Spring 3-1-2021

A Case of Pre-implementation of the Integrated Repository for University Administration by Academic Librarians

Marek Deja
Jagiellonian University, Poland, marek.deja@uj.edu.pl

Leszek Szafrański
Jagiellonian University, Poland, l.szafranski@uj.edu.pl

A Case of Pre-implementation of the Integrated Repository for University Administration by Academic Librarians

Abstract

The purpose of this paper is to observe how employees of academic library administration are developing and how they comply with the internal quality assurance policy (IQA) regarding pre-implementation of the integrated repository (IR). We are interested in information practices of administration staff in the scope of cooperation and open communication with the management staff and external entities. We have studied the role of the current information practices in the successful implementation of IR at the university by academic librarians. We used the method of participant observation and unstructured interviews supported by BPMN modelling (Business Process Model and Notation) and desk research analysis. Our analysis was conducted according to the processes of collective mindfulness and the strategy of anticipating the unexpected proposed by Aanestad and Jensen (2016) but with the emphasis on a tender procedure for purchase order in the pre-implementation of IR by the library at [INSTITUTION] University. We have noticed that before the actual integration of existing information systems into one coherent IR begins, the employees want to make the most of their knowledge and experience to make the implementation process successful. They try to interfere in the purchase order procedure as much as possible to start a technical dialogue with the companies that would be implementing the system at the university.

Introduction

The paper presents the concept of information practices in library administration, which are the subject of the authors' more extensive research on the implementation of a university's integrated repository considerate as integrated information management system supporting accountability. During this research, a specific system of information flow was observed, subject to compliance with order procedures. A university's information system depends on the constantly changing laws and ordinances that are in force in a given country and that shape the activities of public universities. Oliver noted the strong dependence of a university's internal information system on its external environment while examining the cases of such institutions in Hong Kong, Australia and Germany (Oliver, 2008). In Poland, such provisions are first of all set out by the Act of 20 July 2018 - Law on Higher Education and Science, which sets out the rules for the functioning of the higher education system and science (Act of 20 July 2018, 2018, Article 1), the Act of 27 August 2009 on Public Finance (Journal of Laws of 2017, item 2077, as amended), the Act of 30 April 2010 on the Principles of Financing Science (Journal of Laws of 2018, item 87) and the Act of 29 January 2004 - Public Procurement Law, as amended (Journal of Laws of 2019, item 1843).

These laws determine e.g. creating internal regulations at individual universities, which in this paper are treated as elements of internal quality assurance policy (IQA). Cheng (2018), described the information management system at a university as a group of processes with dual information orientation   (Cheng, 2018). A library's information orientation is to ensure high transparency of operations, in accordance with its public legal status, and also to support the development of scientific and didactic processes. The primary goal of our paper is to present how a academic librarians can effectively combine these two orientations while implementing an integrated repository that serves the reporting purpose at university.

The research problem described in the paper involves information practices at the academic library, The aim was to expand the institutional repository managed by librarians towards an integrator connected by

APIs with university administration systems, systems for managing the publishing processes of journals and conference materials, and a module for analytics and records management regarding scientific achievements of staff. A university's information system is primarily a way to meet the users' changing needs, not merely a tool adapted to the requirements of external accountability. The description of information practices in the implementation of IR was developed based on a study of good practices observed at the selected university in Poland. We have gained access to the IQA policy of one of Poland's leading universities - the [INSTITUTION] University. This university is characterized by centuries-old tradition, advanced development of organizational structures and one of the highest levels of computerization in information processes among the country's universities. These factors affect the diversification of the information needs among students, academics, administrative staff and librarians. The IR implementation is oriented towards satisfying the information needs of these three groups of system users and the requirements of institutions financing public science in Poland. To address the problem, we observed the purchase order procedure for the installation and integration of IT systems, analysed the structuring of the IQA policy that was created by administration staff to support the implementation process by using BPMN tools.

Higher education in Poland is gradually responding to rapid changes in reporting systems, which have been implemented by the Ministry of Science and Higher Education since 2015, in cooperation with the Information Processing Centre. These institutions require more and more information from universities that are constantly expanding metadata structures in IT systems and striving to implement procedures for monitoring the flow of information, both printed and electronic. Such an increase in information resources is also accompanied by a growing desire to use them in decision-making processes. More and more often, managing staff at universities want to know what their institution "knows" about their activities, since they want to be at least partly ready for further unannounced changes in the environment (Deja, 2019). However, the fact that external requirements are very unpredictable primarily affects the desire to improve

the data collection process, and only then do people begin to think about using information resources. Therefore, information processes organized by librarians in higher education are activities that involve organizing and controlling information resources that describe a university's scientific activities.

Information management in higher education is a process that involves controlling the collection of information in such a way that the university administration can easily access information regarding its activities and provide it to relevant entities in critical situations, in the face of deadlines for data transfer designated by stakeholders, i.e. at every request (Cheng, 2018). Therefore, this institution must not only have an IT system that would allow preserving such information, but also a knowledge resource that provides a way of preserving the memory of the purpose and methods of implementing information processes. This is one of the primary elements of an institution's internal orientation, as well as a method supporting the IR implementation itself. The IQA policy fulfils this function. Satisfying external requirements is an absolute priority for universities, but effective information management requires creating organizational knowledge resources, i.e. procedures and instructions that will link the benefits of system implementation, i.e. increase the ease and quality of service beneficiaries, with the organization's learning process. Such a body of knowledge cannot be created without the initiatives of academic librarians and their knowledge on digital repositories and standards for developing scientific resources.

Universities must be learning institutions because this is what their public transparency requires. This makes it difficult to prepare the university for implementing the information management systems. An integrated IT system is one in which data or information is entered only once and is available to users in various processes in an institution (Owoc & Marciniak, 2013). However, academia is an area with various information orientations, as well as a multi-disciplinary and multi-module environment. Fragmentation of needs and information practices is therefore problematic with an integrated repository as the primary factor in organizational effectiveness. Its effective implementation depends on taking the user's behaviour

4

into account, as it reflects their experience; on creating a knowledge resource regarding information processes, i.e. procedures, instructions and classification of documents; as well as on the integrity of metadata structures with external systems (Deja & Próchnicka, 2018).

System implementation in university administration context

Research on the implementation and integration of IR in higher education as a way to manage information effectively most often involves observations of various implementations of ERP systems (Abugabah & Sanzogni, 2010). In such research cases, the problems of information re-use and motivation to increase efficiency are often emphasized (Fisher & Naumer, 2006), as are problems of data structure integration Oliver & Romm, 2002), and problems of effective implementation of a culture-dependent organization (Allen & Kern, 2001). References describe the process of implementing an ERP system and the factors that influence the success of such implementation (Oliver & Romm, 2002). The outcomes and benefits resulting from implementing an ERP system are also widely described (Mandal & Gunasekaran, 2002, 2003). However, there is a shortage of research that would describe IT practices in the process of system pre-implementation. Information practice in university administration related to internal communication takes place in many university systems, i.e. scientific repositories (Cullen & Chawner, 2010), student service systems (Al-Hawari, Alufeishat, Alshawabkeh, Barham & Habahbeh, 2017) and cloud computing (Ramachandran, Sivaprakasam, Thangamani & Anand, 2014). In this paper, we describe the process of initiating the integration process, whose essence involves information practices regarding an institutional repository managed by librarians in the existing fragmented information system, and we treat the issues of IR architecture as implications for further analysis of empowering library roles in the university administration.

Research on university IT systems can be broken down into four primary categories. The first category is research devoted entirely to the problems of records management, where technological and procedural

solutions related to the organization of a university's information resource are crucial (Cheng, 2018). The second one includes research on information behaviour of information system users, which most often include groups of academics or students (Deja & Rak, 2018), and sometimes also administrative staff (Deja, 2019). The third category of research involves analyses related to IT support for academic didactics (Gilmanshina *et al*., 2016; Rego *et al.*, 2009). The fourth type of research is devoted to the broadly understood issues of knowledge management. The fourth type is devoted to either generating new knowledge, i.e. problems of IT support for scientific and administrative processes, or to organizational learning, i.e. developing competences, improving university employees' skills and supporting decision-making processes (Owoc & Marciniak, 2013),, depending on the subject of the analysis, i.e. explicit or implicit knowledge.

The fourth category of research usually involves combining the subject of research from the first and second categories (Rowley & Hartley, 2017),, particularly when the study area includes library resources and the subject of analysis is mostly information searching (Savolainen, 2016). This is a humanistic approach to creating information systems in higher education, where the users' needs are a priority, and information systems or information governance (IT, documentation policies and lasting relationships) are to meet these needs effectively.

In our study, the subject of observation primarily involves issues specific to the first and fourth categories, i.e. systemic forms that information management takes in academic library and the development of explicit knowledge in this area for university administration. Our research falls within the area of collective mindfulness theory, which in our opinion can be considered not only as an effective way to deal with post-implementation of information system (Aanestad & Jensen, 2016), but also to systematically observe the successful pre-implementation activities.

The implementation of the new system is for each institution a unique situation in which employees have to deal with the unexpected, with a "novel elements and that taking anything for granted in a routine-like way is a risky endeavour" (Aanestad & Jensen, 2016, p. 20) . In the observed organization, we noticed that administrative employees and librarians tend to make sense of complex tasks by simplifying their roles in tenure procedure. Therefore, we focused on the reluctance to simplify as an important strategy of anticipating unexpected events to ensure that problems with IR implementation within the organization are evaluated from different perspectives (Swanson & Ramiller, 2004, pp. 555–560) . We used the process model of collective mindfulness of Margunn Aanestad and Tina Jensen (2016) to systematize our observations and analyse order procedure which goal is to prepare all involved staff for the implementation of the new IR.

Implementation framework and IQA policy

In the paper, we focused on describing information practices related to the initial stage of IR implementation, i.e. analysis of information practices related to the preparation and conduct of an order for the implementation service. The key role is played here by the IQA internal policy described above as the main resource of institutional knowledge in university administration. In this case, the basis for IQA includes two ordinances determining good information practices related to the flow of documentation and the implementation of orders at a university.

The principles of circulation of administrative documentation between individual university units are governed by the Instructions on the Circulation of Financial and Accounting Documents of the [INSTITUTION] University operating based on Regulation No. 61 of the Rector of the [INSTITUTION] University dated August 9, 2018. The Instruction enforces basic activities of university employees related to the performance of tasks determining the correct actions, which result in solving the problem or "settling the matter". In turn, the procedures for the implementation of orders in library, in addition to the

abovementioned acts, are determined by Ordinance No. 57 of the Rector of the [INSTITUTION] University dated May 5, 2017 regarding the implementation of the Act of January 29, 2004 - Public Procurement Law. The ordinance describes the tasks of university administration and general guidelines for running orders.

Scope and methodology of research

The following questions were asked during the study:

- How the IR implementation goes and what is the effectiveness of this process?

- What role do existing IT practices play in the successful implementation of IR?

The research used the case study method, which allowed us to analyse in detail the existing information practices of librarians who were involved in the preparation of the institutional and nationally regulated order for the examined university. We used the notation of Business Process Model and Notation (BPMN) in two variants 1) diagnosis of information practices 2) development of the procedure practices occurs in. Identifying the procedures at the university in question involved the use of existing documents technique. Collection of data on employees' information practices involved the use of free unstructured interviewing and participant observation, which aimed at clarifying the specific activities related to the order procedure. The research was conducted from August 2018 to January 2019. The interviews involved: university administration employees, whose duties include verification and approval of documents related to ongoing orders, management staff responsible for preparing the order documentation and management team responsible for legal aspects related to the implementation of orders. To clarify the course of procedures, twenty five interviews were conducted, lasting from 30 minutes to 1.5 hours.

Participant observation lasted throughout the entire period of research (from August 2018 to January 2019) and was carried out in individual departments responsible for order implementation (PPD, Office of

the Vice-Rector for Research and Structural Funds, [INSTITUTION] Library). Based on interviews and observations, Figures 1, 2 and 3 were prepared, in which the observed information practice was illustrated.

The questions asked in the interviews were freely chosen to determine how the department responsible for the tenure procedure, implements this procedure, from where they obtain information, and between which departments they monitor the process of sharing information. The manner of asking questions depended on the course of the interview and the information obtained from participants. However, our analysis was strictly subordinated to the three key issues of the "reluctance to simplify" strategy in anticipating unexpected events and organisational problems (Aanestad & Jensen, 2016, p. 20) at the stage of pre-implementation of the IR system during the order procedure. These three key issues are:

1. Taking nothing for granted – we want to check how the voice of lower-level staff in administration and librarians can be useful to management staff and decision making due to understanding gaps in current IT systems but also gaps in employees knowledge regarding new information needs in university administration. This was a subject to our first BPMN analysis (Figure 1).

2. Seeking disconfirmation before confirmation – knowing what are the gaps in the current procedure and knowledge of the employees, in our second BPMN analysis (Figure 2) we want to observe how order procedure broadens the awareness of knowledge gaps regarding the possibilities of implementing new IR solutions, by setting known and unknown deficiencies in IT systems that are to be fixed in the context of the new needs of the organization's environment.

3. Seeking complexity rather than simplifying understandings – third BPMN analysis (Figure 3) was used to check alternative collaboration paths of library staff and potential contractors of the planned system implementation project, to check the institution's ability to make complex decisions about the selection of a project contractor.

Information practices of university administration staff

The order procedure below (Figure 1-3) illustrates a model of information practice in which employees carry out orders related to the selection of a contractor for computer software for managing an institutional repository. The implementation of this type of task is subject to the provisions listed in the introduction. The order procedure (for this paper, the entirety of activities related to the conduct of a order will be so-called) includes three [INSTITUTION] University units (the unit preparing the bid - the [INSTITUTION] Library in this case; the project management unit at the university - the Vice-Rector for Research Office and structural funds; and the team of lawyers overseeing the order in legal terms.

The competition procedure starts at the [INSTITUTION] Library (Figure 1) after signing a contract with an institution supporting the project on behalf of the government (in this case, the Digital Poland Project Centre). This unit initiates the process of integrating changes, as it manages the primary information resource about the university's research performance, i.e. the scientific repository. The next step involves analysing the competences of individual team members selected to perform the tasks in the project. The project manager then assigns tasks to team members and a public procurement specification is prepared to select a contractor; in the case described, this involves an IT service consisting in the creation, development and implementation of software for managing publication resources of the [INSTITUTION] University employees. During team meetings, the project manager decides on the next stages of the procedure based on their own experience and a discussion with the team members. In the described case, a decision was made during the preparation of the public competition specification, to enter a technical dialogue aimed at identifying: the IT services market, interest in the project on the part of potential contractors, and consulting related to the correct description of the subject of the contract.

The Public Procurement Law does not set out the detailed rules for conducting technical dialogue. The only requirement stipulated in the Act is that a dialogue is conducted following the principles of fair

competition and equal treatment of contractors (Article 31a item 2 of the public procurement laws – PPL).

This is a great opportunity to look for disconfirmation from an external entity.

Figure 1. Preparation of the IR specification and technical dialogue before the start of the order
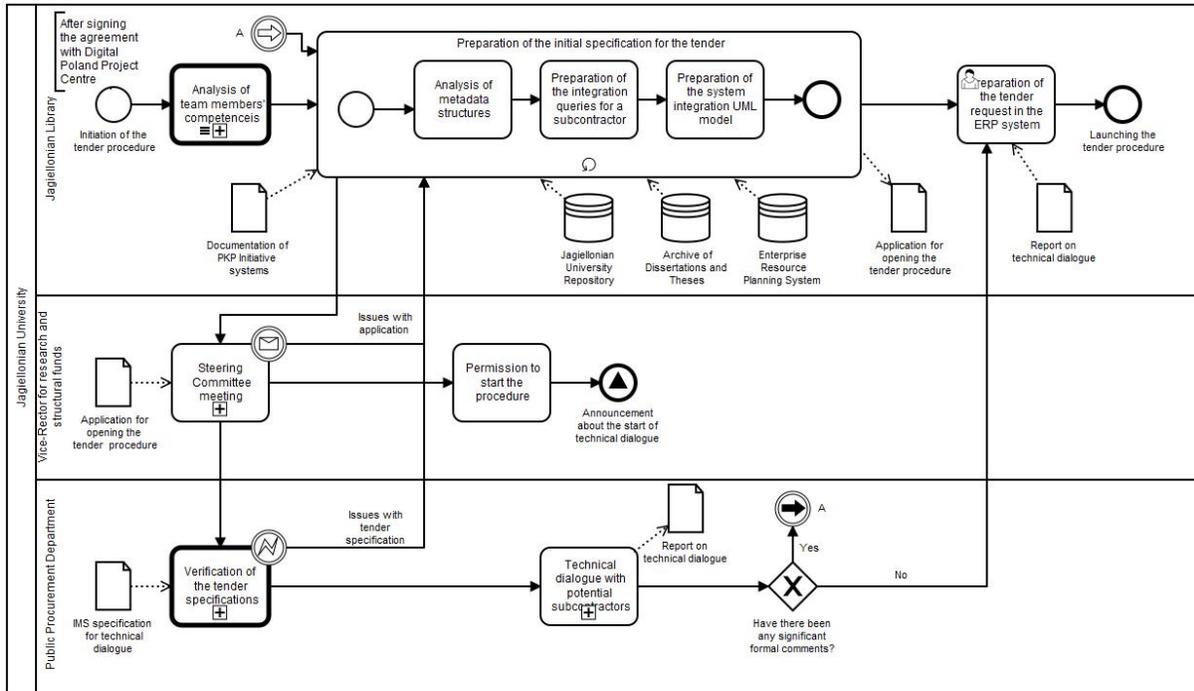
The invitation to the technical dialogue (Figure 2) with the initial order specification after consulting with

lawyers, is published at the PPD website of the [INSTITUTION] University and interested companies

have 14 days to register their participation. The results of the dialogue are published on the PPD UJ

website. Once the technical dialogue is complete, based on the information collected in the

[INSTITUTION] Library, the order specification is fine-tuned and after consulting with the PPD of the

[INSTITUTION] University and the Office of the Vice-Rector for Scientific Research and Structural

Funds, the order documents are published at the website of the [INSTITUTION] University PPD (Figure

3). Potential contractors have 40 days to submit comments or their participation in the order. Bids are sent

to PPD UJ by e-mail. When at least one bid is accepted. It is analysed formally at the PPD UJ level and

substantially at the project team and project manager level. If the bid meets the requirements contained in

the Specification of Essential Terms of the Order, the project manager together with the commission appointed for this purpose shall decide on its acceptance. The next stage involves accepting the offer selection formally by the PPD UJ. The order procedure ends upon signing a contract with the selected contractor.

Figure 2. Technical dialogue with the community
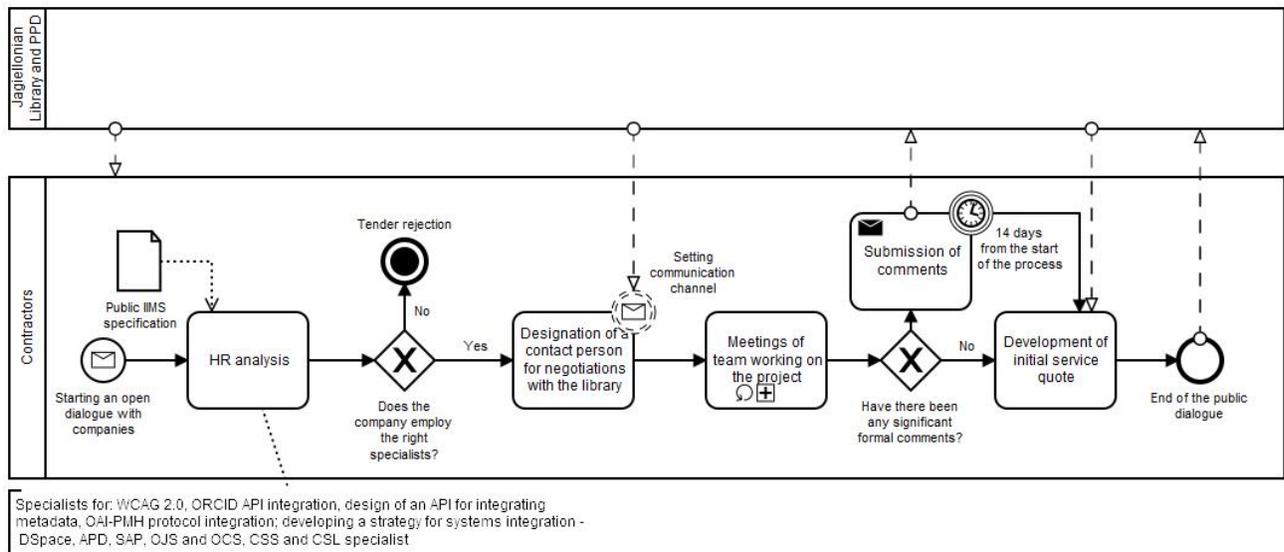
If the bid does not meet the previously assumed conditions, it is rejected and the order procedure starts from the beginning. In the absence of bids, or in case of comments received from potential contractors, the project manager may decide to modify the order specifications.

Documents prepared during the competition procedure, minutes of project team meetings and minutes of the Steering Committee meetings are collected on a network drive, which is available to project managers. This allows quick access to information and decision-making.

Figure 3. Launching the order procedure
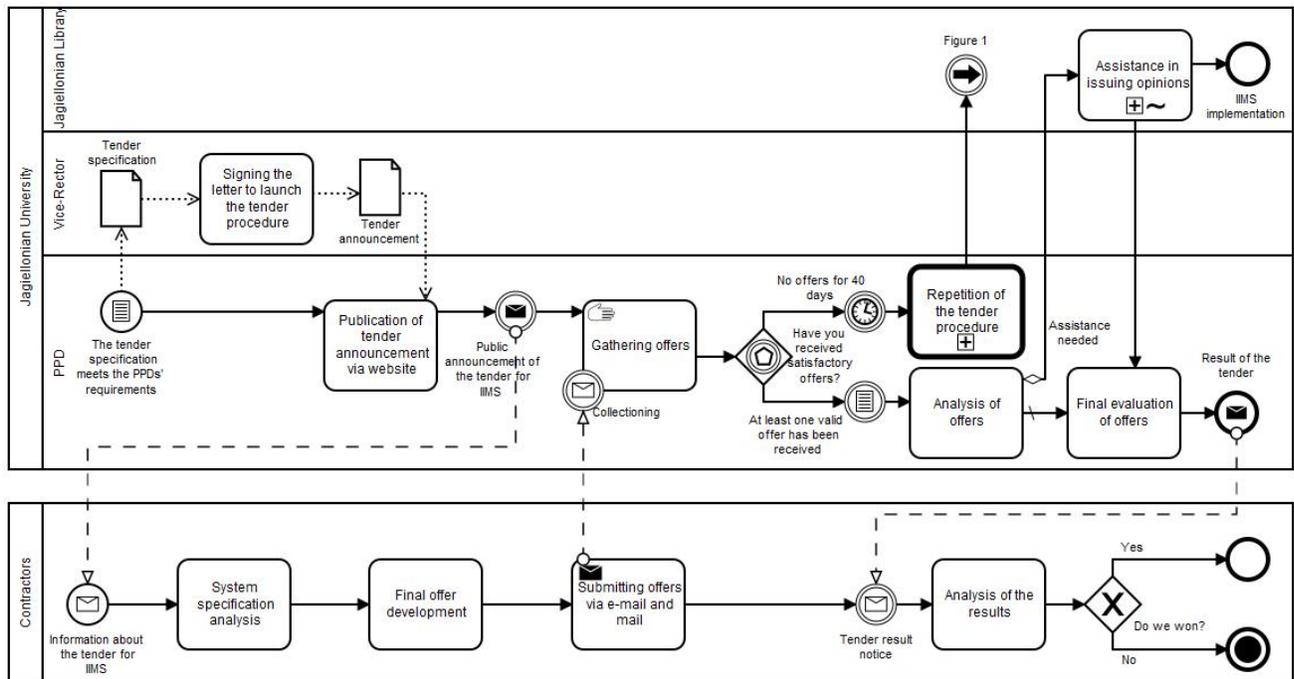
The proper course of the competition procedure is supervised by the project manager, a team of lawyers from the Public Procurement Department of the [INSTITUTION] University and the Steering Committee supported by the Advisory Board, whose members include representatives of university authorities. The Steering Committee is primarily appointed in case of projects that are implemented by several units and the project's expected results cover the entire university.

Potential contractors may enter into the technical dialogue, but they do not need to do so and may apply for the appropriate order bypassing the dialogue procedure. If they do enter into the dialogue, they will present a preliminary project of the service. In the case discussed, the employees participating in the project had three meetings with the company that volunteered for the dialogue. The next stage involves the preparation of bids by potential contractors and entering the order.

During interviews with library staff and administration employees responsible for the order documentation and legal aspects, it was established that they strictly comply with the regulations that apply at the university. They obtain information from official documents and analyse the acquired information in terms of applicable regulations. Therefore, the circulation of documentation and decisions taken illustrated in figures 1-3 are subordinated to the current provisions. Employees who are responsible for the preparation of order documentation and project implementation during interviews pointed to the high spontaneity of their activities. They mainly influence attempts to subordinate legal procedures to prepare orders.

On the other hand, the flow of information and direct contact between employees of units involved in the order, as it results from interviews, is free and a lot of consultations and meetings are conducted before making decisions. The dialogue with the external company, as the employees said, allowed them to obtain information that they would not be able to obtain in any other way. This allowed them to prepare a professional order for an IT service. Legal regulations are the biggest problem. Adaptation of actions to regulations extends the duration of all procedures.

Conclusion and implications

In this paper, we present the information practices of employees implementing the order procedure, which results in the selection of a contractor for the expansion of the system managing the institutional repository. In this case, the employees' information practice can be broken down into two groups: Solutions related to the implementation of procedures subject to regulations and spontaneous collaboration that allow employees to properly perform tasks whose manner of performance has not been specified in relevant provisions. This way, employees who know the context of the needs in an institution, as well as know the structure of IT systems, can cooperate with an external contractor more effectively for the implementation of IR.

As Julie Brooks emphasized (2019) "If, as the definitions emphasise, information governance is about a multidisciplinary approach to minimizing the risks while maximising the value of organisational information, then, arguably, the truly new and valuable characteristic of IG is its focus on meaningful collaboration in meeting information challenges". The IQA policy we have described, written into the BPMN collaboration model, fits in the broadly understood information governance as a set of processes of collective mindfulness which goal is to successfully and collaboratively fulfil new information needs and with possibly full anticipation of unexpected challenges. We believe that the described model of information practice is the first basic stage of effective IR implementation, as it establishes substantive foundations for cooperation of the library staff with an IT company implementing the system. The company must understand the needs of an institution opening the order for a service to understand the meaning of information of university' administration processes. The IQA policy that librarians co-create is part of the organization's learning process in which employees actively participate through changing the institution's information resources, which makes them meaningful for whole university administration. Looking at Dinneen and Brauner (2015) consideration of meaningfull information and data, in a case of IR implementaioan we should not only a look at it as as *thing*, but as a channel binding many actors in similar processes, which gives them a minigfull data. Therefore, they must understand this meaning already at the implementation stage and join current information practices during its implementation.

The information practices of librarians conducting the order is determined by compliance with the procedures set out in the public procurement laws and the good practices adopted in the institution. The university first uses government regulations as the basis for controlling the quality of the procedures and enforcing compliance with information needs. In this way, the university saves time to come up with its own procedures. The circulation of documents has a time frame specified in the Act, which must be controlled by library staff, e.g. announcing order results after 40 days (Figure 3).

The quality of the documentation and the course of the order are supervised by the PPD UJ and the project manager if necessary supported by the Steering Committee. Additional conditions and legal acts that are not specified in the Public Procurement Act are determined by the university's internal legal acts. In this case, however, many collaboration-based information practices are not determined by regulations, but by spontaneous actions of administrative employees and librarians involved in the order procedure, e.g. making a decision to conduct a technical dialogue, appointing employees to prepare the order specification (the regulations do not specify who is to prepare the documentation), or choosing places for storing intermediate order documentation (the final content of the documents is published on the official website of the [INSTITUTION] University and in the digital repository organised by [INSTITUTION] Library). Oliver (2008), as well as Daneshmandnia (2019), noted that the major problem of the effectiveness of implementing an information policy involves silo structures that restrict employee cooperation between units and institutions. The presented IQA policy does not confirm such a thesis explicitly. Mainly due to the very high degree of freedom of collaborative behaviour in which librarians in teams prepare own guidelines for the implementation of an IR system, and in the case of difficult decisions related to the order's outcome - consultations are commonplace. The bureaucratic structures of the university distance employees from the authorities and their decisions, and this is formally the case with the [INSTITUTION] Library. However, in the face of the external orientation of employee practice, motivated by PPL, employees had to establish lasting cooperation within the institution and demanded a group involved in an open dialogue with companies to minimize the risks associated with implementing IR. During the consultations, the information employees start preparing the competition specification changes. Based on interviews, employees can refine the description of the system order based on acquired knowledge about market capabilities to fulfil order guidelines. The advantage of such practice is its influence on decision support. The downside is an extended timeline that is needed for consultations and potential contractor meetings.

16

Daneshmandnia (2019) and earlier Brailer (2005) noted that the most common reason for the successful

implementation of information policy in an institution includes internal information practices based on

cooperation, even if this policy sets a rigid framework for acting as a bureaucratic silo. The very initiative

to integrate IT systems in IR is the first step to the university's development, where many employees

influence implementation-related decisions based on network cooperation and through their experience

with permanent data structures. Looking at the employees' information norms of practice described above,

it can be stated that the effectiveness of a order procedure that is to implement the IR system is of high

quality when in the organization librarians are more reluctant to simplify the solution, and by that,

university management should partially trust librarians and carefully listen to their feedback before

deciding to commission an IR implementation. However, since not all processes are defined by

procedures, information flow barriers may occur and then the basis for effective development of an

information system that is to eliminate such errors in the future by seeking disconfirmation of institution's

primary and internal visions in external entities and by setting direct communication channels for all

concerned. During the study of the described procedure, no gross critical situations were observed, which

results from the extensive experience of all parties involved in the preparation and course of the order

procedure.

References

Aanestad, M., & Jensen, T. B. (2016). Collective mindfulness in post-implementation IS adaptation processes. *Information and Organization*, *26*(1–2), 13–27.

Abugabah, A., & Sanzogni, L. (2010). Enterprise resource planning (ERP) system in higher education: A literature review and implications. *International Journal of Human and Social Sciences*, *5*(6), 395–399.

Al-Hawari, F., Alufeishat, A., Alshawabkeh, M., Barham, H., & Habahbeh, M. (2017). The software engineering of a three-tier web-based student information system (MyGJU). *Computer Applications in Engineering Education*, *25*(2), 242–263. https://doi.org/10.1002/cae.21794

Allen, D., & Kern, T. (2001). Enterprise resource planning implementation: Stories of power, politics, and resistance. In *Realigning research and practice in information systems development* (pp. 149–162).

Springer.

Brailer, D. J. (2005). Interoperability: The Key To The Future Health Care System: Interoperability will bind together a wide network of real-time, life-critical data that not only transform but become health care. *Health Affairs*, *24*(Suppl1), W5-19.

Brooks, J. (2019). Perspectives on the relationship between records management and information governance. *Records Management Journal*, *29*(1–2), 5–17. https://doi.org/10.1108/RMJ-09-2018-0032

Cheng, E. C. K. (2018). Managing records and archives in a Hong Kong school: a case study. *Records Management Journal*, *28*(2), 204–216. https://doi.org/10.1108/RMJ-02-2017-0004

Daneshmandnia, A. (2019). The influence of organizational culture on information governance effectiveness. *Records Management Journal*, *29*(1–2), 18–41. https://doi.org/10.1108/RMJ-09-2018-0033

Deja, M. (2019). Information and knowledge management in higher education institutions: the Polish case. *Online Information Review*, *43*(7), 1209–1227. https://doi.org/10.1108/OIR-03-2018-0085

Deja, M., & Próchnicka, M. (2018). Metadata as a normalising mechanism for information-transfer behaviour in higher education institutions: the information culture perspectiv. *Information Research: An International Electronic Journal*, *23*(4), paper isic1811.

Dinneen, J. D., & Brauner, C. (2015). Practical and philosophical considerations for defining information as well-formed, meaningful data in the information sciences. *Library Trends*, *63*(3), 378–400.

Gilmanshina, S. I., Gilmanshin, I. R., Sagitova, R. N., & Galeeva, A. I. (2016). The feature of scientific explanation in the teaching of chemistry in the environment of new information of school students' developmental education. *International Journal of Environmental and Science Education*, *11*(4). https://doi.org/10.12973/ijese.2016.322a

Information Governance Initiative (2018), "IGI State of the Industry Report. Volume III", available at: http://iginitiative.com/wp-content/uploads/The-State-of-IG-Report-Volume-III-highres.pdf (accessed 12 December 2019)

Mandal, P., & Gunasekaran, A. (2002). Application of SAP R/3 in on-line inventory control. *International Journal of Production Economics*, *75*(1–2), 47–55.

Mandal, P., & Gunasekaran, A. (2003). Issues in implementing ERP: A case study. *European Journal of Operational Research*, *146*(2), 274–283. https://doi.org/10.1016/S0377-2217(02)00549-0

Oliver, D., & Romm, C. (2002). Justifying enterprise resource planning adoption. *Journal of Information Technology*, *17*(4), 199–213.

Oliver, G. (2008). Information culture: exploration of differing values and attitudes to information in organisations. *Journal of Documentation*, *64*(3), 363–385. https://doi.org/http://dx.doi.org/10.1108/00220410810867588

Owoc, M., & Marciniak, K. (2013). Knowledge management as foundation of smart university. *2013 Federated Conference on Computer Science and Information Systems*, 1267–1272. IEEE.

Ramachandran, N., Thangamani, G., & Anand, G. (2014). Selecting a suitable Cloud Computing technology deployment model for an academic institute. *Campus-Wide Information Systems*, *31*(5), 319–345. https://doi.org/10.1108/CWIS-09-2014-0018

Rego, H., Moreira, T., Garcia, F., & Morales, E. (2009). Metadata and knowledge management driven web-based learning information system. *International Journal of Technology Enhanced Learning*, *1*(3), 215–228. https://doi.org/10.1504/IJTEL.2009.024868

Rowley, J., & Hartley, R. (2017). *Organizing knowledge: an introduction to managing access to information*. Routledge.

Savolainen, R. (2016). Approaches to socio-cultural barriers to information seeking. *Library & Information Science Research*, *38*(1), 52–59. https://doi.org/https://doi.org/10.1016/j.lisr.2016.01.007

Swanson, E. B., & Ramiller, N. C. (2004). Innovating mindfully with information technology. *MIS Quarterly*, 553–583.

Appendix A: Institutional sources

[REMOVED FOR DOUBLE-BLIND REVIEW]