

# Towards the Development of an Innovative Platform for the Systematization and Preservation of the Romanian Literary Patrimony

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## Introduction

**G**LOBALIZATION IS a reality of the modern world and represents the most extensive and complex process of metamorphosis of local elements into global content components, with the ultimate goal of creating a single homogeneous system. This process is developing more and more today, and it captures all the elements that define a modern contemporary society (environment, culture, political system, economic system, etc.).

Cultural heritage is important because it strongly influences our sense of identity, loyalty and our behavior. Institutions such as archives, libraries, museums, etc. are responsible for preserving and interpreting cultural recordings. Concern for the preservation of cultural heritage leads to a wider awareness of the complexity of culture.

National literature plays an extremely important, even vital, role in our development, as it represents our identity. This is composed of works and documents that describe the Romanian people with all the features and elements that define us, thus setting a cultural basis that defines our essence as a nation, defining who we are. It is very important for a person to know their origins, history, customs, especially nowadays, when our traditions and customs are fading away, and the process by which we borrow habits, words, traditions from other cultures is more and more intense and often unfolds in a non-critical manner, and so we are gradually losing what we have most valuable, fragments of our own identity.

In this background of globalization and the digital era, this highlighting of literary heritage is diminishing more and more, as the process of preserving and restoring very

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old manuscripts and documents requires high financial resources, threshold which is often not touched or covered, thus reaching a step closer to the definitive loss of the elements that define our culture, our essence as nation (Banciu 2015).

In these times when the process of globalization has an exponential growth, the need to preserve the national identity must necessarily be complemented by the determination and effort required to highlight and conserve the Romanian literary heritage. Of course, globalization is a phenomenon that cannot be stopped but it can be transformed and adapted so it will be represented as a beneficial phenomenon, a phenomenon that would not negatively and permanently affect the quintessence of national values.

In this context, we propose a solution that represents both an open portal to the digital era and also a possible answer to the problems of preservation and conservation, as well as the transformation of this process of globalization and the minimization of its negative impact on our culture.

This solution consists in the development of a digital platform, by which literary works, manuscripts, editions of a work, bibliographies, dictionaries of Romanian literature and many more other documents will be stored, analyzed and processed. It will also facilitate quick access to literature and related materials for everyone.

The platform “The Virtual Library of Romanian Literature: Systematization and Digitization” will lay the foundations for the development and promotion the national, native literature.

Thus, this platform will contribute for preserving and highlighting the Romanian literary heritage by extracting and systematizing knowledge from data sources such as: the *General Dictionary of Romanian Literature*, the *Chronology of Romanian Literary Life* (1944–2000) and canonical works by different national authors that are no longer bound to the copyright laws other structured and unstructured sources which are in the patrimony of the Romanian Academy.

The process of digitization of literature itself is not absolute news in the field, but an impediment to this process is the access to and the processing of these documents as they are not found in full version or an increased effort is required in terms of searching and accessing them. In the case of physical documents (books), a shared consultation is rarely possible (most libraries do not have enough copies of certain volumes or books on a particular topic), or the desired book cannot be reached due to several reasons.

The development of an integrated software platform aims to solve or attenuate most of the problems mentioned above and will represent the basis for the communication and distribution of materials to a large audience, information that will be available in any field (academic, scientific, personal development, and so on). Thus, we can digitize documents from the cultural heritage, we can promote them both nationally and internationally, protect original documents, allow simultaneous viewing by many users, allow remote access anytime.

The digitization process at national level must be based on resource sharing. This fact requires good communication, uniformity at the level of all the concerned institutions, both at local and national level. (Banciu et al. 2012; Filip et al. 2015).

So, as we have mentioned above, the main objective of this project is the development of a solution for conservation, preservation and highlight of information from

Romanian literary heritage using intelligent digital solution for systematization and extraction of information.

The web platform—INTELLIT has several functionalities such as: advanced searching services, semantic analysis, recommendations, statistics, prediction and many more that are going to be described in the next chapters.

## Source of Data from Romanian Literature

**T**HE DATA used will be provided from different source documents from the patrimony of the Romanian Academy, G. Călinescu Institute of History and Literary Theory. This will represent the basis of the Virtual Library of Romanian Heritage, a safe and friendly environment that will give access to all kind of users, not just academic, to the resources and documents needed as well as promoting the national culture.

The Romanian Academy pursued the achievement of some of the most important scientific projects, among which the most important are: the *General Dictionary of Romanian Literature* (1<sup>st</sup> edition, 7 vols., 2<sup>nd</sup> edition, 8 vols., in progress), the *Encyclopedia of Old Romanian Literature*, the *Chronology of Romanian Literary Life*, etc.

The dictionary presents all Romanian authors regardless of where they wrote and became known. The essential criterion of selection and judgment was that of an axiological and historical nature, suitable to the needs and requirements of a dictionary. The dictionary also includes writers from the diaspora. A unitary criterion of appreciation has been attempted. It also includes literary and cultural publications, even newspapers that have a literary page. The dimensions of an article correspond to the place occupied by the author or publication in the general Romanian literature.

The seven volumes contain: I—letters A/B, 1,150 title articles, over 220 illustrations, 732 pages; II—C/D letters, 1,200 title articles, over 350 illustrations, 812 pages; III—Letters E/K, 875 title articles, 295 illustrations, 790 pages; IV—letters L/O, 850 articles, 265 illustrations, 746 pages; V—P/R letters, 800 title articles, 240 illustrations, 725 pages; VI—S/T letters, 750 title articles, 230 illustrations, 827 pages; VII—T/Z letters, 468 title articles, 250 illustrations, 556 pages.

Due to the nature of the content and the quality of the work, the *General Dictionary of Romanian Literature* can be a relevant tool in the process of learning and documenting in fields such as: literature, history, journalism, sociology, linguistics etc.

The development of an online platform will expose the contents of the *General Dictionary Romanian Literature* using some specific functions (searching, filtering and ordering the results) in order to give users a more enjoyable experience in using the dictionary. It is desired to process the text of the entire document, extract information and index according to criteria that are relevant to the user. Finally, this structured information will be viewable by the users.

The *General Dictionary of Romanian Literature* (1<sup>st</sup> edition, 7 vols., Bucharest, 2004–2009, 2<sup>nd</sup> edition, 4 vols., 2016–2017) tries to highlight everything that can define the amplitude of a national literature: authors, publications, concepts, currents, anonymous writings, literary groups and institutions, translators in and from Romania. The

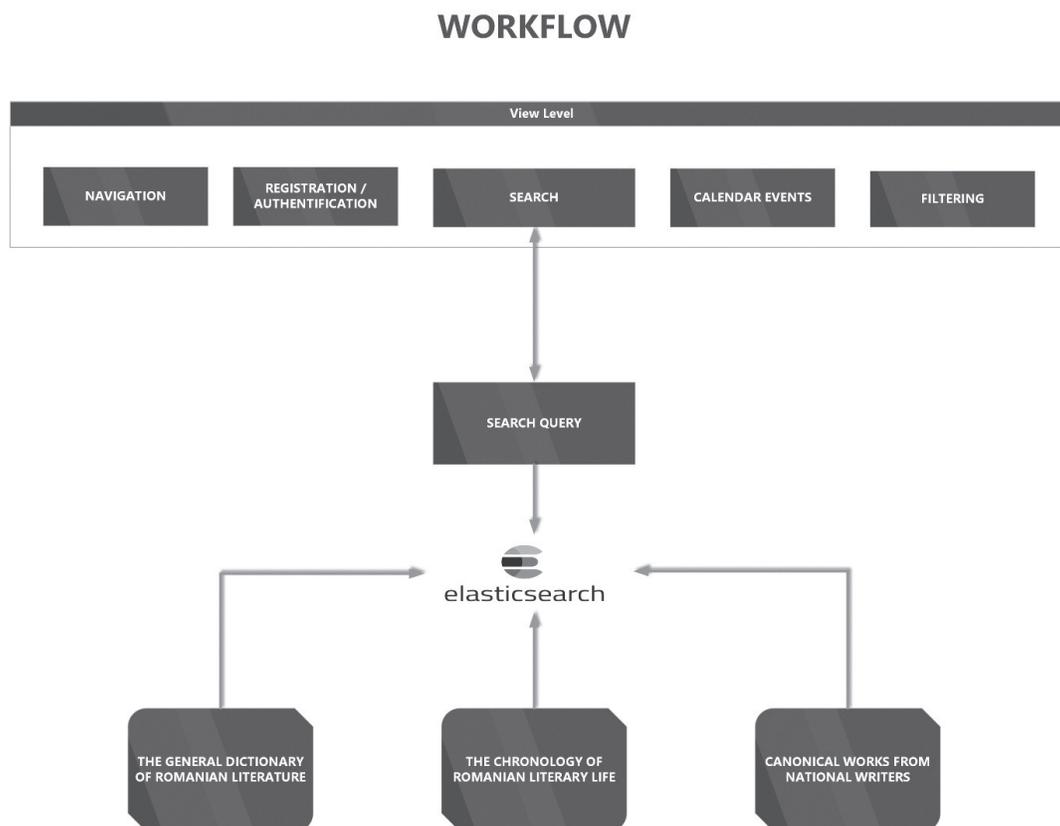
whole concept of this ambitious project is to correctly and succinctly inform the public and to leave a legacy about the Romanian literature in time (Simion 2004–2009).

Following the analysis of the first sets of data received, the categories, based on which search and filtering of the documents will be performed, are extracted. These will be the main categories for sorting document data together with other filters developed to deliver the most relevant results.

The *General Dictionary of Romanian Literature* is an academic work for the general public both in Romania and abroad, interested in the phenomenon of literature (Simion 2016–2017).

The *Chronology of Romanian Literary Life: The Postbelic Period* (volumes I–XIII B, 2010–2017) and *The Post-Communist Period* (7 vols., 2014–2016) is a complex research work, unique in the historical landscape of literature, both by the magnitude of the information, by the type and by the quality of the interpretative approach. The essential feature of this work is the inventory and exhaustive presentation of all Romanian periodicals reflecting actions and tendencies having a direct or indirect effect in the process of ideology in the aesthetic domain and the establishment of political control over literary creation. The purpose of the paper is to give a more detailed picture of the events,

FIGURE 1. WORKFLOW—VIEW LEVEL



SOURCE: the authors' own design.

mentalities, options during the years 1944–1967, 1990–1996 in terms of the reconfiguration of the Romanian landscape as it is from the publications of the time (Simion 2010–2017).

The canonical work of the Romanian writers will be shared by the authors, clustering in order to offer a more relevant sorting of literary genres. The major lyric genres, the epic genre and the dramatic genre will form the basis of the platform search, related to the canonical work, and then the documents will be divided into literary genres. (Diaconu 2013).

The canonical works are viable, lasting in time or for long periods of time and in different cultural environments. In other words, canonical works are regarded as literary-aesthetic (stylistic) principles they are recognized as valuable works in different cultural spaces for a long time. Figure 1 shows the workflow at view level of the platform, as well as data sources.

## Digital Solutions for Access to Romanian Culture

**V**ARIOUS PLATFORMS have been developed over the years to give users access to literature, but they are either incomplete or difficult to access. For an unexperienced user, accessing these platforms may be quite difficult, and interpreting the results can also pose problems (Banciu et al. 2015; Filip et al. 2014).

Following the analysis of the existing platforms, a number of functional requirements have been extracted that will serve as a basis for the new platform that is under development. User requirements have also been identified that would facilitate access to information and provide a more enjoyable experience, thus stirring people's interest in literature. In this chapter we will present a few examples for similar national platforms (Filip et al. 2015).

The online catalogue of the *National Library of Romania* contains bibliographic information about the documents entered into the collections of the library since 1993.

The on-line catalogue of the *OPAC* is the core of the library's automation system and contains several databases, thus trying to preserve the complex structure of the files which characterizes all the catalogues of the *Library of the Romanian Academy*.

*DigiMultiCult*, an integrated system for promoting and highlighting multiculturalism for the purpose of sustainable rural development system, was developed by a national consortium coordinated by the National Institute for Research and Development in Informatics—ICI Bucharest (Marinescu et al. 2014).

There are other platforms on the Romanian territory that provide access to information, but they either don't have effective search mechanisms or we can't find documents in text or pdf format (many of the old documents are in scanned format), or the information stored is insufficient for a particular topic (Băjenaru et al. 2017).

The proposed INTELLIT platform is being developed based on the functional requirements extracted after analyzing the existing platforms Romania, but more focused on user requirements, to develop the process of learning and documenting on different topics from various fields, to create a safe and accessible environment for every type of user, that suits every possible demand. We aim to highlight everything that can define

a culture by providing access to information using a digital solution, to promote the national literature and to provide an overview of past times, a detailed picture of the events, mentalities, options during the years regarding Romanian literary life. The new solution will be based on the latest technologies and standards, will offer a wider range of tools to suits the user needs but will also provide an accessible environment that will last over the years.

## The New Proposed Digital Solution—INTELLIT Platform

**T**HE INTELLIT platform with all its components will provide information regarding the Romanian Literature about bibliography, manuscripts, works from known authors that are no longer bound by the copyright laws and many others and it will act as a support for the Virtual Library of Romanian Literature, providing a model for preserving and highlighting the Romanian Literature Heritage. This platform will be made available to both academics and the general public.

The data sources that can be accessed through the platform are:

- the *General Dictionary of Romanian Literature*, 2<sup>nd</sup> edition;
- the *Chronology of Romanian Literary Life* (1944–2000);
- canonical works from national authors.

The principal characteristics offered by the platform are:

- The client is a Single Page Application web application, all pages inside it are component-based and dynamically shifted together with transitions (related animations), thus developing a modern application and not just a simple web site.
- The server is REST-full; all actions will be done through an API and will then be able to use the logic and application Kernel (REST endpoints and specific logic) in later implementations.
- This application is also designed to act as a native application, supporting interaction with the native operating system API on which the client is running (operating system notifications, etc.), but also using an internal cache to store information already uploaded to the client (information that can also be accessed in the event of loss of connection).
- Modern design created by following the rules and guidelines provided by Google Material Design, but also providing a user-friendly experience.
- The application will be responsive, adapting to any resolution and size of the screen on which it is viewed. As such, it can be used on both PC and mobile devices such as tablets or phones.
- It behaves as a native application and can be installed on Android/Windows/iOS and used with the entire components within.
- Data synchronization, update and real-time viewing methods are implemented
- It is optimized and minimized to make it difficult to modify and provide high performance while maintaining a high level of performance, both in terms of network resources consumed and in terms of physical resources consumed by the client.
- Use of modern technologies that guarantee us a high level of dynamic scalability when needed.

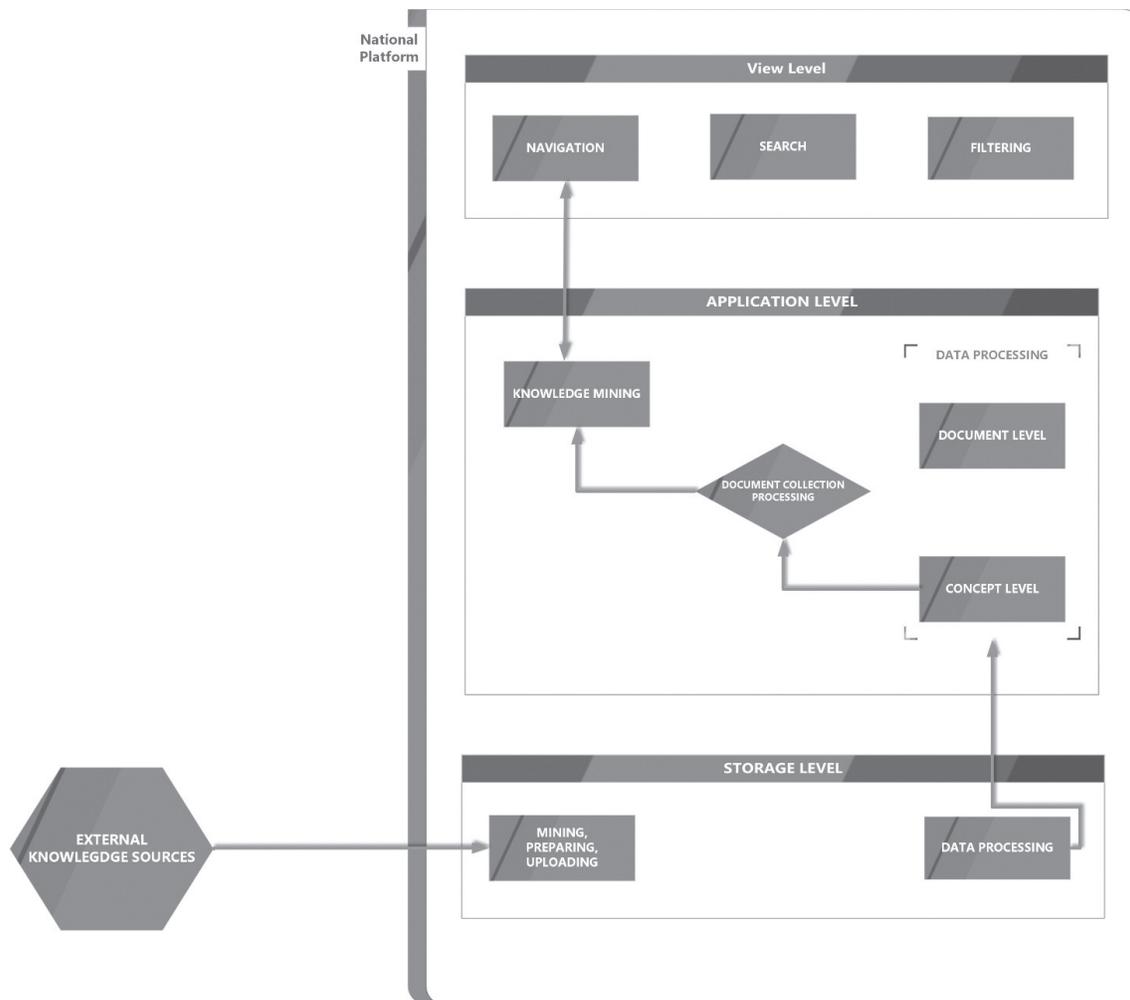
- Facilitates quick access to information about Romanian literature (starting with exhaustive bibliography, information regarding all editions of a work and up to manuscripts and the digital version of the works that allow it—for example the works of the most important Romanian writers, works that are no longer bound by copyright laws).

The new INTELLIT Platform is built on 3 levels and will consist of 3 different applications specific to each level previously presented:

- *view level*: represented by the Web portal which will be accessed by the users;
- *application level*: represented by the processing part, data validation, all the processed required for the platform to run according to specifications;
- *storage level*: represented by the storage warehouse where all the provided documents will be stored.

The Figure 2 shows the overall architecture of the application architecture, followed by explanations for each individual application level.

FIGURE 2. THE ARCHITECTURE OF THE INTELLIT PLATFORM



SOURCE: the authors' own design.

## View Level

THE VIEW Level is about all the pages and views (in essence the Web Portal) that the user will see when they access the platform, such as:

- *Registration/Authentication/Permissions*
  - For these deployments, JWT tokens (JSON Web Token) will be used with both server and client-side validation (Introduction to JSON Web Tokens, accessed 2018).
  - The registration system will allow users to activate their accounts via email within 7 days (a period configurable by platform administrators). Upon expiration of this period, both one's username and email can be used to create a new account. This is a security measure but it also prevents fraudulent attempts to use other people's E-mail address.
  - All protective measures against the most common forms of cyber-attacks (XSS—Cross Site Scripting, CSRF—Cross-Site Request Forgery, etc.) will be taken. These measures include using a secure connection (HTTPS), limiting the lifetime of the token used in the authentication process, separating and validating roles and permissions on the server, depending on the user ID and token, as well as other advanced features such as Fingerprinting Browser (for each authenticated user, a unique fingerprint of the browser and operating system is generated, a fingerprint that is compared to each subsequent user authentication.) If the fingerprint differs, re-authentication is required. Even if the token generated for a particular user is stolen by someone else, it cannot be used for anything without the signature generated using the Fingerprinting Browser method) (Cross-Origin Resource Sharing).
  - Loading documents, both document loading and any other action that can manipulate and modify directly or indirectly data from other levels of the application are checked and processed so that the user cannot upload malicious code. This is also done at the presentation level (to reduce the impact on the other levels) as well as the application level, as such, the user cannot load a JavaScript or SQL file with the .pdf extension or use other similar methods, checking at this level means to read the first bytes in the file and comparing them with the header standard for that type of file.
- View Documents—all documents within the platform will be able to view both full-text documents and parts of documents resulted from the filtering
- Display processing results.
- Advanced search—it will return full documents or just parts that respect the selected criteria (after authors, type of paper, institution, book, bibliography etc.)
- Sorting fields—the platform will offer a diversity of fields to search elements
- Calendar section—it will display an action/apparition/day of birth/special event
- News section, etc.

On the View Level, the platform will be represented by a SPA (Single Page Application) application that will allow dynamic data loading and faster page rendering once the origi-

nal application has been loaded. This application will also be designed to follow the latest PWA (Progressive Web Application)11 standards and will use all of the related features (Service Workers/Offline Mode and native layout on all platforms, manifest, and so on).

This implementation offers a wide range of advantages, starting with the architecture and flexibility, and ending with exceptional documentation and ease of integration with most modern JavaScript libraries or frameworks. The development of SPA applications is indicated in this case because this type of application facilitates the integration of functionality normally reserved for native applications (example operating system notifications and interaction of other API components) and web applications of this type (SPA). Also, these types of applications also benefit from dynamic data loading and storage in an internal cache for later use (in case of no Internet connection) and faster page rendering once the original application has been loaded.

In addition to this, the application will be designed and developed to meet the latest PWA standards and will offer all the specific features, including using the application offline or installing it on any device (PC, tablet, phone) and using it as a native application with all the related functionalities.

The main technologies of the client application part (the View Level) are: *VueJS* (The Progressive JavaScript Framework) and *Vuetify* (Material Design Component Framework), along other libraries and plugins required to run and implement the desired services (*Vuex*, *Vue-Router*, *Webpack*, *Babel*, *ECMAScript 8*, etc.). These technologies offer a wide range of features that allows us to build using an optimized and performant application that can scale dynamically and not just a simple website.

The main problem affecting website performance is the DOM direct alteration and manipulation (using JS-specific selectors or similar bookstores). To have applications that come close to the native level, applications as dynamic as possible, we would theoretically need a great deal of direct DOM manipulation calls.

We have chosen the technologies listed above because this solves this major impediment. Specifically, *VueJS13* is built around the Virtual DOM concept. This, like the native DOM, is represented by a data structure but can be updated and modified without affecting the performance of the application because it synchronizes automatically when there are major changes, in which case only the nodes in native DOM that have undergone changes in the virtual DOM will synchronize, further reducing the impact on performance.

In short, instead of several direct DOM handling calls, we have only one synchronization call.

Among the main features of these frameworks we describe the following:

- It is based on SFC (Single File Components). These components bring to the same file all three major elements of the application pages, the markup syntax (template), the JavaScript code and even the styles (CSS). Thus, component modularity increases enormously, and we can create, export, and import components where they are needed without worrying about their dependencies. Of course, another strength of *VueJS* (The Progressive JavaScript Framework) is that we are not limited by these SFC components and we can declare components in the traditional way, similar to the *ReactJS* operating mode (JavaScript only, no markup).

- Although *VueJS* highlights the basic library/framework, leaving router mechanisms and application status management based on the specific library associated with these actions, and these separate libraries (router, state-management, and many other essential development applications modern web) are officially supported by *VueJS* developers and offer exceptional integration with the basic library.
- Incorporates a Domain-Specific Language (DSL) that facilitates a much faster and easier component development. This language is also used exclusively in the SFC components mentioned above and allows for a separation between the strict presentation level and the level manipulating the data (application level) and gives them to the presentation level.
- Provides modern utilities for various issues that can be encountered in the development process (filters for data in the presentation level or two-way connections between data and presentation level—as such, in situations where we use this functionality, the data change will be followed by a change in the presentation level associated with those data, and vice versa).
- Provides one of the most innovative reactive systems between the early mentioned frameworks. Models are JavaScript objects only, and when they are modified, the view is updated.

## Application Level

**T**HE APPLICATION Level contains all processes that are linked to data validation, all business processes, and algorithms for implementing processing functions or knowledge analysis and extraction functions.

A great deal for these functions and algorithms is achieved by using intelligent tools specifically designed for this type of operation (Text Mining), namely, the Intelligent Miner Tool for Text.

This tool (Intelligent Miner Tool for Text) works based on the input / data input of structured or unstructured data in the data repository (data that can fit into several categories, starting with abstract, digital full text type), and aims to transform and process them to generate patterns, models and knowledge, as well as identifying trends or creating various connections.

The main technological component behind this level is represented by *ElasticSearch*.

*ElasticSearch* (Elastic Stack) is a distributed search engine capable of searching in the full text documents, providing users with an HTTP-based web interface as well as JSON documents that are not limited by data schemes and it's based on *Lucene*, an information retrieval library. We will talk more about this tool and describe the methods used in the next chapter.

On the part of the technologies used as well as the basic architecture, on the *Application Level*, the platform will be represented by a *RESTful* application, an application that will be consumed by the client.

This architecture also allows us to further expand to other platforms and other types of customers (because customers only need to be able to consume our API). The

main technology used is *NodeJS* alongside many libraries / packages that are going to be used to ensure a modular, complex architecture that allows us to develop applications that have real time functionality and supports the concurrent connection of thousands of nodes by making the horizontally scaling possible.

*NodeJS* is a runtime environment that allows execution of JavaScript code outside the browser (for example, on the server).

It also makes it possible to implement the Side Rendering Server for SPA applications, also in JavaScript. Side Rendering Server involves rendering views on the server to reduce customer resource consumption and refresh these data views when changes are detected. In practice, the server (NodeJS) takes over the workload associated with the client. In addition to the pure JavaScript interpretation, NodeJS also provides developers with a set of specific modules for interacting with the operating system or utilities for various common operations (working with system files, networking, cryptography) (Express).

## Storage Level

**T**HE STORAGE level or the data persistence level is responsible for storing and retrieving the data.

Within the “Virtual Library of Romanian Literature” project there will be 3 data warehouses to be stored, related to each type of document, namely:

- data warehouses for literary dictionaries;
- data warehouses for literary life chronologies;
- data warehouses for works of national writers.

This type of storage provides an overview of the literary data store, all documents being stored in the category that they belong to, providing high modularity, and making maintenance and working with the warehouse much easier and faster.

In principle each warehouse will have the same functionality but different data processing and extraction methods as each will have associated other selection criteria and other categories based on which data will be extracted. All categories of processing and extracting relevant data from the documents will be available in a specific document to keep track of them but also to be able to expand the list in the future.

The main technology used here is ElasticSearch5. Documents are indexed by a specific set of rules. Indexing in this case consists of mapping the values in the fields to the appropriate documents or the corresponding rows for a better search, so there is no need for a full search in the documents, the system can find that value in the already created index and will automatically know from which row or document it is. This reduces query execution time based on these already created indexes.

Variations in indexing the text are unlimited, but the end result is the same, these words become index keys and allow much more effective searching than relational databases.

Alongside *ElasticSearch*, *Kibana* will be used, which allows one to view ElasticSearch data and navigate within its elements (in stacks) by offering a wide range of tools/graphs

that allow viewing the data and easily represent them using a specific graph, according to the data type we are working with. Its core consists of classical charts, straight line graphs, pie charts, and many other known and used graphics, more or less, or even the possibility to create a new type of graph (data representation) based on the user design.

*ElasticSearch* (Elastic Stack) was chosen because it is very fast and can perform multiple iterations at the same time, it is fully indexed, allowing full and fast access to any file and scalable, has the same performance even on 300 knots with the possibility to scale horizontally, can work with multiple types of data (text, numbers, structured and unstructured data) and many other features.

Thus, *ElasticSearch* has a much simpler, faster and cleaner design than a classic database that is constrained by schemes, tables, rows, columns, variables, and so on.

During an indexing operation, *ElasticSearch* converts raw data such as log files or message files into documents and stores them in a structure similar to the classic *JSON* object. Each document is a simple set of keys and values. (Keys are usually string-type while values can vary in string, number, data, lists, etc.) but also the working time is considerably reduced and all actions and requests are resolved more efficiently without high resource consumption or high waiting times for processing.

All of the benefits and functionality provided by *ElasticSearch* allow us to work with documents and full-text searches that are not supported by relational or difficult to operate (in this case) databases

## Conclusions

**T**HIS PAPER proposes the development of a solution for the preservation and systematization of Romanian literary patrimony, respectively the development of an online platform that will store data from the *General Dictionary of Romanian Literature*, the *Chronology of Romanian Literary Life, 1944–2000* and other structured and unstructured sources provided by the Romanian Academy Institute of History and Literary Theory.

The features of the INTELLIT platform are presented, its architecture with all the technologies and libraries needed to develop the platform, the functional requirements and the proposed solution.

The platform aims to solve some of the problems of the existing platforms Romania and to offer a wider range of tools that will allow the user to find the information they need in a timely and rapid manner.

The great challenge of the proposed digital solution is to offer in a particular way access to more of the great masterpieces of Romanian literature to unlock the potential of the digital cultural heritage. On the one hand, it is desirable to promote Romanian literature through the wider and easier access of all citizens to the available information resources; on the other hand, this increases the level of knowledge about the great writers and culture at national and international level

The amount of digital cultural heritage in Europe continues to grow, digitization activities have a positive impact on society, and accessibility to cultural heritage generates ben-

efits for both those who are interested and those who provide content. A challenge to digital cultural heritage: how can digital data be re-used in the best way, what is the impact on society and how can it be preserved in the long term? We are going to answer these questions in the next papers.



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## Webography

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### **Abstract**

#### **Towards the Development of an Innovative Platform for the Systematization and Preservation of the Romanian Literary Patrimony**

In this paper we present a solution that represents both an open portal to the digital era and also a possible answer to the problems of preservation and conservation of the Romanian literary patrimony. This solution consists in the development of a digital platform, by which literary works, manuscripts, editions of a work, bibliographies, dictionaries of Romanian Literature and many other documents will be stored, analyzed and processed. It will also facilitate quick access to literature and related materials for everyone. The development of an integrated software platform will represent the basis for the communication and distribution of materials from the field of Romanian literary culture to a large audience, information that will be available in any field: academic, scientific, personal development etc. Thus, it is possible to digitize documents from the cultural heritage, promote them both nationally and internationally, protect original documents, allow simultaneous viewing by many users, and allow remote access anytime. Thus, this proposal will contribute to systematization and preservation the Romanian literary patrimony by extracting and structuring knowledge from data sources such as the *General Dictionary of Romanian Literature*, *The Chronology of Romanian Literary Life (1944–2000)* and other such structured sources and unstructured ones provided by the Institute of History and Literary Theory. An important goal of the platform is to provide access to information and the related literature in an easy-to-access online environment.

### **Keywords**

digital era, preservation, valorization, literary patrimony, digital platform