users.

A. Quantitative evaluation – The log files analysis

The log files that were analyzed during the quantitative evaluation process refer to the IIR system's usage from 20.10.2016 to 20.3.2017. The specific period of time was selected because it refers to a fully functional semester at the University of Piraeus. Log files in general are a valuable resource for understanding the kinds of information needs that users have, for improving ranking scores, for showing search history, and for attempts to personalize IR [26]. Within the context of the specific log files analysis, the term "*search session*" refers to the sequence of requests made by one user for a single navigation purpose [35].

According to the log files of both the DSpace and the IIR system, 54,7% of the total number of users that selected the subject-based browsing option, preferred to employ the IIR system instead of the typical functionality of DSpace. Such a measure does not imply any particular prevalence of the one option over the other.

Moreover, the log files reveal that the vast majority of the users did not spend much time with the IIR system (see table 1). In fact, 164 out of 230 users spent less than a minute. This could be attributed to the fact that the provided GUI consists of two widgets (namely the autosuggest search box and the boxes traversal), with different average usage time. More specifically, the autosuggest search box provides rapid suggestions in accordance with the typing speed of the user.

Table 1. IIR system's usage

no. of user sessions	no. of minutes per session
164	Less than 1
34	1-2
17	3-5
9	6-10
1	11-20
3	21-40
2	41-59

On the contrary, the boxes traversal requires mental effort from the users since they have to select the most appropriate choice from a number of semantically relevant options [36]. From such a viewpoint, table 1 could be interpreted as that users having a specific subject in mind employed the autosuggest search box whereas users with vague information needs employed the boxes traversal.

The above scenario is further justified from the findings stated at table 2. Table 2 indicates that the autosuggest search box was employed 171 times, whereas the boxes traversal was employed 55 times.

[5] INEX 2010 Interactive Track (iTrack). Available at: http://www.inex.otago.ac.nz/tracks/interactive/interactive.asp Date retrieved: 15/5/2018

[6] Dione. Available at: http://dione.lib.unipi.gr Date accessed: 15/5/2018

Table 2. IIR's widgets usage

widget	usages	%
Autosuggest search box	171	75,6
boxes traversal	55	24,4

From the 55 box traversals (see figure 6), 15 times users concluded their subject-based browsing session in their third hop. This is the most popular number of hops from one box to another according to the semantic relations of the subject headings that each box corresponds to (see figure 6). Following that, in a descending order, users concluded their subject-based browsing session in one, two and four hops respectively. The fact that 33 out of 55 box traversals were concluded in one, two or three hops leads to the conclusion that the majority of the users conclude their subject browsing process in a rather short period of time.

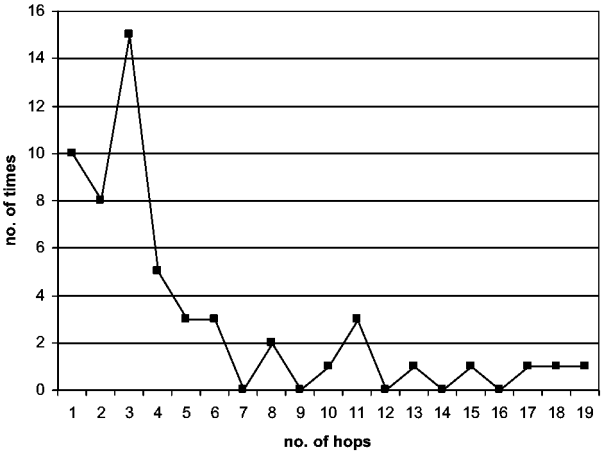

Figure 6. Number of hops in a boxes traversal

According to the log files (see table 3), the most popular semantic relation between subject headings is "contains" followed by a subdivision.

Table 3. Semantic relations

Semantic relation	No. of times
"contains"	178
"is part of"	14
"in context of"	1
clickbox	13
subdivision	27

At this point, it should be noted that "clickbox" is not a semantic relation per se. It refers to the user action of clicking on a box in order to erase its subsequent boxes and thus make the GUI more readable. Moreover, "subdivision" refers to the common subdivisions of two subject headings, defining this way the extended syndetic structure [15] of the underlying subject headings' collection. The relations "contains", "is part of" and "in context of" referred to the semantic relations such as narrow term, broader term and related term.

The predominance of the semantic relation "contains" could be justified from the fact that users tend to think from broader concepts to narrower ones when trying to satisfy their information needs. Additionally, the fact that the second most popular semantic relation refers to subdivisions, underpins the importance of the extended syndetic structure during a subject browsing process.

As far as users' satisfaction is concerned, safe conclusions cannot be extracted from the log files analysis. Some users may have started using any of the two systems and concluded their sessions without shifting to the other one. From another point of view, some users may have started using any of the two systems and, due to their dissatisfaction, concluded their sessions by using the other one. The satisfiability of the users employing the IIR system is measured through the circulation of a suitable questionnaire [37] that will be described later in this paper.

Thus, the qualitative part of the evaluation refers to a user survey where real users performed specific search tasks and then they filled-in a pre- and a post- questionnaire that were based on the principles of Kelly [16]. According to the proposed approach, the questionnaires consist of a number of questions where a specific set of accordingly weighted predefined responses is provided for each one of them.

B. Qualitative evaluation – Search scenarios, Questionnaires

The qualitative evaluation of the IIR system was implemented through a user survey. More specifically, the participants were initially asked to perform two subject search task scenarios and fill-in adequately designed pre- and post- questionnaires [34][38].

1) The procedure

The purpose of the survey was to measure the impact of the new subject-based IIR system that was recently integrated to the DSpace digital library of the University of Piraeus. In order to achieve this, a comparison between the traditional subject-based search functionality of the digital library and the new IIR system was performed.

Initially, the participants were gathered in a computer lab and they were accordingly informed about the purpose of the survey. Then, they were asked to fill-in a pre-questionnaire in order to record their search profiles. More specifically, their educational level, their familiarity with web search engines and DSpace's subject-based searching functionality were logged. After that, they were asked to perform two subject-based search task scenarios. Both of the scenarios should be implemented with both of the systems under comparison. The participants were asked to start with the traditional DSpace subject-based searching functionality and then repeat the same scenario with the new IIR subject-based search system. The whole process was supervised by the evaluators in order to ensure that there would be no technical difficulties in conducting their tasks.

After they had completed both scenarios, they were asked to fill-in an accordingly designed post-questionnaire in order to express their opinion about the two systems under comparison.

2) Participants

A total number of 16 users participated in the survey. They were all members of the academic society of the University of Piraeus. The participants were all familiar with the University's library. However, as indicated from the questionnaire's statistics, some of them had never used the DSpace digital library before.

3) Search task scenarios

Each participant was asked to perform two subject-based search task scenarios. The first scenario was simple in order to give to the novice participants the opportunity to get acquainted with the two systems. The second one was more complicated due to the fact that the described information need was more general and required a more detailed search. Finally, it should be noted that both search task scenarios correspond to existing subject headings within the digital library.

The participants were asked to perform the first task to the traditional subject-based search functionality and then to the new IIR system. After completing the first task, they were asked to perform the second task following the same sequence.

The two search tasks were the following:

a) You are looking for information about "*Stress management*". Try to satisfy your information needs using the traditional subject-based search provided by the DSpace digital library. Then, try to satisfy the same information needs by employing the new IIR service.

b) You are looking for information about "*Computer network protocols*". Try to satisfy your information needs using the traditional subject-based search provided by the DSpace digital library. Then, try to satisfy the same information needs by employing the new IIR service.

4) Questionnaire

Upon completion of the two search tasks, the participants were prompted to fill in a post-task questionnaire. In this questionnaire the users were asked to answer questions referring to the usability, the satisfiability and the effectiveness of the new IIR system as compared to the traditional subject-based search provided by the digital library.

5) Results

The whole process lasted between 10 to 20 minutes for each participant. A completed search process could either end up with successful or unsuccessful search results.

As indicated in figure 7, most of the participants were students in an under- or post-graduate level.

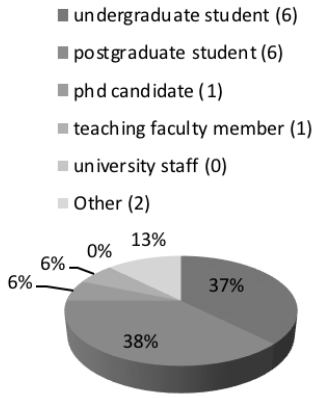

Figure 7. Educational level of the participants

Moreover, they had all, more or less sufficient experience in searching for information online. However, it seems that the digital library of the University's Library is not popular among the participants of this survey. 94% of the participants (see table 4) had never or very seldom used the digital library in the past. This could be attributed to the fact that the digital library was quite recently incorporated within the overall Library's infrastructure.

Table 4. Frequency of DSpace digital library's visits

Frequency of visits	participants	%
one time each semester or less	5	31.25%
one to three times a month	0	0.00%
once a week	1	6.25%
more often than once a week	0	0.00%
never	10	62.50%

When combining the answers of question 3 with the answers of question 4, it becomes apparent that participants that have used the traditional DSpace functionality in the past were more reluctant in finding the new IIR system easy to use, as compared to users that employed both of the systems for the first time. More specifically, 2 out of 6 users that have used DSpace before found the traditional DSpace's functionality easier to use than the new one (see table 5), in contrast to 10 out of 10 users without any prior experience with DSpace that found the new system easier to use.

Table 5. Comparison of the two systems based on ease of use for users with prior experience with DSpace

System	participants	%
DSpace subject-browsing system	2	33.33%
New IIR system	4	66.67%

The same conclusions apply when combining the answers of question 3 with the answers of question 5. Participants with prior experience with DSpace found the two systems

equally easy to understand (see table 6). Again, 10 out of 10 users without any prior experience with DSpace found the new system easier to understand than the traditional one.

Table 6. Comparison of the two systems based on understandability for users with prior experience with DSpace

System	participants	%
DSpace subject-browsing system	3	50.00%
New IIR system	3	50.00%

When combining the answers of question 6 with the answers of question 8 it becomes apparent that users that succeeded in satisfying their information needs with both of the systems found that the new IIR system aided them in completing their search tasks faster than the traditional one. More specifically, 7 out of 10 participants satisfied their information needs faster with the new IIR system.

Answers to question 9 indicate that the new metaphors in subject-based browsing introduced by the new IIR system (i.e. box traversal) helped DSpace-non-experienced participants in satisfying their information needs while at the same time such new metaphors did not discourage the DSpace-experienced participants in using the system (see figure 8). More specifically, 15 out of 16 participants found that browsing through the subjects by employing the new IIR system helped them in satisfying their information needs.

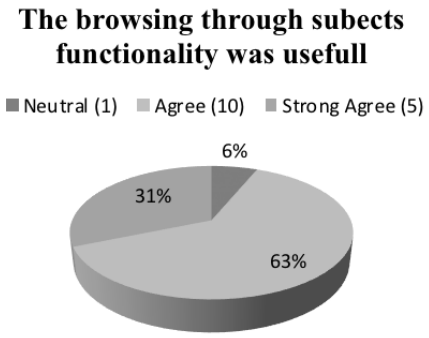

Figure 8. The participants' opinion about the browsing through subjects' functionality provided by the new IIR system

Finally, answers to question 10 indicate that the vast majority of the participants enjoyed using the new IIR system in order to satisfy their information needs (see table 7). In fact, 14 out of 16 participants would prefer to browse the digital library of the University of Piraeus by subject through the employment of the new IIR system instead of the traditional DSpace functionality.

Table 7. Comparison of the two systems based on the users' intention of reusing one system or another

System	participants	%
DSpace subject-browsing system	2	12.50%
New IIR system	14	87.50%

The remaining 2 participants are DSpace-experienced users that seem to be reluctant in changing their information seeking habits.

During the questionnaire procedure many participants asked questions concerning the usage of the new IIR system. stating that they will use it again in the future as indicated from the answers to question 10.

V. Conclusions

In this paper a novel IIR system for subject-based browsing was evaluated. The system is integrated to the DSpace-based digital library of the University of Piraeus in Greece.

The evaluation process is twofold: quantitative and qualitative. The former refers to the log file analysis of the IIR system's usage for a period of 6 months. The latter refers to the results of a user survey that compares the traditional subject-based search of DSpace against the new IIR system. More specifically, 16 participants were asked to perform two subject-based search task scenarios employing both systems. Then, they were asked to fill-in an adequately designed questionnaire in order to record their impressions concerning the two systems.

The log file analysis reveals that end users usually do not spend too much time searching for information by subject. Moreover, they seem to prefer the new functionality that is provided by the IIR system, despite the fact that it introduces new metaphors as far as the user interface is concerned.

Finally, the extended functionality of the new IIR system as compared against the traditional DSpace's functionality seems to outweigh the fact that the new IIR system has greater learning curve due to the new metaphors it introduces. Thus, users are very interested in employing new methods and techniques in information seeking and retrieval, especially when such new tools and methods help them in fulfilling their information needs accurately and timely.

Future work could be targeted towards the alteration and modification of the service under evaluation so as to provide personalized results based on the user's preferences and/or to give the opportunity to the users to provide tags in order to enrich the subject headings. Such an enrichment could facilitate and improve search and retrieval process.

References

[1] **Liu, J., Zamir, H., Li, Y. and Hastings, S.K. (2018).** Search systems and their features: What college students use to find and save information. *Library & Information Science Research*, 40 (2), pp. 118-124.

[2] **Kelly, D. and Sugimoto, C.R. (2013).** A Systematic Review of Interactive Information Retrieval Evaluation Studies, 1967-2006. *Journal of the American Society for Information Science and Technology,* 64 (4), pp. 745-770. DOI: 10.1002/asi.22799.

[3] **Drabenstott, K. M. (2003).** Do non-domain experts enlist the strategies of domain experts. *Journal of the*

American Society for Information Science and Technology, 54(9), pp. 836–854.

[4] **Wildemuth, B.M. (2004).** The effects of domain knowledge on search tactic formulation. *Journal of the American Society for Information Science and Technology*, 55(3), pp. 246–258.

[5] **Brajnik, G., Mizzaro, S., Tasso, C. and Venuti, F. (2002).** Strategic help in user interfaces for information retrieval. *Journal of the American Society for Information Science and Technology*, 53(5), pp. 343–358.

[6] **Pollock, A. and Hockley, A. (1997)**. What's wrong with internet searching. D-*Lib Magazine* <Available at: http://www.dlib.org/dlib/march97/bt/03pollock.html>

[7] **Rieh, S.Y. and Xie, H.I. (2001).** Patterns and sequences of multiple query reformulations in web searching: a preliminary study. In: *Proceedings of the 64th Annual Meeting of the American Society for Information Science and Technology*, vol. 38, pp. 246–255.

[8] **Fields B., Keith S., Blandford A. (2005).** Designing for Expert Information Finding Strategies. In: Fincher S., Markopoulos P., Moore D., Ruddle R. (eds) *People and Computers XVIII — Design for Life.* Springer, London, pp. 89–102

[9] **Carstens, C., Rittberger, M. and Wissel, V. (2009).** How users search in the German education index - tactics and strategies. In: *Proceedings of the workshop Information Retrieval at the LWA*.

[10] **Markey, K. (2007).** Twenty-five years of end-user searching, part 1: Research findings. *Journal of the American Society for Information Science and Technology*, 58(8), pp. 1071–1081.

[11] **Frakes, W. and Baeza-Yates, R. (eds) (1992).** *Information Retrieval, data structures and algorithms.* Prentice Hall, New York: Englewood Cliffs.

[12] **Kelly, D., Erguello, J., Edwards, A. and Wu, W.C. (2015).** Development and Evaluation of Search Tasks for IIR Experiments using a Cognitive Complexity Framework. In: *Proceedings of the 2015 International Conference on The Theory of Information Retrieval*, Northampton, Massachusetts, USA, September 27 - 30, pp. 101-110.

[13] **Cheng, J., Hu, X. and Heidorn, P.B. (2010).** New Measures for the Evaluation of Interactive Information Retrieval Systems: Normalized Task Completion Time and Normalized User Effectiveness. *ASIST*, October 22-27, Pittsburgh, PA, USA.

[14] **Borlund, P. (2000).** Experimental components for the evaluation of interactive information retrieval systems. *Journal of Documentation*, 56(1), pp. 71-90.

[15] **Papadakis, I., Kyprianos, K., Mavropodi, R. and Stefanidakis, M. (2009)**. Subject-based Information Retrieval within Digital Libraries Employing LCSHs. *D-Lib Magazine*, 15(9/10) <Available at: http://www.dlib.org/dlib/september09/ papadakis/09papadakis.html>

[16] **Kelly, D. (2009).** Methods for evaluating interactive information retrieval systems with users. *Foundations and Trends in Information Retrieval*, 3(1-2), pp. 1-224.

[17] **Borlund, P. and Ingwersen, P. (1997).** The development of a method for the evaluation of interactive information retrieval systems. *Journal of Documentation*, 53(3), pp. 225-250.

[18] **Su, L.T. (1992).** Evaluation measure for interactive information retrieval. *Information Processing and Management,* 28(4), pp. 503-516.

[19] **Dunlop, M. (1997).** Time, relevance and interaction modeling for information retrieval. In: *Proceedings of the 20th ACM SIGIR Conference on Research and Development in Information Retrieval*, pp.206-213.

[20] **Belkin, N., Cole, M. and Liu, J. (2009).** A model for evaluation of interactive information retrieval. In: *Proceedings of the SIGIR 2009 Workshop on the future of IR Evaluation*, pp. 7-8.

[21] **Hienert, D. and Mutschke, P. (2016).** A Usefulness-based Approach for Measuring the Local and Global Effect of IIR Services. In: *Proceedings of the 2016 ACM on Conference on Human Information Interaction Retrieval*, Carrboro, North Carolina, USA, March 13-17, 2016, pp. 153-162.

[22] **Cleverdon, C.W., Mills, J. and Keen, E. M. (1996).** *Factors determining the performance of indexing systems*. Cranfield. UK: Aslib Cranfield Research Project, College of Aeronautics.

[23] **Cleverdon, C.W. (2000).** The effect of variations in relevance assessments in comparative experimental tests of index languages. Cranfield, UK: Cranfield Institute of Technology.

[24] **Hildreth, C.R. (2001).** Accounting for users' inflated assessments of on-line catalogue search performance and usefulness: an experimental study. *Information Research*, 6(2) <Available at: http://InformationR.net/ir/6-2/paper 101.html>

[25] **Borlund, P. (2003).** The IIR evaluation model: a framework for evaluation of interactive information retrieval systems. *Information Research*, 8(3).

[26] **Hearst, M. (2009).** *Search User Interfaces*. Cambridge: University Press.

[27] **Fuhr, N., Klas, C.P., Schaefer, A. and Mutschke, P. (2002).** Daffodil: An integrated desktop for supporting high-level search activities in federated digital libraries. In: *Research and Advanced Technology for Digital Libraries. 6th European Conference on Digital Libraries*, pp. 597-612.

[28] **Klas, C.P., Kriewel, S. and Fuhr, N. (2007).** An experimental framework for interactive information retrieval and digital libraries evaluation. In: *Proceedings of the 1st international conference on Digital libraries: research and development (DELOS'07).* Springer-Verlag, Berlin, Heidelberg, pp. 147-156.

[29] **Wei, X., Zhang, Y. and Gwizdka, J. (2014).** YASFIIRE: yet another system for IIR evaluation. In: *Proceedings of the 5th Information Interaction in Context Symposium*, Regensburgm Germany, pp. 316-319.

[30] **Agirre, E., Di Nunzio, G.M., Mandl, T. and Otegi, A. (2009).** CLEF 2009 ad hoc track overview: robust-WSD task. In: *Proceedings of the 10th cross-language evaluation forum conference on Multilingual*

information access evaluation: text retrieval experiments (CLEF'09). Springer-Verlag, Berlin, Heidelberg, pp. 36-49.

[31] **Suomela, S. and Kekalainen, J. (2006).** User evaluation of ontology as query construction tool. *Information Retrieval*, 9(4), pp. 455-475 DOI: 10.1007/s10791-006-6387-3.

[32] **Pharo, N., Nordlie, R., Fuhr, N., Beckers, T. and Fachry, K.N. (2009).** Overview of the INEX 2009 interactive track. In: Proceedings of the Focused retrieval and evaluation, and 8th international conference on Initiative for the evaluation of XML retrieval (INEX'09), Springer-Verlag, Berlin, Heidelberg, pp. 303-311

[33] **Kriewel, S. and Fuhr, N. (2010).** Evaluation of an adaptive search suggestion system. In: *Proceedings of the 32nd European Conference on Information Retrieval Research (ECIR 2010)*, Springer-Verlag, pp. 544-555.

[34] **Borlund, P. (2016).** A study of the use of simulated work task situations in interactive information retrieval evaluations: A meta-evaluation, *Journal of Documentation*, 72 (3), pp. 394-413.

[35] **Huang, X., Peng, F., An, A. and Schuurmans, D. (2004).** Dynamic Web Log Session Identification With Statistical Language Models. *Journal of The American Society for Information Science and Technology,* 55(14), pp. 1290–1303.

[36] **Avouris, N. (2000).** *Introduction to Human-Computer Interaction*. Athens: Diavlos Publications.

[37] **Covey, D.T. (2002).** *Usage and usability assessment: Library practices and concerns*. Technical report, Digital Library Federation.

[38] **Li, Y. & Hu, D. (2013).** Interactive retrieval using simulated versus real work task situations: Differences in sub-facets of tasks and interaction performance. In: *Proceedings of the American Society for Information Science and Technology*. DOI: 50.10.1002/meet.14505001092.

Appendix

In this section the pre- and post- questionnaire that was given to the participants of the survey are given.

Pre-task questionnaire		
	Question	**Answers**
1	What is your educational level?	- Undergraduate student - Postgraduate student - PhD candidate - Teaching faculty member - University staff - Other
2	I have experience in searching/ browsing the web	- Strong disagree - Disagree - Neutral - Agree - Strong agree
3	How often do you employ the digital library of the University of Piraeus in order to satisfy your information needs?	- One time each semester or less - One to three times a month - Once a week - More often than once a week - Never

Post-task questionnaire		
	Question	**Answers**
4	Which system did you find easier to use?	- DSpace subject-browsing system - New subject-browsing system
5	Which system was easier to understand?	- DSpace subject-browsing system - New subject-browsing system
6	Did you manage to satisfy your information needs with both of the provided systems?	- Yes - No
7	Which system did not provide any results?	- DSpace subject-browsing system - New subject-browsing system - Both
8	Which system was the fastest in satisfying your information needs?	- DSpace subject-browsing system - New subject-browsing system
9	When employing the new subject system, browsing through subjects (top of the page) helped me in satisfying my information needs?	- Strong disagree - Disagree - Neutral - Agree - Strong agree
10	Which of the two systems would you prefer in reusing in the future for satisfying your information needs?	- DSpace subject-browsing system - New subject-browsing system - None

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South European undergraduate and continuing professional development program reconceptualization for the New Information Professional: a synergistic innovation perspective

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Abstract:

Purpose *– As, under the new educational, communicational and technological paradigms, Library and Information Science curricula reconceptualization is gaining momentum, this opinion paper should be seen as a theoretical contribution to current thinking around South European formal education and Continuing Professional Development potential to effectively addressing the New Academic Library challenges.*

Design/methodology/findings *- Building on context-specific case studies and previous international research focusing the investigation of the necessity to reshape official undergraduate programs and academic librarian career-long learning opportunities, our paper discusses whether and how an open flexible synergistic approach could be an ideal solution to current scenario pain points. Besides offering a brief but comprehensive review of the topic, it further proposes a set of future research studies that may result foundational to change within the librarian community by helping unpack the complexities of an ecosystem still in search of its identity.*

Index Terms — LIS education; Academic Libraries; South Europe; Continuing Professional Development; Library consortia; synergistic innovation.

I. Introduction

Before embarking on the exploration of potential solutions to refreshing Information Professionals (IPs) qualifications, it will be absolutely necessary to begin with a brief introduction to challenges facing academic librarians in an era where accountability, return-on-investment, creativity and flexibility have turned from buzzwords into norms [1]. New Information Professionals in their attempt to keep their transforming organizations abreast with the pressing demands of a constantly expanding field of action, especially under the Open Science and Learning Analytics scope, need to strengthen the multidisciplinarity [2] of a sector still in search of its identity [3], by means of adding to the Learning Resources and Research Center's (LRRC) toolbox a new set of elements (measures, activities, applications) and by amplifying and systematizing library use data collection so as to effectively showcase their contribution to student success and retention.

As recent developments in the area of educational technology, research dissemination and andragogy have started to call into question several of the LRRC processes and operations, the academic librarian is being required to reconsider:

- the collection and capitalization practices of explicit/ implicit knowledge produced inside the library walls in line with the North American approach of considering in-library student activity a valuable intellectual capital,
- his/her contribution to different research lifecycle stages,
- his/her active involvement in the educational process through program evaluation, the development of Open Educational Resources and the design and implementation of High Impact Practices [4].

As it was very vividly stressed in the most recent MIT Future of Libraries Institute-wide Task Force Preliminary Report "the future of libraries is more complicated and interesting than a simple transition from a predominantly print world to a digital one" [5], a future that necessitates update on an ongoing basis and adaptation to evolving research and learning scenarios, facilitated by visionary and innovator human resources eager to create and support efficient and effective services that add value to the parent organization.

It has been repeatedly argued during the last decade that

reshaping the diverse workforce qualifications charter can be considerably helped by taking a technology-facilitated, flexible and dynamic holistic approach. In this sense, versatile interventions spanning the entire formal education/Continuing Professional Development (CPD) chain and coordinately supported by interinstitutional joint resources and experience, could provide the necessary adaptability in response to budgetary cuts, roles and jurisdiction fluidity, and eventually the absolutely necessary dissociation from the Van House & Sutton "Habitus" [6,7] which forged by libraries and the public sector, might sooner or later put librarians on the spot.

Taking these new realities into account, emerging tech capabilities providing a plethora of new learning formats and minimizing geographical and financial barriers to participation in learning on one hand and the need to reconsider the entire environment in which the profession practices on the other, IFLA's Continuing Professional Development and Workplace Learning Section (CPDWL) have decided in 2015 to revise its 2006 guidelines in an effort to inform administrators and stakeholders about professional norms, provide models, and raise expectations [8].

II. Critical questions

Despite the remarkable infrastructural, service and library staff development progress achieved thanks to a series of activity intensive projects during the last decade, South European academic library community - not having yet fully recovered to a normal and stable economy - is already confronted with the challenging necessity of renewing its workforce competences. In the face of informational landscape groundbreaking changes, the Library and Information Science (LIS) community is puzzled today by a series of critical questions, among which:

- whether existing CPD and formal undergraduate LIS curricula can adequately support New Information Professional (NIP) against the upcoming tectonic shifts in the global LIS job market,
- which types of CPD the current Higher Education framework permits or promotes and
- whether CPD activities that, according to recent research, follow rather than precede developments, are exploited to the fullest extent possible.

Attempts to forward a new CPD paradigm are frequently obstructed by the problematic nature of a system generally beset by the diversified approaches that pervade both innovation and formal and informal staff development [9, 10, 11]. Also, the inability to timely address international dynamics, the perpetuation of a culture undermining transformation and innovation efforts, and the somewhat disconnected, seldom, low intensity and short duration CPD are only a few among the numerous system dysfunctions that could be summarized as follows:

- the underrepresentation of New Critical Skills (NCS) in undergraduate curricula that do not exceed 19% of the entirety of Spanish and Greek official LIS programs as recorded in a research conducted early 2017, a lagging behind that may be worthwhile further investigating [12]:
- the lack of library associations' involvement in professional accreditation,
- the incapacity of early adopting systematic changes before it becomes absolutely necessary [13],
- the strong mimetic forces that stemming from professional networks and formal education create a grid of common organizational structures and re-utilization practices that hinder the influx of new knowledge and therefore innovation [14,15,7],
- the establishment of the CPD agenda more on the basis of traditional library core operations and less on contextual factors,
- the lack of infrastructural capacity to systematically disseminate new field-related knowledge
- the confinement of the important intellectual capital that is educational material within university walls and finally
- the universal paradox of developing tools before skills [16] which could be interesting to further investigate for the South European university library-specific context.

III. International developments

In their attempt to overcome these intractable issues generated by the inevitable fluidity of today's informational scenario, and further exacerbated by the controversy surrounding the current interpretation of CPD scope and content, oscillating between "a realization, a commitment, a plan, an activity and a process" [16], several associations have been launching dynamic professional development projects invigorating NIP's flexibility and adaptability to change.

In particular, the need to adopt commonly accepted open pluralistic policies [18,19] in support of academic and professional associations' involvement in a co-regulated LIS educational reconfiguration [20,21,22] with added value to all stakeholders, is the assumption underpinning:

- the formation of training consortia, inter alia, CPD 25 Staff Development and Training Program by London and South East England Consortium (M25), The Library School (in collaboration with Open University of The Netherlands), and Academic and National Library Training Co-operative (Ireland) or
- the extension of existing professional associations' scope of activities as in the case of Swiss Academic Library Consortium, North West of England Academic Libraries Consortium (NoWAL), Minnesota State Colleges and Universities Consortium (PALS), Beijing Academic Library Consortium, Council of Australian University Librarians (CAUL), and Consortium of Academic and Research Libraries in Illinois (CARLI).

In the face of shrinking budgets and the advent of new paradigms [3, 23] and despite challenges associated with

recording the usage of non-traditional instructor-led training, and with defining the amount of CPD necessary to maintaining professional competence [8], these initiatives seem more relevant than ever, constituting, thanks to their excellent responsiveness to the market and their open structures, an ideal test field for program innovation [24].

IV. Towards a synergistic approach

A. Conceptualization outline

The more libraries advance on their evolution continuum, the more researchers become immersed in the investigation of (1) LIS education's response to current job market requirements [25], (2) librarian training preferences [26], (3) the significance of informal learning opportunities [27], (4) the necessity of solid and well-structured CPD programs [28] and finally (5) the importance of implementing a national skills development strategy that would ensure public funding and serious commitment on behalf of academic library administrations [29]. Most of their findings agree upon the pressing need for systematic enhancement and enrichment of existing structures and content, a necessity repeatedly emphasized since the Ranganathan era (1931), and the importance of involving LIS educators and degree programs as researchers, advocates, consultants, and participants in continuing education provision [8, 30, 31, 2, 32]. An essential component of this redefinition could very well be the creation of an open synergistic educational platform responding to sector requirements and open education international trends based on the four different learning scenarios proposed by Castaño Muñoz et al. in Open Education 2030 Report (2013) [33].

In the words of Andreia Inamorato dos Santos (Information Society Unit, European Commission) in her keynote speech at D-Transform Event (Open University of Catalunya, November 2016), experts insist on seen Open Education, as the perfect meeting point of formal/informal professional development that guarantees thanks to its fluidity and flexibility a timely response to change. In this context, the envisioned open training and development online space, a content-rich collaborative, supportive and supported online learning environment [34], through the incorporation of both theoretic and authentic hands-on-practice scenarios, could:

- significantly help draw the exact LIS ecosystem coordinates,
- contribute to NIP knowledge update from both internal and external information sources [35],
- capitalize on online professional development tools' potential to creating sustainable learning communities [36],
- urge participants, active and future academic library professionals, to critically consider their own learning, as CPD attendance doesn't per se make a professional competent [37] and
- constitute a genuine forum on most current LIS research lines based on Jenkins [38] connected learning principles.

B. Success factors

For the proposed synergistic initiative to be successfully implemented, a set of specific objective and subjective preconditions ought to be first met: (1) co-creation principles comprising common targets, mutual interest, strong leadership, enthusiasm and determination [39], (2) LIS curricula evaluation, (3) the development of a scientific framework that will help forward a commonly accepted terminology, structure and identity, (4) mutual recognition and accreditation agreements independent of institutional and geographic affiliations [40], (5) a SWOT analysis of local academic library network so that the resulting entity would have combined forces and no overlapping weaknesses [23], followed by (6) the integration of a standardized quality control system that includes among other things the formation of an advisory committee and continuous feedback from all stakeholders [41].

Last but not least, developing a marketing strategy should also be taken into serious consideration during the design phase as it would help project the network's uncontested value and promote South European libraries among movers and shakers of a global initiative.

V. Conclusions

A. Key takeaways

Library's improvement and sustainable development like for all living and constantly evolving organisms [42] demands a continuous re-adaptation that without LIS education reform within the coordinates of an attitude change, that according to Musman [43] constitutes the most important innovation of the information profession, will not be possible.

South European state university libraries share a lot in common in terms of technological, financial, administrative and functional affordances and LIS undergraduate program and CPD system weaknesses to addressing today's challenges. Seen these similarities through the prism of existing consortia positive training experiences, the longevity of which is a per se guaranty of their success, and European Higher Education new funding opportunities, like the EU Renewed agenda for HE, could open new promising avenues for the development of the proposed synergistic online intervention.

As a closing comment in the face of the unique opportunity presented for a dynamic response to the academic library heterogeneous workforce's training requirements and in line with EC directives, IFLA CPD principles and LIBER strategic planning for the next decade [8,44,45], we would like to reiterate, based on concrete literature-derived evidence, the need for development of an online cooperative platform as the natural next step toward both reconfiguring NIP skills development mechanisms and expanding Southern European Libraries Link members' collaboration that could position them in the avant-garde

scene of a new paradigm.

B. Future research lines

As academic librarians become critical contributors to the co-development of the HE agenda, recording and analysing their CPD related choices and considerations is of determining effect to unpacking the complexities of an ecosystem still in search of its identity. Therefore, among further research actions enquiring potential issues on the way to developing a context-specific synergistic online CPD platform, we would propose:

- running a mixed methods exploratory study consisting of an inventory of south European academic librarian CPD types and frequencies further supported by the collection through in-depth interviews of detailed reflections on their knowledge acquisition choices rationale and their respective correlations with library transformation and innovation levels, a study that may result foundational to change within the academic library community,
- engaging in a country-level LIS curricula profile and content analysis with a mindset toward New Critical Skills (NCS), followed by a qualitative research component focusing the exploration of dysfunctions' cause-effect related stakeholders' perceptions and
- further investigating the "tool before skills development" paradox for the south European specific context.

REFERENCES

[1] **Schonfeld, R. C. (2016).** Organizing the Work of the Research Library. IthakaS+R Report. https://doi.org/10.18665/sr.283717

[2] **Boyd, R. (2008).** Staffing the Commons: job analysis in the context of an Information Commons. Library Hi Tech, 26(2), 232-243.

[3] **Burke, R. (2010).** Library consortia and the future of academic libraries. [Online]. Available at: http://www.neal-schuman.com/nealschuman/companionwebsite/academic/Burke2010.pdf [Accessed: August 21 ,2017]

[4] **Kuh, G. D. (2008).** Excerpt from high-impact educational practices: What they are, who has access to them, and why they matter. Association of American Colleges and Universities. [Online] Available at: https://www.aacu.org/leap/hips [Accessed: August 26, 2017]

[5] **MIT Institute-wide Task Force on the Future of Libraries Report**, 2017, [Online] Available at: https://www.pubpub.org/pub/future-of-libraries [Accessed: September 8, 2017]

[6] **Van House, N., & Sutton, S. A. (1996).** The panda syndrome: an ecology of LIS education. Journal of education for library and information science, 131-147.

[7] **Myburgh, S. (2003).** Education directions for new information professionals, The Australian Library Journal, 52:3, 213-227, DOI: 0.1080/00049670.2003.10721549

[8] **Varlejs, J. (2016).** IFLA Guidelines for Continuing Professional Development: Principles and Best Practices. International Federation of Library Associations and Institutions (IFLA), The Hague. Available at: https://www.ifla.org/files/assets/cpdwl/guidelines/ifla-guidelines-for-continuing-professional-development.pdf

[9] **Larsen, Borup J. A survey of Library & Information Science schools in Europe. In: Lorring, L, Kajberg, L (Eds.) (2005).** European Curriculum Reflections on Library and Information Science Education. Copenhagen: Royal School of Library and Information Science, p. 232-242. <http://hdl.handle.net/1889/1704>.

[10] **Brine, A., & Feather, J. (2003).** Building a skills portfolio for the information professional. New Library World, 104(11/12), 455-463.

[11] **Harvey, R., & Higgins, S. (2003).** Defining fundamentals and meeting expectations: Trends in LIS education in Australia. Education for Information, 21(2-3), 149-157. Available at: http://hdl.handle.net/10150/105825

[12] **Sant-Geronikolou, S. (2017).** Out-of-the-box thinking around in-library use data collection: the case of Spanish University Libraries. Poster session presented at LIBER Annual Conference 2017, Patras, Greece. [Poster] Available at: http://liber2017.lis.upatras.gr/wp-content/uploads/sites/6/2017/04/PosterFV_Sant.pdf

[13] **Deiss, K., & Petrowski, M. J. (2009).** ACRL 2009 strategic thinking guide for academic librarians in the new economy. [Online] Available at: http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/value/acrlguide09.pdf [Accessed: August 20, 2017]

[14] **Weiner, S. G. (2003).** Resistance to change in libraries: Application of communication theories. Portal: Libraries and the Academy, 3(1), 69-78.

[15] **Beckert, J. (2010).** Institutional isomorphism revisited: Convergence and divergence in institutional change. Sociological Theory, 28(2), 150-166.

[16] **Bergquist, W. H., & Pawlak, K. (2008).** Engaging the six cultures of the academy: Revised and expanded edition of the four cultures of the academy. John Wiley & Sons.

[17] **Broady-Preston, J. (2009).** Professional education, development and training in a Web 2.0 environment: A case study of the UK. New Library World, 110(5/6), 265-279.

[18] **Lorring, L., & Kajberg, L. (2005).** European curriculum reflections on library and information science education. Royal School of Library and Information Science

[19] **Audunson, R. (2005).** The public library as a meeting-place in a multicultural and digital context: The necessity of low-intensive meeting-places. Journal of documentation, 61(3), 429-441.

[20] **Litsey, R. (2015).** Library Consortia: Models for Collaboration and Sustainability. Eds. Valerie Horton

and Greg Pronevitz for American Library Association, College & Research Libraries, 76(6), 850-851.

[21] **Guzzy, J. E. (2010).** US academic library consortia: A review. Community & junior college libraries, 16(3), 162-184.

[22] **Anglada De Ferrer, L. M. (2008).** Los consorcios como instrumentos de cooperación bibliotecaria: la experiencia del CBUC. Patrimonio Cultural, No 49, p. 29-36

[23] **Samea, L. (2015).** Academic library consortia in Arab countries: An investigating study of origins, development, and services. International Journal of Library and Information Science, 7(7), 130-147.

[24] **Edelson, P.J. (2004).** Images of continuing education. Continuing Education Higher Review ,68, 87-95

[25] **Moreiro-González, J.A., Azcárate-Aguilar-Amat, P. Marzal-García-Quismondo, M.A., Tejada-Artigas, C.M. & Vergueiro, W.(2008).** Desarrollo profesional y opinión sobre la formación recibida de los titulados universitarios en información y documentación de las universidades públicas de Madrid (2000-2005). El profesional de la información, vol. 17, n. 3, pp. 261-272. Available at: http://eprints.rclis.org/23354/

[26] K**orobili-Xantinidou S., Moreleli-Cacouris M. & Tilikidou, I. (2003).** Concepts, reality and suggestions about Greek library management education, New Library World, vol. 104, no. 6, pp. 203-217.

[27] **Riley-Huff, D. A., & Rholes, J. M. (2011).** Librarians and technology skill acquisition: Issues and perspectives. Information Technology and Libraries, 30(3).

[28] **Clair, G. S., Harriston, V., & Pelizzi, T. A. (2003).** Toward world-class knowledge services: Emerging trends in specialized research libraries. Information outlook, 7(7), 10-16.

[29] **Lockhart, J., Majal, S. (2012).** The staff training and development initiatives at the Cape Peninsula University of Technology (CPUT) libraries. Innovation: journal of appropriate librarianship and information work in Southern Africa, 45: 120-134.

[30] **Mack, D. (2011).** Libraries and Museums In An Era Of Participatory Culture, Salzburg Global Seminar, Session 482. [Online] Available at: http://www.salzburgglobal.org/fileadmin/user_upload/Documents/2010-2019/2011/482/SessionReportPrint482.pdf [Accessed: May 22, 2017]

[31] **Bitter-Rijpkema, M. E., Verjans, S., & Bruijnzeels, R. (2012).** The Library School: empowering the sustainable innovation capacity of new librarians. Library Management, 33(1/2), 36-49.

[32] **Keeling R. P. (Ed) (2006).** Learning Reconsidered 2: Implementing a Campus-Wide focus on the Student Experience. American College Personnel Association.

[33] **Castaño Muñoz, J., Redecker, C., Vuorikari, R., & Punie, Y. (2013).** Open Education 2030: planning the future of adult learning in Europe. Open Learning: The Journal of Open, Distance and e-Learning, 28(3), 171-186.

[34] **Rowley, J. (2001).** Knowledge management in pursuit of learning: the learning with knowledge cycle. Journal of Information Science, 27(4), 227-237.

[35] **Ipe, M. (2003).** Knowledge sharing in organizations: A conceptual framework. Human resource development review, 2(4), 337-359.

[36] **Cooke, N. A. (2012).** Professional development 2.0 for librarians: Developing an online personal learning network (PLN). Library Hi Tech News,29(3), 1-9.

[37] **Friedman, A., & Phillips, M. (2004).** Continuing professional development: Developing a vision. Journal of education and work, 17(3), 361-376.

[38] **Jenkins, H. (2012).** Connected Learning: Reimagining the Experience of Education in the Information Age. [Online] Available at: http://henryjenkins.org/blog/2012/03/connected_learning_a_new_parad.html [Accessed: August 20, 2017]

[39] **Yeoh, J. (2005).** Regional academic library and information training consortia in the United Kingdom and Ireland: A model for success. In Continuing Professional Development- Preparing for New Roles in Libraries: A voyage of discovery, IFLA publications.

[40] **Virkus, S. (2007).** Collaboration in LIS education in Europe: Challenges and opportunities. In Proceedings of the World Library and Information Congress: 73rd IFLA General Conference and Council. Libraries for the future: Progress, Development and Partnerships, pp. 19-23.

[41] **Montague, R., & Steadley, M. (2005).** Mulitfaceted CPD: Developing a program to meet the diverse needs of LIS professionals. IFLA publications, 116, 180.

[42] **Ranganathan, S. R. (1931).** The five laws of library science. Madras Library Association (Madras, India) and Edward Goldston (London, UK).

[43] **Musman, K. (1982).** The diffusion of innovation in libraries, In Jantz, R. Innovation in Academic Libraries: An Analysis of University Librarians' Perspectives, Rutgers University Community Repository. DOI: http://dx.doi.org/doi:10.7282/T3M90714

[44] **European Commission (2013).** Communication on Rethinking Education. [Online] Available at: https://ec.europa.eu/digital-single-market/en/news/communication-rethinkingeducation

[45] **Association of European Research Libraries (LIBER) (2017).** Research Libraries Powering Sustainable Knowledge in the Digital Age. LIBER Europe Strategy 2018-2022, The Hague. [Online] Available at: https://libereurope.eu/wp-content/uploads/2017/11/LIBER-Strategy-2018-2022.pdf

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Personal photograph collections ontology development through thematic tags

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Abstract:
Purpose *- The number and the variety of photos have grown to a great extent as they can be created anytime, everywhere and spontaneously. Searching for a particular photo file has become a boring, repetitive and tedious activity. The application of an ontology to express the user profile characteristics relation with the narrative, spatial, time and other types of information of the collected photos becomes imperative.*

Design/methodology/approach *-The work presented in our article includes the development of a personal photograph collections ontology (MyOntoPhotos) specialising in documenting the metadata of the topics that end-users prefer mostly to capture with their devices. An extensive survey, among 650 participants, was conducted with the use of an online questionnaire comprised of semi-closed questions, following the Likert scale and the scale category grading.*

Findings *-The ontology created was based on the results of an extensive survey aiming to identify thematic areas of interest, apart from spatial and temporal information, as other similar efforts did in the past. It is mentionable that the survey results proved the majority of the responders selected 22 thematic tags.*

Originality/value *-Based on the research findings an innovative concept for a mobile application is presented, focusing on enhancing end-users photo collections organizing and retrieval functions.*

Index Terms — Ontology mapping, Dynamic Ontology development, Personal photography, Photo management, Digital photo organization, Photo retrieval.

I. Introduction

The number and variety of photographs have increased significantly [1], [2]. Users can create photos anytime, everywhere without prior planning [3], capturing a vast variety of everyday life events [4]. Digital photographs are not an easy task, and conscious effort is required to organise, manage and, thus to preserve and to locate them when is necessary [5]. The photos hold memories of events and have the power to take us back in the time and to remind us what we did, so they are of high emotional value [6].

But searching for a particular photo among a vast volume of digital files is a dull, repetitious and laborious activity [7], mainly because a text retrieval query requires some photography semantics knowledge. For this reason, the present work provides evidence that whenever labelling photos with the appropriate thematic tag will improve the recovery rate significantly and easily. As a result, retrieval is based on the highest possible accuracy and retraction, which has proven to be a challenge [8].

This is possible by ontologies. According to [9], ontology is an explicit specification of conceptual thinking. Also, ontology has the definition and the clues as to how these concepts are interlinked imposing a specific structure in the field of study [10]. Ontologies can represent a particular area of interest by promoting and facilitating the interoperability between information systems [1], the explanation of questions, the formulation and the utilization of information [11]. The use of the positive features of ontologies - interoperability, capture and organization of knowledge - is very important [12], [13].

In this article, a framework for personal photos organization is proposed, through the use of an ontology (MyOntoPhotos). The aforementioned ontology includes thematic, spatial and temporal tags. These tags were selected through a survey that was conducted on an extensive, random sample of end-users. The ontology is going to be part of a photo organizing application which will allow users to improve tags ranking order as they use it.

The rest of the article is organized as follows: next, Section 2 describes similar initiatives and related work. Section 3 is dedicated to presenting the methodology followed concerning the ontology formation. Consequently, Section 4 presents the ontology most popular tags as they were selected by users through the survey. Next, Section 5 provides the conclusions about the most important findings and lessons learned, while identifies the research restrictions. Finally, in Appendix section the questionnaire is presented.

II. Literature review

To begin with, author [14] establishes image properties categories based on user behavior by analyzing the words and phrases that viewers employ to describe them. According to [15] there is an interest in the detection of still

images, user images and metadata to provide the breadth and significance of the semantic gap [16]. The semantic gap is the "*lack of coincidence between the information that one can extract from the visual data and the interpretation that the same data have for a user in a given situation*" [17, p.1] In recent decades several semantic gaps make it difficult for users to search for the photos they want [18], [19].

Also, *Flickr* allows users to upload images online for storage by commenting on titles, descriptions, or labels [20]. *Flickr tags* - date, location, and owner - are mainly assigned by the user who downloads the image with several benefits [21], but without allowing correlations to the same query to retrieve the requested photos or automatic photo organization. Authors [22] referred to *Instagram tags* as guides for the main subjects, events, locations, ideas or emotions. In *Picasa* the organization of photos is limited to creating albums as photo collections without supporting automatic event tracing [23].

Moreover, *EXIF* (EXchangeable Image File) allows the description of geographic coordinates using GPS tags. At the same time, *Photogeo's* contribution is very important, with the use of new algorithms. In detail, the algorithms allow the user to comment on photos with basic metadata characteristics - who, the location where was recorded, the date and time of downloading – [24]. In *PhotoMap* [2], the annotation is automatically performed using the spatial, temporal and social context of a photograph [7].

In terms of organization and personal digital imaging, research has mainly focused on interface design [25], spatial indexing [26], data display [27], the time of taking photographs [28] and facilitating the exchange of photographs. Furthermore, the *ContextPhoto* ontology [1] provides concepts for portraying the spatial and temporal frames of the photo (where, when) and the Semantic Web Rule Language (SWRL) rules for export the social context of photography (who was close).

An essential part of the photos organization and retrieval is to identify the topics that end-users are interested in or impressed by [24]. So far, a considerable body of research has been carried out on the above-mentioned domains, but none of them has focused on exhaustive depiction and use of topics as the central entry point for search and retrieval functions, as suggested in this research.

The topic that is most often used is related to *people* [29], [26], [30]. Next, there is a tendency for photos concerning *places* [31], [32], [33], [28], [34], [35], [2] or related to various *time periods* [5], [29], [28], [36], [37]. Also, it seems that many people prefer to organize their collection based on a *specific event or circumstance*, such as a wedding, a baptism, a congress, a meeting at the workplace, etc.[38], [6], [4], [28], [39] or a *trip* [30], [2]. It is noteworthy that [40] time and location dimensions should be included as part of the abovementioned topics descriptive information (specific event, circumstance or a trip). In addition, many prefer to take photos about *nature* [32], [38], [5], [41] and *specific objects* [29].

III. METHODOLOGY

In the present study, we conducted a survey that describes and measures the degree of correlation between two variables: the behavior in taking pictures and the subjects that are mainly depicted. Through the correlation, according to [42], a statistical control is performed to determine the two variables to be consistently changing.

The questionnaire used during the survey is provided in the Appendix section and was the most appropriate tool for collecting the necessary input data for building the ontology proposed [42]. The content of the questionnaire was based on previous research activities [5], [29], [43], [37] while it was necessary to be modified on the basis of the Greek context and the new technological developments and requirements.

Concerning the structure of the questionnaire, there are 19 questions, divided into two parts. The first part (question 1 up to 13) refers to the participants' demographics and photography preferences. The second part of the questionnaire (question 14 up to19) is devoted to measuring the topics that participants prefer to capture more often, through a set of visual aided questions.

The survey conducted from November 2016 to February 2017 through an online questionnaire on a random sample of participants. The promotion of the survey was realized mainly via the social networks. The number of responders was large enough (650) to enable a satisfactory level of representation among different sub-groups in terms of gender, age, and level of education. It is considered that the sample can provide useful information for creating the ontology. The participants were able to communicate via e-mail, if they needed any further clarification. The protection of personal data, the anonymity of the participants in the study and the use of their responses solely to promote research were highlighted.

Finally, it is worth noting that in this questionnaire, after a thorough study of the literature, visual modernisms were introduced. More specific, hashtags (#) were used for presenting topics (e.g. #Parents / #Children etc.), based on terms from Social Media Networks (e.g. Facebook, Instagram, Twitter, etc.), while their visualization was done with the help of related images, assisting participants to respond more quickly and accurately.

IV. RESULTS AND DISCUSSION

After a thorough study of the responses, the following conclusions were extracted for the topic tags. Initially, it should be noted that the selected number of tags was 22. The tags were organized in eight broader topic areas / categories - #place, #friends, #occasion, #selfies, #family, #domestic animals, #leisure time and #personal items. Besides, based on the results of the survey (see question 15) topic #Various Objects was also used for the case where participants could fill in other topics that can be

photographed and not mentioned or included in the previous tags.

Most of the participants, i.e. 95%, would not spend more than one hour per week to organize their captured photos. This indicates that the use of an application to organize photos that would considerably decrease the time spent is essential. It was observed that 80% of the participants did not provide extra tags other than those already included in the survey (questions 14a-e).

Also, #place and #time are preferable topics that users fancy to access (search) their photos. In more detail, users are interested in #place visited, #place of living, #place of working, #place of taking photos, #gps, #year, #season, #month #date and #day of taking. It is remarkable that the survey results proved that the use of the 22 topic tags, thus the number of photos taken for each category, is not affected statistically enough by factors such as gender, age and education profile.

The majority of the participants (i.e.72%) believe that a set of five topics is sufficient for tagging their photos. Thus, the topic tags that would be most frequently chosen and hence the subjects of interest are: #Nature, #Best friends, #Social occasion, #Historical monuments, #City, #Museums / #Buildings, #Selfies, #Brothers, #Classmates, #Wedding / #Baptism, #Dog, #Hobby, #Parents / #Children. The topics mentioned above were selected based on the survey responses and in conjunction with the literature review are the basis for the *MyOntoPhotos* Personal Photo Ontology entities and relationships creation.

The ontology development followed the guidelines described in "Ontology Development 101", which has been introduced by the creators of Protégé 2000, Ontolingua and Chimaera. Specifically, an iterative design that helps developers to create an ontology [44] was applied. The two most important concepts for an ontology-based system in the field of photography are accuracy and recall during retrieving user-based results [15]. All possible combinations for topic tags variations, as shown by the graph and ontology design, are based on the above factors.

More specific the researchers wanted to depict the preferred topics (subjects) that "capture" the respondents, with the percentage of interest in each topic (i.e. #nature 82%, #best friends 75%). Simultaneously, there is another correlation "is interested in" where #person –respondent- refers the #place and the #time, as retrieving tags. In the ontology development, it is shown also the percentages of preferences of #place and #time (i.e. #place visited 53%, #year 55%). The results of the ontology, as set out, are presented in the following figures, 1 and 2, and in the .owl archive.

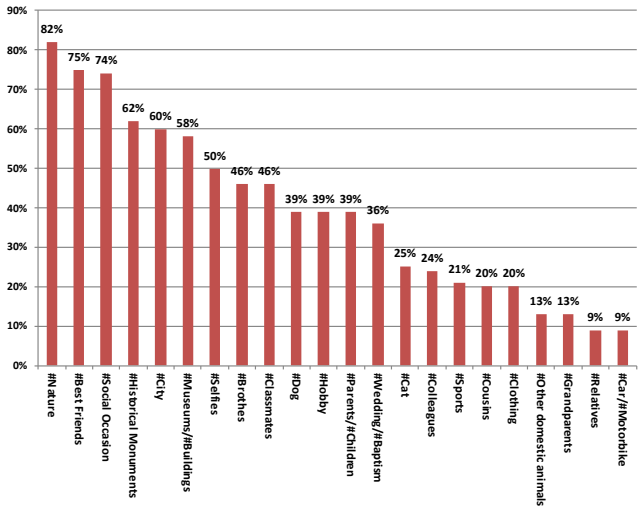

Figure 1. MyOntoPhotos Topic tags

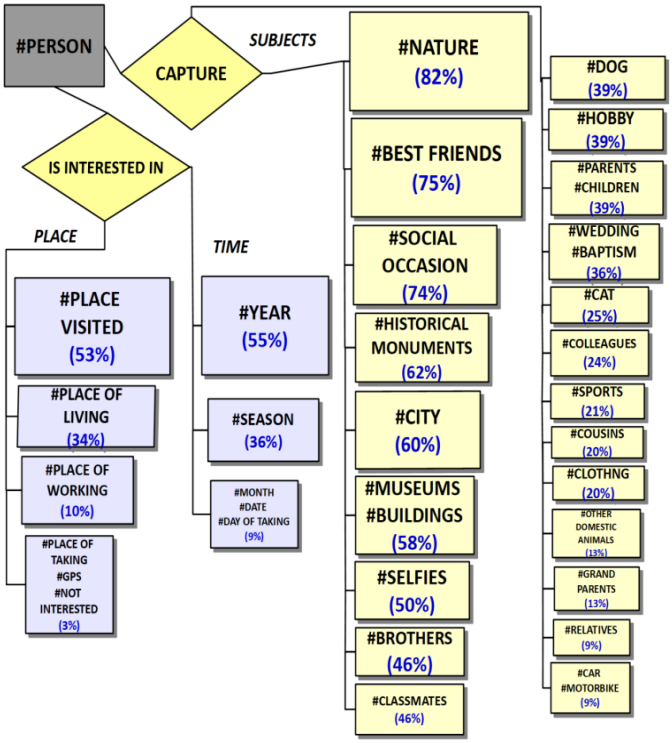

Figure 2. Overall representation of Ontology – Most popular topic tags

V. CONCLUSIONS

This paper highlighted the importance of using ontology to organize knowledge and specifically the subject of personal photographic collections. As has been already mentioned, the organization of personal photos is a laborious and a boring process that is avoided, resulting in never founding a large part of the photos being as they are lost in the large volume of the collection. In this paper, it is proposed to organize personal photos through an application with the use of the *MyOntoPhotos* Personal Photo Ontology, which mainly includes topic areas of interest and photographed, place and time tags ranked by using the popularity information based on the survey

results. Then, the ranking order will be personalized, based on the user's personal interests. An initialization phase with a game of presented photos and the user selecting the ones that finds interesting enough would be a good primary phase in order to enhance the application training phase and provide the user the best ranking tags as soon as possible.

Differences in preferences varied between gender, age and grade of education exist but are not significant enough. Most of the persons chose to use up to five thematic #tags: *#Nature, #Best Friends, #Social Occasion, #Historical Monuments, #City*. In essence, the proposed application based on the ontology created after the thorough literature review and the responses of the questionnaire will "learn" users' photographic interests and remove the choices of less interest, emphasizing on the most commonly used #tags that they will assign in their photos. It will also be possible to organize personal photos at users' most convenient time. Ultimately, each user profile will be modeled on the #tags topics chosen, so photos will be organized and retrieved in an easy and quick way.

REFERENCES

[1] **Viana, W., Bringel Filho, J., Gensel, J., Oliver, M. V., & Martin, H. (2007).** PhotoMap–Automatic Spatiotemporal Annotation for Mobile Photos. In: *International Symposium on Web and Wireless Geographical Information Systems* (pp. 187-201). Springer Berlin Heidelberg.

[2] **Viana, W., Miron, A. D., Moisuc, B., Gensel, J., Villanova-Oliver, M., & Martin, H. (2011).** Towards the semantic and context-aware management of mobile multimedia. *Multimedia Tools and Applications, 53*(2), 391-429.

[3] **Van House, N. A. (2009).** Collocated photo sharing, story-telling, and the performance of self. *International Journal of Human-Computer Studies, 67*(12), 1073-1086.

[4] **Latif, K., Mustofa, K., & Tjoa, A. M. (2006).** An approach for a personal information management system for photos of a lifetime by exploiting semantics. In: *International Conference on Database and Expert Systems Applications* (pp. 467-477). Springer Berlin Heidelberg.

[5] **Datia, N., Pires, J. M., & Correia, N. (2016).** Time and space for segmenting personal photo sets. *Multimedia Tools and Applications,* 1-33.

[6] **Frohlich, D., & Fennell, J. (2007).** Sound, paper and memorabilia: resources for a simpler digital photography. *Personal and Ubiquitous Computing, 11*(2), 107-116.

[7] **Monaghan, F., & O'Sullivan, D. (2006).** Automating photo annotation using services and ontologies. In: *7th International Conference on Mobile Data Management (MDM'06)* (pp. 79-79). IEEE.

[8] **Do, T. M. T., Blom, J., & Gatica-Perez, D. (2011).** Smartphone usage in the wild: a large-scale analysis of applications and context. In: *Proceedings of the 13th international conference on multimodal interfaces* (pp. 353-360). ACM.

[9] **Gruber, T. R. (1993).** A translation approach to portable ontology specifications. *Knowledge acquisition, 5*(2), 199-220.

[10] **Paralic, J., &Kostial, I. (2003).** Ontology-based information retrieval. *Information and Intelligent Systems, Croatia*, 23-28.

[11] **Kotis, K., Vouros, G. A., & Stergiou, K. (2006).** Towards automatic merging of domain ontologies: The HCONE-merge approach. Web semantics: *Science, services and agents on the world wide web, 4*(1), 60-79.

[12] **Horrocks, I. (2008).** Ontologies and the semantic web. *Communications of the ACM, 51*(12), 58-67.

[13] **Lanzenberger, M., Sampson, J. J., Rester, M., Naudet, Y., & Latour, T. (2008).** Visual ontology alignment for knowledge sharing and reuse. *Journal of Knowledge Management, 12*(6), 102-120.

[14] **Jörgensen, C. (2003).** Image Retrieval: Theory and Research, Scarecrow Press, Lanham, MD.

[15] **Enser, P. G., Sandom, C. J., Hare, J. S., & Lewis, P. H. (2007).** Facing the reality of semantic image retrieval. *Journal of Documentation, 63*(4), 465-481.

[16] **Radley, A. (2010).** What people do with pictures. *Visual Studies, 25*(3), 268-279.

[17] **Hare, J. S., Lewis, P. H., Enser, P. G., & Sandom, C. J. (2006).** Mind the gap: another look at the problem of the semantic gap in image retrieval. In: *Multimedia Content Analysis, Management, and Retrieval 2006* (Vol. 6073, p. 607309). International Society for Optics and Photonics.

[18] **Liu, Y., Xu, D., Tsang, I. W., & Luo, J. (2011).**Textual query of personal photos facilitated by large-scale web data. *IEEE transactions on pattern analysis and machine intelligence, 33*(5), 1022-1036.

[19] **Tao, D., Tang, X., Li, X., & Wu, X. (2006).** Asymmetric bagging and random subspace for support vector machines-based relevance feedback in image retrieval. *IEEE transactions on pattern analysis and machine intelligence, 28*(7), 1088-1099.

[20] **Ames, M., & Naaman, M. (2007).** Why we tag: motivations for annotation in mobile and online media. In: *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 971-980). ACM.

[21] **Marlow, C., Naaman, M., Boyd, D., & Davis, M. (2006).** HT06, tagging paper, taxonomy, Flickr, academic article, to read. In: *Proceedings of the 17th conference on Hypertext and hypermedia* (pp. 31-40). ACM.

[22] **Highfield, T., & Leaver, T. (2015).** A methodology for mapping Instagram hashtags. First Monday, 20(1), 1-11.

[23] **Ferré, S. (2007).** Camelis: Organizing and browsing a personal photo collection with a logical information system. In: *International Conference on Concept Lattices and Their Applications* (Vol. 331, pp. 112-123).

[24] **De Figueirêdo, H. F., Lacerda, Y. A., de Paiva, A. C., Casanova, M. A., & de Souza Baptista, C. (2012).** PhotoGeo: a photo digital library with spatial-temporal support and self-annotation. *Multimedia Tools and Applications, 59*(1), 279-305.

[25] **Graham, A., Garcia-Molina, H., Paepcke, A., & Winograd, T. (2002).** Time as essence for photo browsing through personal digital libraries. In: *Proceedings of the 2nd ACM/IEEE-CS joint conference on Digital libraries* (pp. 326-335). ACM.

[26] **Toyama, K., Logan, R., & Roseway, A. (2003).** Geographic location tags on digital images. In: Proceedings of the eleventh ACM international conference on Multimedia (pp. 156-166). ACM.

[27] **Bederson, B. B. (2001).** PhotoMesa: a zoomable image browser using quantum treemaps and bubblemaps. In: *Proceedings of the 14th annual ACM symposium on User interface software and technology* (pp. 71-80). ACM.

[28] **Li, J., Lim, J. H., & Tian, Q. (2003).** Automatic summarization for personal digital photos. In*: Proceedings of the 2003 Joint Conference of the Fourth International Conference on Information, Communications and Signal Processing, 2003 and Fourth Pacific Rim Conference on Multimedia*. (Vol. 3, pp. 1536-1540). IEEE.

[29] **Kindberg, T., Spasojevic, M., Fleck, R., & Sellen, A. (2005).** The ubiquitous camera: *An in-depth study of camera phone use. IEEE Pervasive Computing, 4*(2), 42-50.

[30] **Van House, N. A., Davis, M., Takhteyev, Y., Ames, M., & Finn, M. (2004).** The social uses of personal photography: methods for projecting future imaging applications. *University of California, Berkeley, Working Papers, 3, 2005*.

[31] **Bruneau, P., Pigeau, A., Gelgon, M., & Picarougne, F. (2008).** Geo-temporal structuring of a personal image database with two-level variational-Bayes mixture estimation. In: *International Workshop on Adaptive Multimedia Retrieval* (pp. 127-139). Springer Berlin Heidelberg.

[32] **Cao, L., Luo, J., Kautz, H., & Huang, T. S. (2008).** Annotating collections of photos using hierarchical event and scene models. In: *IEEE Conference on Computer Vision and Pattern Recognition, CVPR 2008*. (pp. 1-8). IEEE.

[33] **Cooper, M. L. (2011).** Clustering geo-tagged photo collections using dynamic programming. In: *Proceedings of the 19th ACM international conference on Multimedia* (pp. 1025-1028). ACM.

[34] **Naaman, M., Paepcke, A., & Garcia-Molina, H. (2003)**. From where to what: Metadata sharing for digital photographs with geographic coordinates. In: *OTM Confederated International Conferences" On the Move to Meaningful Internet Systems"* (pp. 196-217). Springer Berlin Heidelberg.

[35] **Naaman, M., Harada, S., Wang, Q., Garcia-Molina, H., & Paepcke, A. (2004)**. Context data in geo-referenced digital photo collections. In: *Proceedings of the 12th annual ACM international conference on Multimedia* (pp. 196-203). ACM.

[36] **Ryu, D. S., Chung, W. K., & Cho, H. G. (2012).** A hierarchical photo visualization system emphasizing temporal and color-based coherences. *Multimedia Tools and Applications, 61*(3), 523-550.

[37] **Van House, N., Davis, M., Takhteyev, Y., Good, N., Wilhelm, A., & Finn, M. (2004).** From "what?" to "why?": the social uses of personal photos. In: *Proceedings of CSCW 2004*

[38] **Cao, L., Luo, J., Kautz, H., & Huang, T. S. (2009).**Image annotation within the context of personal photo collections using hierarchical event and scene models. IEEE Transactions on Multimedia, 11(2), 208-219.

[39] **Rodden, K., & Wood, K. R. (2003).** How do people manage their digital photographs? In: *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 409-416). ACM.

[40] **Boutell, M., & Luo, J. (2005).** Beyond pixels: Exploiting camera metadata for photo classification. *Pattern recognition, 38*(6), 935-946.

[41] **Ransom, N., & Rafferty, P. (2011).** Facets of user-assigned tags and their effectiveness in image retrieval. Journal of Documentation, 67(6), 1038-1066.

[42] **Creswell, J. W. (2011).** Controversies in mixed methods research. *The Sage handbook of qualitative research*, *4*, 269-284.

[43] **Schreiber, A. T., Dubbeldam, B., Wielemaker, J., & Wielinga, B. (2001).** Ontology-based photo annotation. *IEEE Intelligent systems, 16*(3), 66-74.

[44] **Cristani, M., & Cuel, R. (2005).** A survey on ontology creation methodologies. International *Journal on Semantic Web and Information Systems (IJSWIS), 1*(2), 49-69.

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APPENDIX

Questionnaire

Q1. Sex
- Man
- Woman

Q2. Age
- 18-24
- 25-35
- Over 35

Q3. Education
- High School
- University
- Postgraduate
- Doctorate

Q4. Rate your familiarity with the Internet and Smart Phones.
- Very good
- Good
- Moderate
- Not at all good

Q5. How much do you like to take pictures?
- Very much
- Very
- Moderate
- Not at all

Q6. How many pictures, on average, do you capture per week?
- 1-10
- 11-5
- 26-50
- Over 50

Q7. Select your photo storage medium as well as the frequency.

	Very often	Often	Rarely	Not at all
a. Personal Download / Camera				
b. Personal Download /Mobile phone				
c. Acquisition via the Internet by third parties (Social Media - Cloud)				

Q8. Where do you save the photos?
(You can select more than one answer)
- On a mobile folder
- In a folder on the computer
- In the cloud (Google Drive, One Drive, Dropbox, Flickr)
- Other:

Q9. How much time do you spend approximately in a week to organize your photos?
- Not at all
- Up to 1 hour
- 2-3 hours
- More than 3 hours

Q10. How easy do you find the photos you are looking for?
- Very much
- Very
- Moderate
- Not at all

Q11. Indicate how much time you spend approximately per week to search for old photos.
- Not at all
- 1-15 minutes
- 16 minutes - 1 hour
- Over 1 hour

Q12. Do you consider an application useful to help you organize your photos easily?
- Very much
- Very
- Moderate
- Not at all

Q13. If the application allows you to manage your photos later than the download time, when would you like to be reminded?
- In a couple of hours
- During the day
- The next day
- I choose
- Other:

Q14. Choose how often you take pictures of one or more of the subjects / topics below. You can select more than one option.

a) FAMILY ENVIRONMENT

#Family Environment

	Very often	Often	Rarely	Not at all
#Parents / #Children				
#Brothers				
#Cousins				
#Grandparents				
#Other Relatives				

b) FRIENDS & SELFIES

#Friends,#Selfies

	Very often	Often	Rarely	Not at all
#Best friends				
#Classmates				
#Colleagues				
#Selfies				

c) OCCASION & LEISURE TIME

#Occasion,#Leisure time

	Very often	Often	Rarely	Not at all
#Wedding, baptism				
#Sports				
#Hobby (dance, cooking, etc.)				
#Social occasion (celebration, birthday, event)				

d) LOCATION

#Location

	Very often	Often	Rarely	Not at all
#City				
#Nature				
#Historical monuments				
#Museums / #Buildings				

e) ANIMALS & PERSONAL OBJECTS

#Animals, #Personal objects

	Very often	Often	Rarely	Not at all
#Dog				
#Cat				
# Other domestic animals				
# Car - #Motorbike				
# Clothing				

Q15. List possible subjects / objects that you are interested in and are not referred to the above questions

#Objects

Q16. Choose how you would prefer to organize your photo collection by topic

(You can select more than one answer)

- #Family Environment
- #Friends
- #Selfies (myself)
- #Occasion
- #Leisure time
- #Place
- #Domestic animals
- #Personal Objects
- #Various Objects
- Other:

Q17. Choose how you would prefer to organize your photo collection by time.

(You can select more than one answer)

- By season
- By year
- Other:

Q18. Choose how you'd prefer to organize your photo gallery by location.

(You can select more than one answer)

- Place where I live
- Place where I work
- Place I visited
- Other:

Q19. How many labels would you like to manage your photos?

(* Labels will correspond to questions asked by the application to organize photos in categories, depending on each person's interests, for example #parents, #selfies).

- With 1-5
- With 6-10
- With 11-20
- Other:

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