

Business Process Support in the Context of Records Management

João Pires, André Vasconcelos and José Borbinha
INESC-ID, Instituto Superior Técnico, Avenida Rovisco Pais 1, Lisbon, Portugal

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Abstract: For an organization to achieve benefits from records management, it needs to include several practices such as the implementation of a records management system in alignment with the organization's reality and business processes. The focus of this work is on framing records management in business process management by identifying the role that records management plays in business. This research is applied in the replacement of a records management system workflow module. This research proposes the replacement of the workflow module by a flexible and open source solution, composed by an enterprise service bus and two workflow engines, accessed through a single API. The solution proves to be a flexible and scalable solution to the workflow module and that can even be used by more systems than records management systems. The implementation of records management in organizations is analysed, including the alignment between business processes, records management and workflows. This research shows that records management acts as an essential component to business that supports business processes and all the phases of their management, allowing for improvement regarding the storage, management and monitoring of records while also optimizing the execution of business activities.

1 INTRODUCTION

Records are “information created, received and maintained as evidence and as an asset by an organization or person, in pursuit of legal obligations or in the transaction of business” (ISO 2016). Records management is therefore how an organization stores, manages and monitors its records. Records management is usually required for legal compliance, but when properly aligned with the business, the best practices of records management also allow the adding of value for the organizations, by maximizing the value of the information. On other words, the management and preservation of records according to the requirements of the organization and its regulatory context can be a new capability to increase business efficiency and reduce costs of storage and search of information.

The correct application of records management to an organization comprises a set of practices to be applied, such as a previous analysis of the records management desired and most fit to the business, elaboration of classification tables and other more advanced practices like the implementation of system

that have processes regarding records management: the records management systems.

1.1 Problem

Although the application of records management to organizations can bring several benefits, an inefficient development of a records management system or implementation of records management can bring additional processes for the business, mainly regarding business process efficiency and optimization.

While the development and implementation of a records management system can be essential for the application of records management, it is not the only practice of records management needed and should have in mind the organization where it is going to be implemented and the other records management practices.

Therefore, the main problem proposed in this research is the framing of records management in business process management, which is expected to allow to identify the role of records management relating to this methodology applied to the business processes used in organizations. Having identified the

role that records management plays in business, because it is a part of the application of records management, the way to develop and implement a records management system with the interaction with business process in mind will allow for additional benefits for organizations, namely more efficiency in records management and business processes management.

1.2 Goals

As referred in the previous section, the main goal of this work is the framing of records management regarding business process management. For this framing to be possible, there must be an identification to the benefits that come from an optimal interaction between records management and business, mainly business processes.

This framing includes the development of a records management system, through the identification of requirements, system components and interaction with other systems. To allow the automatization of tasks regarding records management, in the development of a records management, this research will develop a workflow module inside of a specific system. This paper proposes a solution to the back end of the workflow module in a records management system.

After the development of a records management system, this paper discusses solutions to implement a records management system in an organization, including the identification of several issues that prevent optimal implementations and implementations that end up causing inefficiencies regarding the organization's business processes and desired records management. In this research the role records management plays regarding other business components, mainly business processes, is identified, allowing for the correct framing of records management regarding business process management.

1.3 Document Organization

After the introduction to the problem and to the concept of records management and the benefits that come to an organization from applying it properly, in Section 2, the topics of business process management, records management, workflow and integration of systems are detailed, including existing work done on these topics. In Section 3, there is an analysis of the problem at hand, regarding the development of a records management system, GfiDoc, with a big focus on the replacement of its workflow module,

which previous solution included several problems, In Section 4 the solution to address the problems identified in Section 3 is presented through the proposed architecture, functionalities, message behaviour and finally through the development made to the new back end to GfiDoc's workflow module, that was given the name of business layer. To identify benefits of the use of the proposed business layer, evaluate its functionality and consider if the problems presented were solved, in Section 5 there is the development of a prototype to which tests were made, and the analysis of the results regarding the business layer are mentioned. In Section 6, the implementation of a records management system is discussed, regarding issues and wrong implementations, to define an optimal solution that has in mind an organization's business processes, including the framing of records management regarding business process management. Finally, in Section 7, the main conclusions of the work are referred along with future work that is advised to be done.

2 RELATED WORK

2.1 Business Process Management

The Object Management Group (2017) defines Business process management (BPM) as "a method of efficiently aligning an organization with the wants and needs of clients". Dumas et al. (2013) defines a business process as "a chain related events, activities and decisions that lead to a raise of value to an organization or for its clients. One or more actors participate in these processes and they also possess resources and artefacts associated".

Dumas et al. (2013) refers to BPM as a continuous cycle of improvement, with the following phases:

- Process identification: development of an organization's process architecture;
- Process discovery: processes are documented as one or more models (As-is model);
- Process analysis: each process is evaluated regarding problem identification and impact and effort to solve each problem;
- Process redesign: changes are made to processes and result in a new process model (To-be model);
- Process implementation: processes are implemented, regarding changes in the organization's culture and technology to support new processes;
- Process monitoring and controlling: data gathering from the execution of processes is

used to identify new problems, giving birth to a new iteration of the cycle.

To model business processes, the most important notation used is the Business process modelling notation (BPMN), being an easy to use graphical modelling notation, which produces easy to understand processes (OMG 2013). Along with this notation, that are also other notations that complement the use of BPMN, such as Case management modelling notation (CMMN), which supports case management, Decision modelling notation (DMMN), which provides support regarding decision making and XPD, which “provides a standard mechanism for defining and executing business processes, allowing interoperability” (White, 2017).

2.2 Records Management

“Records management has the goal of providing efficient and systematic control over the production, reception, maintenance, utilization and destination of records, including the processes to constitute and maintain evidence and information about activities and transactions” (DGARQ, 2011). Records management, as referred by DGARQ (2011), includes the application of several practices regarding documentation, including simple ones such as ordering and development of classification tables and more advanced ones such as the implementation of a records management system. Standards such as MoReq2010, ISO 15489:2016 and ISO/PDTR 21965 are guidelines that support the development of records management in an organization, including the structure and processes a records management system should possess regarding the management of information stored.

2.2.1 Implementation of Records Management in Organizations

APDSI (2016), identifies obstacles to the correct implementation of a records management system in organizations, such as lack of interoperability and loss of business process due to focus only on document procedures. APDSI (2016) also proposes guidelines that would lead to a correct implementation of records management, such as analysis of the organization’s reality and processes, formation of users and proper selection of information systems that follow requirements based on standards such as MoReq2010 but that also adjust to the records management desired to be applied.

2.2.2 GfiDoc

“GfiDoc® is an innovative solution in total alignment with the European standard MoReq® (Model Requirements for the Management of Electronic Records) and with new digital tendencies. It ensures an integrated and complete capture, registry and management of all document’s life cycle. GfiDoc® is characterized by its functional richness, simplicity and ergonomic utilization or administration. It provides a robust integration layer, allowing the aggregation of documental evidence from other business applications, while also providing workflows.” (Microsoft, 2017).

GfiDoc provides workflows through its workflow module, that uses the system K2, mainly through its framework SmartObjects, which allows for GfiDoc to possess an interface managed by K2 in its workflow module. The workflows present in GfiDoc’s workflow module are called document-centric workflows, which Marchetti et al. (2005) defines as “the automation and administration of particular document procedures”. Many records management systems possess workflow modules, which are workflow management systems that hold these workflows, that possess only activities regarding the management of records stored in the records management systems such as GfiDoc.

2.3 Enterprise Service Bus

Zdun (2005) refers that the use of an enterprise services bus as a mediator for communicating applications, on top of SOA, allows these to communicate by using adaptors regardless of the communication protocols supported, because of the capabilities over messages that an enterprise service bus possesses. In this way, applications that only support REST protocols (being the most used nowadays), such as HTTP, can communicate with an application that only supports SOAP protocols, due to the utilization of an enterprise service bus, that mediates the messages. An example of an enterprise service bus is WSO2 Enterprise Integrator, an open source solution, which possesses an enterprise service bus as a main component, illustrated in Figure 1, but also possesses other profiles to better the integration experience, such as a Message broker profile that provides queueing and message storage capabilities to the enterprise service bus profile.

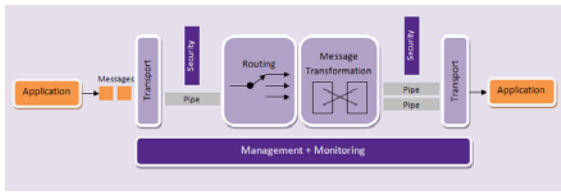


Figure 1: Enterprise service bus profile architecture of WSO2 Enterprise Integrator (WSO2, 2018).

3 PROBLEM ANALYSIS

Records management and business processes act as important components for business efficiency. Therefore, there needs to be a definition of how a records management system, as part of the application of records management, should be developed, regarding requirements and components, and implemented ensuring alignment with the organization business processes.

Having a records management system developed and a reference for the correct implementation of this system, we then gain insight of the role that records management must play in business, mainly regarding the organizations processes.

In order to frame records management in the business process management context, this research was applied to GfiDoc, a records management system referred in Section 2.2.2. In this research a workflow module was replaced that used the system K2 and its framework, SmartObjects and presented two problems that needed to be solved regarding the module.

The first problem was flexibility, because the functionality of the workflow module depends on the use of K2, not being able to use any workflow engines to support GfiDoc’s workflow module. This vendor lock-in problem, that adds up to the fact of GfiDoc not having any control over its module interface, because, through the SmartObject, all actions are perceived and processed by K2.

The second problem is the cost of the solution, because the use of K2 implies the acquisition of a paid license, increasing the price of the solution.

4 PROPOSED SOLUTION

This section proposes a solution for the replacement of GfiDoc’s workflow module, that instead of using the system K2 and its SmartObject to provide workflow management capabilities to GfiDoc, will use an enterprise service bus, which will then allow

communication with other workflow modules, through the execution of calls to a single REST API. The architecture for this solution, named business layer, illustrated in Figure 2, is composed of an enterprise service bus, that will receive messages and transform and redirect them, as needed, to their respective workflow engines to be processed and then returned to GfiDoc. The enterprise service bus used for the business layer is the enterprise service bus profile of WSO2 Enterprise Integrator (WSO2 2018). There will be two workflow engines considered for the business layer, although there could be more engines added in the future.

The usage of two workflow engines is expected to prevent the development from following a route of development of a point-to-point communication of the enterprise service bus with a specific workflow engine. The system’s engines to be considered for the business layer are Bonita Community edition and WSO2 Business Process Server (both are open source systems).

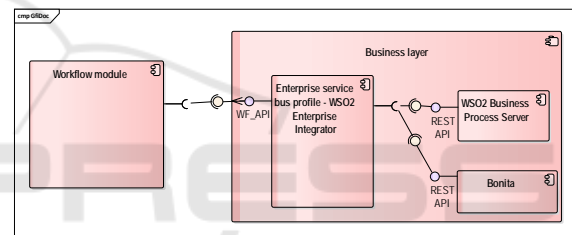


Figure 2: Architecture of the proposed solution.

Regarding functionalities, the ones defined are considered as being the essential functionalities for the business layer to be able to support a workflow module and to provide correctly workflow management capabilities. The functionalities are:

- List workflows;
- Generate instance of a workflow;
- Give task to a user;
- Complete task;
- Cancel a workflow instance;
- Suspend/Active the instantiation from a specific workflow.

Additionally, there are four more functionalities, which consists of events that are triggered when the following actions occur in the workflow engines:

- When a workflow instance is created;
- When a new pending task appears;
- When a task is completed;
- When a workflow instance ends;

In these four cases, the workflow engine sends a message directly to GfiDoc notifying about the event that occurred, along with the information related to the workflow/task in question so that GfiDoc can

store the information about the event. In the case of the other functionalities, the message is sent from GfiDoc asking for an action to be performed to the business layer, the message is treated by the enterprise service bus, that transforms and redirects it as needed, sending the message to the API of the chosen engine, as shown in Figure 3.

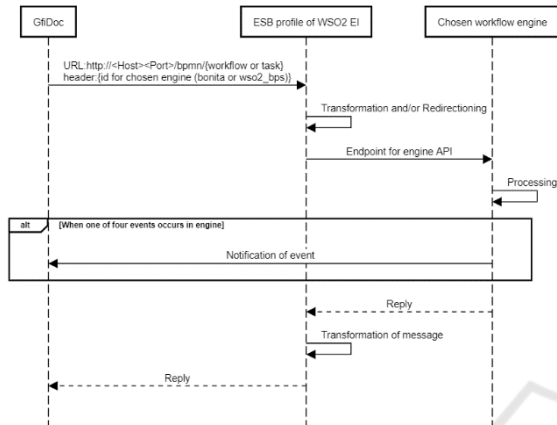


Figure 3: Messages of GfiDoc with business layer.

4.1 Data Model and Interface

For GfiDoc to store information regarding workflows and tasks, the data model had to be changed to guarantee these capabilities. As shown in Figure 4, two new entities were added to the existing data model: Workflow and Task. By adding these entities two entities GfiDoc can now store metadata regarding workflows and tasks, through the attributes present in each entity.

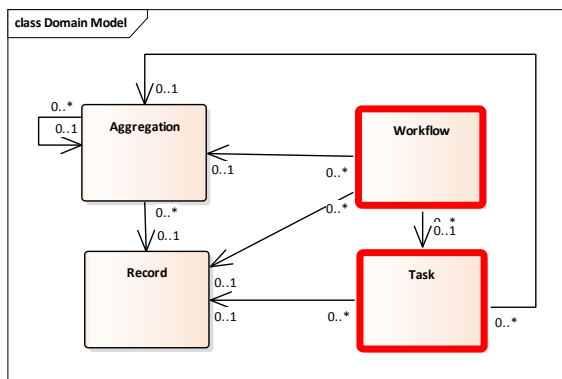


Figure 4: Entities added to the data model (with thicker and red border) and their relations.

Being able to store information essential for the workflow module, a user interface was also developed in GfiDoc. This interface, completely controlled by GfiDoc, is not dependent of any other

system like the last one, that belonged to K2. This interface is shown in Figure 5, that shows a list of pending workflows to instantiate.

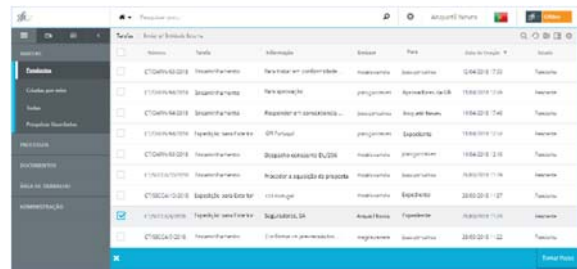


Figure 5: New interface showing pending workflows.

4.2 Business Layer

4.2.1 Requirements

Table 1 identifies the requirements that the business layer needs to fulfil to support GfiDoc's workflow module, identified by GfiDoc's development team. These requirements were referred by GfiDoc's clients as main problems that needed to be solved regarding the former workflow module, that used K2, and therefore need to be fulfilled with the use of the business layer. The comparison, in Table 2, of the requirements and the technologies that allow to perform them, show that, using the business layer, all requirements are fulfilled. Even though neither one of the two engines used can fulfil requirements 3 and 4, the enterprise service bus introduces capabilities that fulfil them and show the business layer can support GfiDoc's workflow engine.

Table 1: Detailed requirements of the business layer.

Requirement	Description
Req. 1	Allow the modelling of workflows using tools compatible with the notation BPMN 2.0.
Req. 2	Process workflow autonomously and deliver results to GfiDoc.
Req. 3	Present the state of a workflow graphically.
Req. 4	Maintain independence of specific workflow engine
Req. 5	Allow the use of more than one workflow engine simultaneously.

4.2.2 Enterprise Service Bus Profile of WSO2 Enterprise Integrator

According to the functionalities defined for the business layer, a service was defined, resulting in the development of a REST API that would be the API that will receive messages from GfiDoc. In the API there are the resources

Table 2: Detailed Requirements of the Business Layer.

Requirement	Bonita	WSO2 Business Process Server	Business Layer (ESB and engines)
Req. 1	Yes	Yes	Yes
Req. 2	Yes	Yes	Yes
Req. 3	No	Yes	Yes
Req. 4	No	No	Yes
Req. 5	No	No	Yes

workflow and task, to better explain where each functionality will be applied. For example, for the actions “Give task to a user”, “Complete task” and “Suspend/Active the instantiation from a specific workflow”, the services are accessible through the URL `http://<Host><Port>/bpmn/task`, the HTTP method POST, the header “software” indicating the engine desired (with value “bonita” or “wso2_bps”) and with a field, in the body “action” that has the value of “claim”, “complete” and “suspend/activate”, respectively. For a service to be applied on the workflow resource, for example the action “Cancel a workflow instance”, the URL is `http://<Host><Port>/bpmn/task`.

The integration flows in the enterprise service bus, that indicate the steps through which the message goes through until it is sent to a workflow engine, were developed using the tool WSO2 Developer Studio, that allows a graphical modelling of the integration flows, that are translated in run time to an XML that describes the API. For each functionality of the first six for the business layer, an integration flow was developed, given that the other four, regarding events, are done by each of the workflow engines. In each integration flow, the redirection to the desired workflow engines is enabled by a mediator called switch mediator, that chooses a path of the flow to take depending on the value of the header that chooses the workflow engine. Figure 6 shows the integration flow for the functionality “Generate instance of a workflow”, where there are three branches because, regarding whether a workflow needs variables or not to be instantiated, the message format differs.

4.2.3 Bonita

We use Bonita as a workflow engine, in the business layer, since its REST API can already receive messages from the enterprise service bus used.

The first workflow modelled in the workflow engines is a simple workflow, composed of two events, a start event and an end event, and one task named “Send message” that receives two variables

“remeten” and “message”. This ad-hoc workflow is meant to simulate the sending of a message to a certain user and is modelled in BPMN 2.0.



Figure 6: Integration flow for the instantiation of a workflow.

For the sending of messages, since the use of listeners and events are not available in the open source version of Bonita (Community edition), a connector called REST connector was used, that allows, for each of the 4 events defined, the sending of a REST message to a URL, being this URL specified as the one to GfiDoc. The message to send, for each event of each task/workflow, is written in Groovy.

4.2.4 WSO2 Business Process Server

Following the same development as in Bonita, a workflow identical to the ad-hoc workflow modelled in Bonita was modelled to be uploaded to the WSO2 Business Process Server, by creating an Activiti project with the workflow in BPMN 2.0, as shown in Figure 7. Since, in this case, we can use listeners and events, written in *Java*, these just have to be associated with the workflow and its task, associating a different event to each of the four events, because the data sent to GfiDoc in the case of each of the four events differs from one another. In Figure 7, besides the workflow modelled, there are also represented the associations for the two events regarding workflows, where we associate the event “start” for the event of when a workflow instance is created and “end” for when a workflow instance ends.

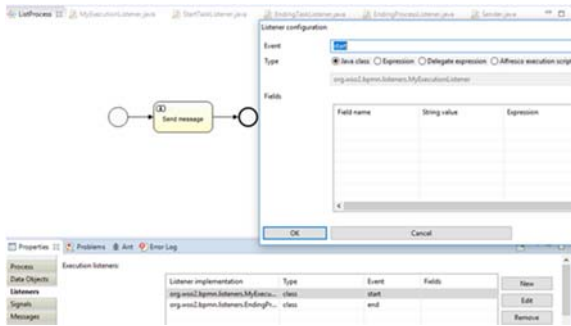


Figure 7: Ad-hoc workflow modelled, and workflow events associated.

5 DEMONSTRATION AND RESULTS

To evaluate the business layer developed, we first assess its integration with GfiDoc’s workflow module. We first demonstrate if the business layer is scalable solution that can handle several messages from users simultaneously, then we validate if the business layer supports the back end of a workflow module in a records management system. After guaranteeing the business layer as a valid solution, we analyse if the problems identified in Section 3 are solved with the use of this solution, while also referring additional benefits that can come from the use of the business layer for other purposes than the one referred.

A prototype was developed to evaluate if the business layer can act as a back end for GfiDoc’s workflow module. As illustrated in Figure 8, the prototype uses a HTTP server to receive messages from the engines in the business layer regarding events and uses a REST client, Postman, to send messages to the business layer REST API (WF_API).

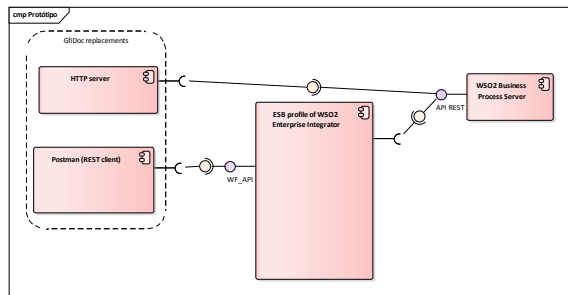


Figure 8: Architecture of the prototype developed.

Only WSO2 Business Process was used because there wasn’t considered need to test both workflow engines since the integration flows are already developed.

The test of the prototype was developed according to Ferme et al. (2015), by sending simultaneous messages to simulate an increasing number of simultaneous users and calculating the throughput value for each set of messages sent and processed by the engine of the business layer. By comparing the throughput obtained and its growing rate, these shows if the system is a good workflow management system compatible with the notation BPMN 2.0. The message chosen to be the same sent in all messages is for the instantiation of a workflow, given it requires quite a bit of processing from the system. The sequence of messages that will happen for each message sent in the test is the same as the one illustrated in Figure 9.

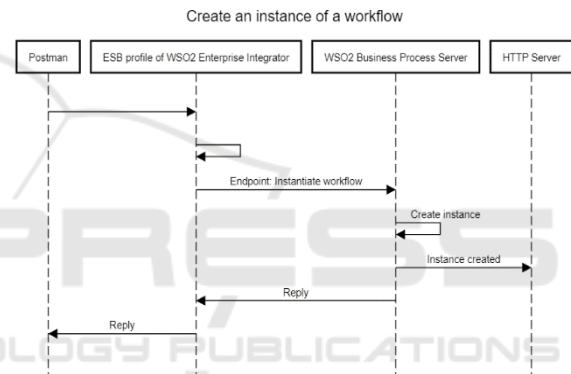


Figure 9: Sequence of each message performed in the test.

As a comparing measure, the tests performed on the business layer were also performed with a point to point communication between the REST client (Postman) and WSO2 Business Process Server. Regarding to Figure 9, the only difference in this case is that messages, instead of being treated by the enterprise service bus, go directly to WSO2 Business Process Server. This way not only the functionality of the business layer is evaluated, but also if the use of the enterprise service bus as a mediator of the messages is beneficial or not to support the business layer and GfiDoc.

5.1 Results

5.1.1 Throughput

The results of the tests performed using Jmeter are illustrated in Figure 10, which shows that the business layer is an acceptable workflow management system and can support GfiDoc’s workflow module. Also,

the use of an enterprise service bus is beneficial and guarantees a scalable solution. The throughput values obtained show that, when using an enterprise service bus, the throughput values are always higher than when there is a point-to-point communication with the workflow engine.

The values shown regarding throughput could be even greater if more profiles of WSO2 Enterprise Integrator would be used, given that the queueing capabilities are much greater when also using the Message broker profile. Also, the API and integration flows developed lack optimizations regarding performance, given that they intend to show most of all the functionality of the business layer.

Adding to these results, latency was tested, which results are shown in Figure 11, showing that the messages processed with the help of the enterprise service bus are in average faster than in the other test case, that proves the use of the business layer for GfiDoc’s workflow module.

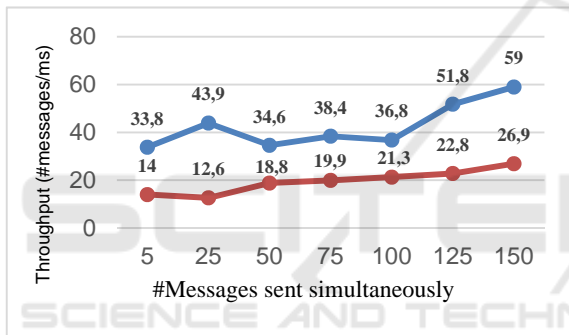


Figure 10: Values of throughput for the test cases of using an enterprise service bus (blue) and only using and workflow engine (red).

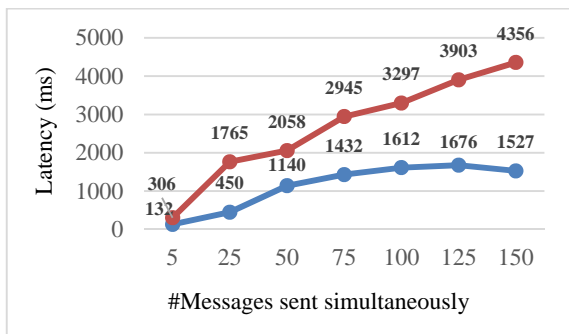


Figure 11: Values of latency for the test cases of using an enterprise service bus (blue) and only using and workflow engine (red).

5.1.2 Price

Since the business layer is, for now, only composed of open source systems, the use of this system

comparing to the use of a proprietary system like K2 presents less costs. Therefore, cost wise, the use of the business layer in GfiDoc’s workflow module presents a cheaper solution than its predecessor.

Regarding the cost of development, the business layer possesses a high development time to implement a workflow module, given the low amount and quality of support that exists regarding open source technology, relying mostly on user forums or on paid support packages, that still are cheaper than the acquisition of most proprietary systems such as K2.

Furthermore, because the business layer is composed of open source systems, according to Das et al. (2010), it also possesses the following benefits:

- “Test before buying”;
- “Lower cost to start”;
- “More simplistic and easier to understand”;
- “No mishmash”;
- “Availability of the source code and the right to modify it”;
- “Right to redistribute modifications and improvements to the code”.

Additionally, given that many cloud services vendors charge based on CPU usage, the use of the enterprise service bus profile of WSO2 Enterprise Integrator, which is an XML that describes all the API and can be uploaded to the server, is a lightweight solution to deploy in the cloud.

5.1.3 Flexibility

Regarding the problem referred in Section 3 about the use of K2 preventing other workflow engines from being used, the business layer does not suffer from this problem, allowing several workflow engines to be implemented in the layer and to even be used simultaneously.

To add another workflow engine to the business layer, the integration flow, after analysis of the engine’s available functionalities and REST API, needs to be developed and all endpoints needed added. Additionally, in the workflow engine, there needs to be a way to send messages to GfiDoc in the referred events, whether by using listeners like in WSO2 Business Process Server or a *REST connector* like in Bonita. Having done this, with the adding of another possible value for the header of the message for the selection of this workflow engine, it can be used by GfiDoc’s workflow module.

5.1.4 Main Contributions

Through the proposal and development of the business layer, the workflow module of GfiDoc is

now a more flexible and cheaper solution. The development of an open source solution that allows the communication with several workflows' engines and the use of their capabilities through a single REST API, being also a scalable and lightweight solution is an attractive solution for a back end of a workflow module. Using a workflow module in a records management system, task regarding records management are automatized, since it reduces the change of human error in records processing.

The simultaneous use of several workflow engines is not advised, but can be useful in exceptional cases, such as when a migration of processes from an engine to another occurs.

By using a records management system aligned with an organization's business processes and culture, the usage of documents and the efficiency of business activities are optimized. This also allows the automatic generation of records to act as evidence for the execution of these activities, having in mind that the perseverance and management of all records stored, according to records management standards such as MoReq2010 are guaranteed.

6 DISCUSSION

In this section we analyse how a records management system, such as GfiDoc, and the workflow module developed in Section 4 should be implemented in an organization.

Since organization's activities have as main focus the business and the generation of value, the focus on records of the records management systems show that these cannot be a central platform for a business. Instead, records management systems, along with other practices of records management must act as support for the business, mainly for the business processes. These business processes are orchestrator of activities, that have the objective of producing value for the organization and the records management systems need to be able to generate records that prove these executions and support activities that utilize records stored in the system.

Does this mean that workflows are not necessary? Ruh and Gold-Bernstein (2014) refers that workflow are meant to automatize only manual tasks and business processes are composed of manual tasks and service calls to other systems, like workflow management systems. Furthermore, Ruh and Gold-Bernstein (2014) also refer that workflow management focus on the optimization of processes, while business process management focus on a continuous improvement lifecycle. Therefore, to

perform complex calls, made by business processes, to certain systems such as records management systems, workflow modules can be used to automatize these workflows whose focus is more of the area of the system at hand, having in mind that there should not be a loss of the business context at any time.

This way, the implementation of records management in an organization needs to be aligned with the existing business processes and how these are managed, while also having in mind the culture and reality of the organization, for optimal benefits to be achieved.

6.1 Obstacles to the Implementation of Records Management

Although the benefits of the application of records management in organizations, that include the implementation of a records management system such as GfiDoc, according to APDSI (2016), only 74% of organizations interviewed in Portugal possess records management systems implemented, and not all possess integration with business processes. In order to analyse why records management systems are not implemented in every organization, along with their workflow modules such as the one developed in Section 4, which introduces an open source and flexible solution to increase business efficiency, the main obstacles identified that lead to an incorrect or inexistent integration of records management and business process management are described in the following subsections.

6.1.1 Wrong Idea of Records Management

Records management and its benefits are not totally acknowledged by organizations; the benefits of the management of information are but the ones regarding the increase of business efficiency when integrated with the business are not. Also, records management is not only about acquiring a records management system, because it requires other practices to be applied such as the development of classification tables, control access lists and analysis of the business processes. By only implementing a records management system and not integrating with any other systems and practices because they are not seen as essential components to the business, some organizations undervalue records management, seeing it as a cost to comply with regulations and not as an investment to achieve benefits for the business.

Using the architecture proposed in this paper, the organization can possess a records management

system with a set of workflows that increase the efficiency of the business and benefits from applying records management. As shown in Section 5, the business layer supports the workflow module and can provide an increase in efficiency for the organization's business.

6.1.2 Business Process with Low Maturity

In a public administration organization in Lisbon, Portugal, the records management system is used as a main platform and is not integrated with its business processes because these do not present a maturity level high enough to support be business, leading to a greater focus of records management and loss of context in the business when executing workflows. Having acknowledge this, the organization has not been able to optimize its business process due to a strong resistance to change, which along with the limited interoperability that its records management system possesses with other systems, to a greater use of paper documents.

Although an understandable situation, it can never be a good solution, rather it must be seen as a temporary solution, until the business process can be optimized and managed and a better records management can be applied.

Regardless of the benefits that can come from implementing a records management system such as GfiDoc, with a workflow module that introduces flexibility and cost reduction to an organization, if the business processes cannot support records management practices, there are going to be inefficiencies. The organization will still benefit from using the records management system, which will store its documents and increase the automation of workflows, but optimal benefits from aligning these with business processes cannot be achieved. Additionally, there is the danger of loss of business context and incorrect modelling of the workflows, given that most of the workflows in the workflow module are modelled by the organization and these workflows can present the same problem that for the business processes, which is a low maturity level, that leads to an inefficient records management performed by the records management system.

6.2 Framing Records Management

Having in mind that records management is a business component that supports an organization's business processes, these processes need to be adjusted to the desired records management, implying the identification of problems and new

modelling of business processes by an organization. These processes, according to the business process management cycle referred in Section 2.1, are executed and data is gathered from this execution to identify possible improvements to the processes.

Furthermore, ISO (2016) refers that, when defining the architecture of an organization, records management as to be accounted for.

This way, we conclude that records management is present in all phases of the business process management lifecycle, as a support business rather than an independent area of an organization's business.

7 CONCLUSIONS AND FUTURE WORK

Records management, when applied in alignment with an organization's business processes and reality, can bring great benefits regarding the management of its information and regarding the increase of business efficiency. Also, the correct application of records management includes the implementation of several practices rather than simply developing and implementing a records management system.

By defining the requirements and components of a records management system that is based on the standard MoReq2010, a workflow module of GfiDoc was replaced by an open source, scalable and flexible solution, called business layer. This layer acts as the back end for GfiDoc's workflow module and allows it to communicate to several workflow engines through a single REST API, but also other systems through the sending of messages to one or more workflow engines that belong to the business layer developed.

Finally, the correct way to implement records management system was defined, and problems that prevent this implementation were identified and analysed, resulting in the identification of the role records management plays in the organization, leading to the framing of records management in business process management. This framing resulted in the conclusion that records management is present in every phase of business process management and therefore in every stage of the business, by optimizing the usage of records and the generation of records that act as evidence for the actions done in the business.

Regarding future work, GfiDoc's workflow module still needs to fully be developed, by adding services in GfiDoc to communicate with the business layer. Regarding the business layer, the API and the business layer needs optimizations focused on

increasing the performance of the solutions. Also, case management could be added to improve the flexibility of the solution, and the enterprise service bus of the business layer can also possess integration flows for more systems, rather than only workflow engines.

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