POLITECNICO DI TORINO

Master in Computer Engineering

Master Degree Thesis

Developing Extensible Web-Portal Increasing Visibility, Communication and Dissemination for Biomedical Research Projects

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December 2021

Summary

Researchers do a lot of effort during their projects, but is there any target audience to get the result? Also, are investors and governments aware of the research results? The main objective of developing this project is to find the answer of these questions and provide an appropriate and comprehensive space for biomedical researchers.The Internet is one of the most extensively utilized methods of disseminating research. Many current authors acknowledge that the Internet is a low-cost, widely accessible dissemination channel. The portal is not just a portal for publishing the latest research, but along with project information, complete updates on team members, events, workshops, related articles and also non-academic posts. Another significant feature is to provide an easy way to communicate with the researchers of the project as soon as possible, which can facilitate related collaborations, acquaintance and communication more easily through investors and project enthusiasts.

The design and implementation of the project has been done using open-source tools and languages. NodeJs and Next.js are respectively have been used for back-end and front-end, and MongoDB is used for database. This portal lets the project owners (researchers) to have a dedicated communication channel to talk about themselves, and demonstrate their papers. Management of publishing these data to the Internet, is easily done via a custom dashboard designed for the project owners, which is secured.

Acknowledgements

First and foremost, I want to express my gratitude to my supervisor, Prof. Ladislau Matekovits, for his unwavering support, advice, and availability during the thesis development.

Completing this study would not have been possible without Prof. Ildiko Peter's help. I would like to express my heartfelt gratitude for her assistance.

Finally, my heartfelt appreciation to Javad, my kind, loving, and supporting husband. Your words of support during difficult times were much appreciated and recorded. Thank you from the bottom of my heart.

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Chapter 1

Introduction

Our knowledge of the world is improving rapidly and as time goes on Reliability increases.It is apparent that communities' adaption to the knowledge base is improving by the day.However, given that access to knowledge is limited and that a big portion of the world is underdeveloped, it is critical for long-term growth[7].

Current communications highlight the role of web portals which helps to increase access to a set of information. It is very important to fill the knowledge gap in any way because today every part of the world depends on another.

Web Portal is an interactive and user-friendly platform that is continually updated with a variety of material such as articles, journals, conference papers,announcements, newsletters, technical reports, workshops, current research, openings, course details, and more.

Open access solutions help to achieve a sense of equilibrium. The term "open access" refers to the removal of existing access limitations. Restrictions on access to articles and knowledge and the scientific community around the world, particularly in poor nations, scientists and researchers continue to struggle to publish their work due to a lack of access to a reliable network.

Institutional economic problems or lack of awareness on open access solutions is another barrier. Web-based platforms increases access to educational and research opportunities and brings equal opportunities to the whole world.

From a different perspective, open access solutions are equally desirable. Researchers' discoveries' visibility, distribution, use, and effect can all benefit from open access, as can their ability to identify, access, and utilise the results of other researchers.

1.1 Dissemeniation

The science of Dissemination and Implementation (D&I) is referred to the study of how to be effective in translating and applying in the world of research. There has been a growing interest in equality of knowledge in the field of Dissemination and Implementation to ensure fair implementation based on evidence, exercises or programs in a range of different populations and settings. Simultaneously, researchers

recognize the potential of Dissemination and Implementation science for wider promotion of dissemination, implementation and sustainable evidence-based interventions to point knowledge inequalities that is one of the most significant issues in the world [2].

Knowledge equality is important from this perspective, which can lead to major changes, including health equality. For community participation and translation scholarships in their mission for personal improvement and population health. The infrastructure and resources of it are well-equipped to make an equity better and easier.

Dissemination and implementation science is a field that is growing dynamically and focuses on the gap between research and practice to reduce. D&I science has developed frameworks, strategies and methods to facilitate acceptance, implementation, and finally sustainability of interventions based on evidence, programs and guidelines. In line with recent concepts of "fair implementation" and knowledge equality and then health quality as a result, efforts will only affect the health of the population if delivered fairly over time among different environments and populations.

There is an increasing awareness of the significance of health equality in Dissemination and Implementation science. Equality of health point to provide a fair and equitable opportunity to be healthy, through "reduction and finally, the elimination of inequalities in health and its determinants that have adverse effects for eliminated or marginalized groups.

While the complex and ingrained nature of the background is reflected in executable frameworks such as integrated framework to run and implement research, health research, service, exploration, preparation, implementation, sustainability. These frameworks are primarily for explicit focus addressing health inequalities.

Knowledge equity has increased implicit or exploratory in the field of D&I due to many reasons, including some methodological, funding and resource challenges as well as historically limited structural barriers.

Equality of knowledge helps to accelerate research and implementation of studies. But there are challenges in this. Despite these challenges, there is value and potential impact on transforming knowledge equality into an explicit part of D&I models, frameworks, actions and planning, implementation and evaluation.

Considering equal opportunities to achieve equality of knowledge, we conclude that there must be infrastructure. Given the common goal of the scientific community and pragmatists to improve dynamic processes and eliminate the gap between research and practice, documenting and disseminating science can be helpful.

Understanding how equality of knowledge can be effective in the field of information and operationalization and create development is one of the important issues that can ultimately lead to the creation of a more integrated concept, development, dissemination, implementation and sustainability. It creates interventions to bridge inequalities and bridge the gap between knowledge and practice.

1.1.1 Sensitizing

In order to strengthen the dissemination of science, we must get help from a sensitizer. There are many sensitizers, one of the most important of which can be in the field of health.

Health equity could be used to educate and sensitize Dissemination and Implementation planning and execution. A health equity "sensitizing" perspective could improve Dissemination and Implementation in the ways outlined below.

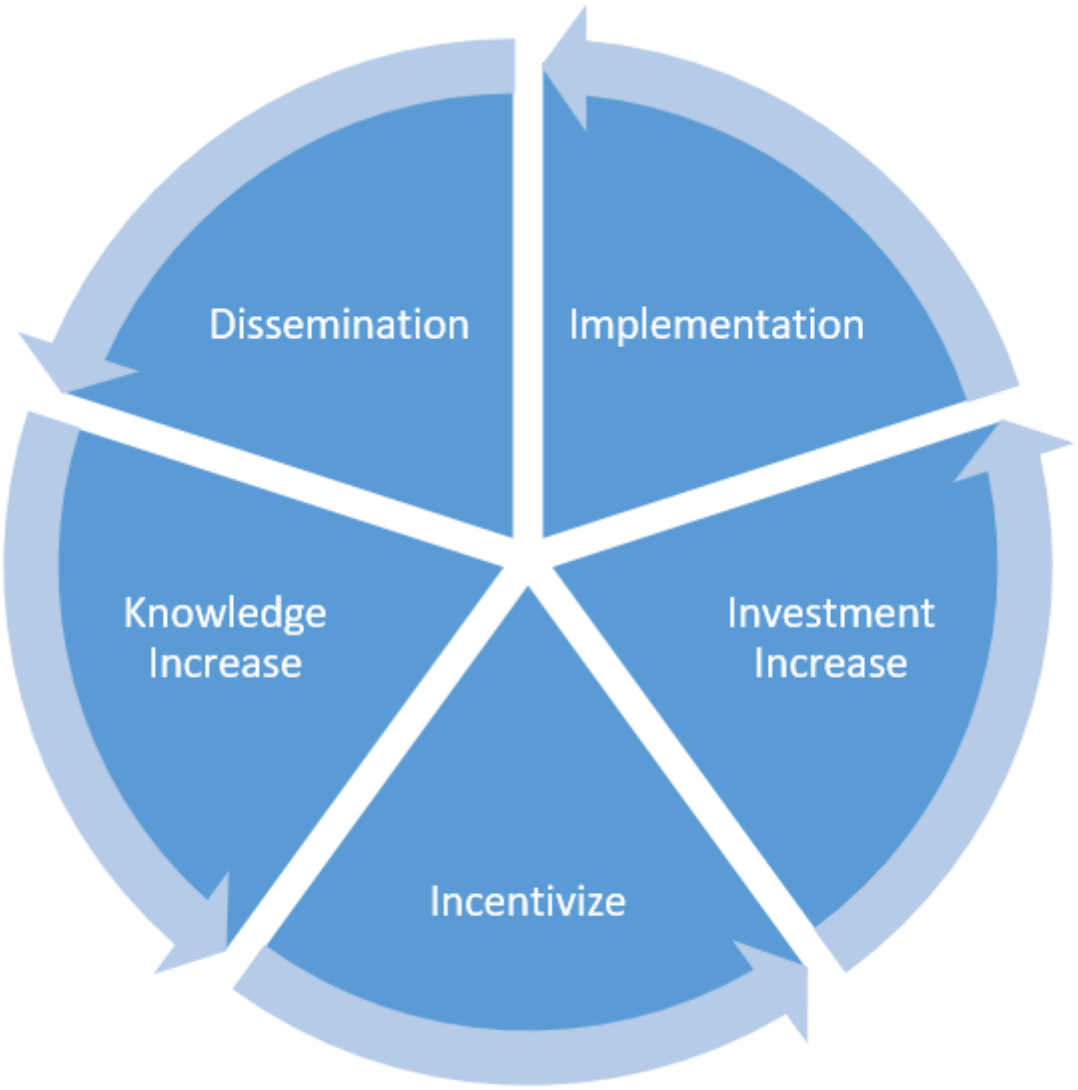

Figure 1.1. Dissemination

It should be mentioned that D&I and knowledge equality are complementary. Participation of the scientific community and stakeholders optimal relationship between knowledge equity and science of D&I requires the active participation of a wide range of stakeholders.

Community participation and co-production of knowledge are complex tasks that require expertise, organizational support and a successful, cost-effective infrastructure. This process is based on chain interaction, with fair sharing power, decision

making during research and resources. Promoting the participation of the scientific community is possible by providing presentation platforms. Interactive cores that help build capacity in communities and Researchers participate as full partners.

By focusing community participation in finance and other support activities, as well as community service targeted at decreasing knowledge inequities, programs can enable meaningful contact between the scientific community and other people involved in D&I activities and research easy and fast.

The dissemination of scientific projects can also lead to the development and training of the workforce. The increase of numerous D&I tutorial opportunities has seen in the last decade in response to the recognized need to increase D&I workforce capacity.

Recent efforts have also focused on practical D&I capacity through web-based, technical training help, self-learning, online toolbox, scientific communities practical interventions and several strategies. Education and capacity building through awareness of current projects and ongoing research is another effective case strategies for developing research skills and potential collaboration and networks.

The platform also helps develop tools and communication, so that people can meet project team members and members of publications and journals and learn about their interests and backgrounds. This in particular could lead to the development of investment partnerships and investment in scientific projects.

The dissemination of projects can provide a financial Support. Providing financial support for scientific projects, pilot studies, and career development are important aspects of disseminating and promoting scientific projects. Promoting research collaborations and responding to priorities for using community-based research resources can also be important aspects of others. It is also necessary to pay attention to the connections that occur as a result of publication. Focusing on knowledge equity can also be used in collaboration.

1.2 Benefits of Dissemination

Therefore, research centers, universities, scientific and medical centers also benefit from them. The increased influence of researchers also increases efficiency. Investors such as governments, scientific societies, and organizations that support and fund scientific research are encouraged to have more information than ever before.

A web portal, also known as a link page, that provides information from a variety of sources.

End users have access to a network resource portal like application and database, that can be accessed via a web browser or other devices. A web portal is a customized website that contains information from a range of sources in a coherent and uniform manner. A web portal can be accessed through the Internet or a private network such as a local area network (LAN) using the Uniform Source Finder address (URL).

Login is required for the web personal portal, although it is not required for the website.

A service-oriented architecture (SOA) is a software design paradigm in which application components deliver services to other components via a network communication protocol. The SOA architecture design provides a framework for connecting independent programs so that users can access its features as services over the network. The main advantage of SOA is that it makes services interoperable, meaning that they can communicate with one another even if each implementation is written in a different computer language or uses a different transport protocol (software that oversees the runtime transmission of data).

1.3 Mediums of Dissemination

Improvements in web portal design mainly focuses on improving appearance. A website uses multiple connections to implement strategies and data transfer. The development process consists of various components or sections such as layout, page, book, menu and placeholder. These components make sharing quality information on a website, easy.

The authors find consistent evidence that countries with a reasonably high degree of internet access had higher results across a variety of tests and sample compositions. Knowledge dissemination can aid individuals in making better decisions and protect investors from unexpected transactions, hence preventing market failures like information asymmetries. Journals and projects that get published can be powerful motivators[3].

The internet increases access to information for all groups of information users such as scientists, governments, investors, and increases the timeliness of information provision. The internet would serve as a primary information distribution channel, therefore it can be the first choice to disseminate publications and events related to the project.

For example, as the internet became more commercialized, companies began to use new corporate reporting channels to supplement or replace paper-based reporting, a practice known as internet financial reporting.

1.4 Architecture and Method

There are several types of portals according to their operations:

1. **Vertical portals**: These portals provide access to different types of information and services about a specific area of interest.

2. **Horizontal portals**: These portals are known as "megaportals". It targets the entire Internet community. These sites allow the user to personalize Page with various information. Accessing the information such as course updates and reports. Mega-portal providers wait for individual users to use the site to access the rest of the Internet.In other words they hope that users first use their own site. These are the portals that are developed and maintained for their use by intranet members or enterprise network.

3. **Knowledge portals**: Knowledge portals improve the efficiency of knowledge workers by providing quick access to critical or helpful information for one or more tasks.

1.5 Design Phase

The efficiency and effectiveness of the techniques can be improved by designing and deploying a suitable platform. Because technology tools and elements are also involved in the learning process and play an essential role as the main media and interactive skills, proper and fruitful interactions require proper planning and structuring[3].

So that social activities and interactions are continuously produced and flowing in a dynamic space and environment, the tools or technologies used should be in line with these goals. This continual flow of interaction contributes to stability in the creation of teacher-student and student-student relationships and interactions, as well as stability in the classroom when it comes to solving problems and tasks.

First, the key to implementing and expanding the philosophy of collaboration and interaction is to understand it. Researchers should understand that having more interactions to solve an issue gets them closer to the objective and makes the learning process easier and more in-depth. They must understand why and how they interact, as well as how these interactions lead to various results. What kind and level of collaboration is expected in collaborative learning, as well as how the group continues to complete the work.

1.6 Dissemination Tool

Any study outcome implementation process starts with awareness; When potential users discover about the tools, or findings and have some idea of how they operate [9]. This platform as a planning tool aids in the methodical growth of awareness by combining the concepts of diffusion and dissemination. Diffusion is described as a passive process in which an invention spreads through channels in a social system over time. Dissemination entails a more active, personalized communication strategy with the purpose of influencing people to accept the innovation. Neither construct, on its own, provides adequate advice for the proper distribution of research findings; nevertheless, when combined, the notions complement and support one another. Both conceptions are reflected in the creation of this planning tool to aid in the dissemination of research findings.

The Distribution Tool was intended to help researchers develop a dissemination strategy that goes beyond traditional methods of dissemination such as conference presentations and peer-reviewed publications. Using only traditional approaches, according to study, is ineffective. In a systematic review of 102 controlled trials examining the effectiveness of strategies for changing behavior, it was discovered that passive approaches to sharing information, such as conference presentations, were less effective than social influencing interventions, such as having respected opinion leaders promote the innovation.

The tool enables researchers to think through the dissemination process and to gather the pieces required to produce a formal dissemination strategy tailored to their individual research, the requirements and interests of their target audience. This dissemination tool strategies emphasize on approaches for academics to achieve their specific project aims and reach target user audiences.The tool also aids researchers in evaluating the best strategies for disseminating patient information by emphasizing the advantages of partnering with dissemination partners to widen user populations' reach and responsiveness.

The platform is useful as a planning tool at various stages of the research process. When the outcomes of a research project are known or the research efforts have resulted in a product, tool, or software, one obvious time to finish it is at the end of the project. Having the conclusions of the study, as well as supporting evidence and pilot data on implementation, can help you persuade distribution partners and end-users. The tool is particularly beneficial early in the research proposal process, as it can help determine user needs and dissemination partner preferences. This data will be utilized to fine-tune study questions in order to address the practical concerns of customers. This tool will attract the interest of both users and partners, allowing you to enlist their assistance throughout the process.Furthermore, through their grant submission procedures, funding agencies are increasingly influencing and guiding academics to examine and plan for distribution as a core component of their initial study projects.

Beginning with diffusion theory, the tool was created in stages. Knowledge, persuasion, choice, execution, and confirmation are the five steps of the innovative decision-making process. In first two stages, the innovation must be understood , including its value and cost benefit, as well as identify key adopters, their beliefs and culture, and how to contact them. The purpose of these processes is to persuade the user of the value of the invention. The organizing strategy for transmitting knowledge was also employed in the tool's design, which included specifying the message, the target audience, the messenger, how the message should be delivered, and how to evaluate the result. Also, relevant literature from the disciplines of health care, change management, sociology, psychology, social sciences, and organizational development which provided us with a broad understanding of dissemination theory and methodologies, is crucial.

One of the challenges is the lack of publicly available dissemination self-assessment tools for researchers. Despite the fact that much has been written about putting research findings into practice, there has yet to be developed a practical evaluation tool that would enable patient researchers to effectively put their findings into practice. In fact, meaningful distribution planning tools for researchers appear to be lacking.

To determine key areas of distribution planning, all accessible information is collated, then it is reduced to the current portions. Then, to assess each of these primary categories, design questions and seek experts from a variety of fields to review the draft tool. Among the reviewers were experts in patient safety research, experts from all over the world in dissemination research,knowledge management professionals, professors who specialize in dissemination theory, leaders of research dissemination organizations, and professionals in charge of developing and maintaining dissemination partnerships.

The tool went through a series of iterations based on their comments. Experts, for

example, suggested that the questions be open-ended to better educate and encourage researchers' opinions on dissemination. This approach was recommended above one that included descriptive sentences and a scale of agreement or disagreement replies a style that is frequently used in other instruments. Specialists also sought to incorporate more information to account for the financial and human resources required for dissemination, also to describe tactical activities and the personnel who would be accountable for completing them. They also stressed the necessity of paying attention to informal user networks, which, as data reveals, offer important dissemination potential. 12 They also advocated emphasizing the necessity of connecting research findings to connector organizations' agendas, as well as understanding the value of timing—identifying events and challenges in the partner's environment that may aid or impede their interest in the study findings.

Researchers from the Patient Safety Portfolio were also enlisted to help finish the tool with their studies in mind. According to expert comments, researchers also suggested adding an action planning section to assist respondents think about practical next actions for putting the plan into reality.

1.6.1 Explanation of the Tool

The tool is designed to create a functioning document that will take numerous iterations to finish. As new information becomes available, changes are made. While the principal investigator may be in charge of completing the tool, he or she should expect to consult with other members of the research team in order to fully utilize their expertise and, more significantly, to get their support for the plan. The planning tool acts as a framework for the team's conversation, with each member contributing their own unique viewpoint. End users and partners should be included in the distribution planning team to better understand their needs and, as a result, the appropriate tactics and approaches for "selling" the innovation. Defining the study, selecting target users, working with dissemination partners, explaining the research, evaluating the performance of the dissemination process, and generating an action plan are the six aspects of the tool. Each part builds on the previous one to assist researchers in developing a thorough plan.

What will be done with the research findings and products? Patient safety research may provide a number of discoveries and/or technologies that should be shared with other researchers and/or target consumers. This section assists researchers in determining what they want to disseminate and how to write the user's value statement. This part, in classic marketing terms, aids with the definition of the "product," which is an important step in the dissemination process. The tool assists researchers in considering ways to bundle or package their findings in order to define the product. For example, if the research findings contain an event reporting system, the researcher could disseminate it as a whole or individually, together with the taxonomy and data analytic tools that were established as part of the system. An assessment of the product's preparedness for dissemination is critical for each product that the researcher produces. The planning tool aids researchers in determining whether a discovery or product is ready for immediate use by evaluating its track record of effectiveness in practice, the strength of scientific evidence supporting the findings, and whether it follows standard protocols. This assessment of product

readiness aids the researcher in developing a convincing value proposition to pique user attention.

Who are the end-users? who will put it into practice? Individuals or organizations that potentially profit from the research findings are referred to as end-users. End-users help to focus on the dissemination plan and target the message. Many change efforts fail because they do not include formal structures and mechanisms. 13 Understanding end-user behaviors and the technologies they use is critical when preparing for dissemination,14 since user networks constitute a potent environment for sharing innovation.

The Dissemination Planning Tool asks the researcher to consider the requirements and values of the users (consumers), as well as why the study is significant to them (e.g., saves time, improves their work). External elements in the environment, such as regulatory demands, often drive user wants. The tool encourages researchers to consider other occurrences that may aid or hinder consumers' interest in their research. A standard released by the Joint Commission on Accreditation in Healthcare Organizations (on examining organizational leadership responsibilities in generating a nonpositive culture, for example) can encourage a hospital administration to look for a patient safety culture-assessment tool. The Dissemination Planning Tool also encourages the researcher to consider user implementation difficulties and how to overcome them. When end-user demands are taken into account, the research message shifts from research-centric to user-centric, resulting in a pull from consumers who want to "purchase the product." Rather of pushing a product on people, attracting them to it will help with distribution.

How can you contact the users as a dissemination partner? Both formal and informal social networks are used by end users to distribute information. 5 Because who proposes an idea has an impact on how quickly it spreads,16 social system rules can control how members interact, and hence affect adoption rates. Dissemination is frequently a fluid storytelling process rather than a linear endeavor. Informal innovation dissemination—through networking, between users, or by tapping into existing networks—is a significant tool for spreading ideas. Researchers are prompted to create a list of organizations with established networks that can affect target consumers due to their legitimacy, expertise, and power of distribution capacity.

Researchers can harness the reach of major intermediaries or connector organizations to adapt and amplify their message to users by working with them. Aligning innovation with corporate goals and values is a crucial technique for implementing innovations in organizations. 17 This element of the tool, like the end-user section, assists researchers in considering the benefits of having partners participate in distributing the study to help them answer the inevitable "What's in it for me?" question.

How do you communicate the findings of your research? The use of a variety of channels is essential for effective dissemination. Multifaceted approaches, according to Bero, were consistently beneficial in encouraging change. While numerous communication techniques (e.g., public and unpublished material, education, academic detailing, etc.) might influence provider practice, Borenstein19 suggests that it is the frequency of exposure to diverse strategies that has the most impact on behavior.

It's also crucial to match the research's intricacy to the appropriate media. This portion of the tool assists researchers in identifying how users obtain information

and, more critically, identifying the channels available through recognized connector organizations, such as Web sites and newsletters. User comments on their information-seeking behavior can also help researchers figure out how to best market their work.

How do you know what worked and what didn't? While enhanced patient care is the ultimate measure of success, this component of the tool assists the researcher in considering interim process metrics of success, such as the number of physicians who want additional information after a product demonstration. It is an iterative procedure to assess the success of the dissemination plan. Dissemination is a process that involves a long-term engagement with consumers and partners, rather than a one-time effort. Continuous feedback allows researchers to assess the success of their messaging, such as which strategy or approach performed best or was most cost-effective.

The input can be used to improve a researcher's distribution strategy. Furthermore, a collaborative effort among academics, partners, and users can improve how research is used and eliminate potential roadblocks, such as those identified by TRIP grantees (behavioral, structural, process, human subjects, partner, study site, and costs).

Where do you begin with a dissemination plan? In addition to assisting with the development of the dissemination strategy, the tool also includes a final area where you can begin accounting for the resources, both human and financial, that will be required to make it a reality. Dissemination plans frequently fail in two areas. They first become an idealistic "shopping list" of every feasible or desired usage for the product that can be recognized, but with no practical time or resource commitments. Second, no designated lead person has been identified to ensure that the tasks outlined are carried out. 21 The section on distribution work plans assists the researcher in outlining both immediate and long-term next-action activities, as well as the timeframes and personnel responsible for them. The researcher is also prompted by the work plan to consider what resources are required to carry out the distribution plan.

1.6.2 Usability

Tools are supposed to be simple to use and make achieving a goal easier, not more difficult. In the academic world, it is not an exception. As technology evolves, many new tools will need to be developed and used by students and teachers who will be obliged to use these technologies to better their learning experience. Learning at a distance has its own set of challenges and concerns, which should not be made more complicated for end-users, but rather made simpler and more fruitful. The arduous task of customizing the application environment should not be done by users. Everything must be handled and prepared by the tool, which enhances the user's experience.

1.7 Thesis Objectives

This portal proposes a framework that demonstrates the interaction and opportunities between knowledge equity and D&I science and highlights, how it can support researchers and encourage them to give more information about their projects.

Researchers' visibility must be improved in order for their work to be recognized in academic and practitioner circles on a global scale. Setting up a platform can thus be seen of as the development of a personal home page, or as "creating a virtual identity insofar as it flags issues, stances, and individuals viewed as relevant by the author." This online presence, or digital identity, is in addition to the academic identity demonstrated by authorship in academic journals and conference proceedings. While the latter is closely linked to the researcher's conceptual development and contribution to the production of formal knowledge, the digital identity builds on these.

If journals, mainstream systems, seminars, and congresses serve as diffusion hubs for offline identities, portals, search engines, institutional pages, third-party blogs and signature files in e-mails, particularly when posted to discussion lists and message boards, serve as diffusion hubs for online identities. Nonetheless, there are two major advantages of internet media over traditional physical distribution methods:

1. Greater potential reach.
2. More up-to-date data platforms, if correctly managed, can provide the most recent news about a researcher's institutional affiliation, as well as recent research trends. In fact, if updated pages are properly meta-tagged and use RSS feeds, no human interaction is required for the changes to be reflected in specific search engines and feed aggregators.

Overall, the most important component should be one's own evolving, up-to-date information. Web friendly search engines reward dynamic pages with rich and focused content with high ranks. The probability of being found under specific keywords is increased by offering descriptions of one's studies and interests, as well as providing documents, other relevant resources, and links to and from other people with similar interests. Simple HTML pages or, better still, a CMS —or CMS-like features from other apps such as blogs – can be used to create this information, which can play a large role in terms of linking and networking.

Reading, live storing, and reinforcing digital diffusion are all possible effects of the platform. Taking comprehensive notes as highlights of what has been read, reflections that come after the reading, or simply as a record of the fact that something has been read is typical of the research process. Researchers can use social software to upload their notes to the World Wide Web as a way to 'present and reflect on their learning' to an audience that is larger than simply their classmates. Furthermore, "knowledge works if each person makes links while browsing," therefore writing, link building, and browsing must all be fully interwoven. If someone notices a connection but fails to connect the dots, he or she is wiser, but the group is not."

The process of reading, writing, analysis, reflection, and learning can all be made public through digital dissemination in the form of a platform; Eventually, there will be publishing in scholarly channels, but there are both more immediate and longer-term benefits. Ideas can be executed more quickly in the short term, and data can be collected automatically. Another immediate benefit of this method of working is that less knowledge is left missing, because each day, a live digital store is established, one that is organized, searchable, and completely available. "Represents a space

where the interaction between memory and promise, the link between past and future is made feasible," says the platform. As a result, a factually driven dynamic identity emerges by following the researcher and generating new knowledge within his community.

The fact that content is categorized, tagged according to specific keywords adds to this identification. And, aside from the fact that classification and searchability might be beneficial to the researcher, full accessibility is critical: data and information must be accessible not just to the content owner or author, but also to other researchers. This can make a difference in terms of improving people's access to knowledge and visibility in developing countries. A platform's intrinsic attribute of immediacy allows users to access knowledge without filters or delays: the platform transforms into a digital storehouse of resources, news and current events, general information, academic materials, and cutting-edge research. It should be mentioned that Internet restriction in some countries can obfuscate this element; however, this is a political issue, not a technological or conceptual one, and thus falls outside the focus of this chapter.

1.8 Why Web?

In many regions of the globe, the Internet is a significant aspect of research and education. Through digital libraries and electronic publications such as e-journals, e-print archives, and online conference proceedings, it is now widely utilized as one of the principal strategies of distributing research findings. According to a recent study, online publishing of articles in computer science may lead to greater citation-based impact. Furthermore, the Web has the potential to drastically alter the connections between the many stakeholders in the field of scientific communication. All researchers may now utilize the Internet to aid in the promotion of their study. There is a compelling case to be made for utilizing the Internet.Academics are frequently free to publish, at least in wealthy nations, so the significant cost would be in the design and production of promotional materials. As described below, web publication allows you to reach out to new audiences. It's also faster than most print media, and it offers hypertext-specific capabilities like linking to whole journal or conference articles from publication lists or summaries, assuming copyright isn't an issue. Another advantage of publishing on the Web is the relative ease with which its online impact may be assessed[21].

Much recent study has looked at the types of intellectual information that may be collected from the Web, particularly Web connections. Counts of linkages between universities have been found in numerous national university systems to provide findings that correspond considerably with source and target institutional research production, suggesting that link counts might be useful measures of scholarly effect. Nearly 90% of the links were established for reasons that were related with academic work but were not online versions of bibliographic citations, according to an experiment that sought to ascribe causes for such link creation[22].

Chapter 2

State of the Art

2.1 Introduction

Data sharing allows research communities to exchange results and expand on the knowledge generated by their discoveries. When it comes to crises, areas such as public and animal health, as well as food safety, would benefit from quick data exchange. However,institutional obstacles, regulatory, and ethical, as well as a lack of acceptable platforms that provide an infrastructure for structured data sharing, frequently result in data not being shared or being given in the form of supplementary materials in journal papers. In recent papers, they offer an informatics platform with protocols for organized data storage, management, and pre-publication sharing of pathogen sequencing data and the analysis[4].

The CDHs provide a full platform for cooperating users to exchange, analyze, and interpret their data. A typical system application begins with a data provider presenting sequence read data and selecting the relevant CDH for sharing. Defined autonomous processes identify these incoming data sets and transport them via a suitable analysis workflow, as determined by the CDH. The analysis's findings in and of itself.

The system offers the following benefits: Responsible open data: COMPARE strongly supports open science and open scientific data; a true understanding of pathogens in global circulation, as well as the ability to model and predict, can only be achieved through a comprehensive view across all previously observed pathogens; for NGS-based methods, what is observed today in surveillance and diagnostics becomes the reference point for tomorrow's outbreak investigation; all data shared through CDHs are thus ultimately responsible[11].

Structured data sharing: to help discovery, maximization of value, and interoperability , data sharing in CDHs has structure and formality; data are validated at the time of reporting against defined and published specifications; similarly, metadata associated with incoming data sets are validated against the appropriate standards; new data are thus integrated into the system in structured form to support full searchability, interoperability, and readines.

Interfaces:Platforms must support a variety of acceptable interfaces, just as users differ in the extent of their data operations and their level of informatics skill. The

systems support the spectrum of users by supporting all CDH functions through both web and programmatic interfaces.

Support:The CDHs are documented with user guides and training materials, in-person training is available, and they operate an experienced email help desk around the CDHs. DTU Uploader is one of the COMPARE platforms with web-based data reporting tools.

The COMPARE program was created to address the issues of open data sharing while still adhering to the findable, interoperable, accessible, and reusable guiding principles for data management and discovery.Finally, data becomes Reusable' as a result of data sharing promotion and explicit conditions of usage.

The Hindu Kush–Karakoram–Himalayan (HKKH) Partnership Project seeks to build institutional capacity for systematic planning and management of protected area ecosystems throughout three national parks in the Hindu Kush–Karakoram–Himalayan region[5]. The project entails the execution of various applied research and development tasks that necessitate the integration of disparate data and information, as well as the interpretation of disparate forms of information and knowledge, such as historical databases , simulation results, system dynamic models, and professional reports.

To address these requirements, the HKKH Project launched an Integrated Web Portal (IWP) concept to facilitate multidisciplinary cooperation, communication, and information dissemination among involved stakeholders and general public users. The IWP used cutting-edge web-based tools and technology to improve access, interactive usage, and the exchange of data, information, and knowledge from a range of sources. The IWP was designed to incorporate a wide range of data and information resources, including project documentation, bibliographic data, model data, geographical data, interactive maps, satellite pictures, and research data.

More significantly, each of these pieces of data and information is coupled with its own set of metadata. Access to these information resources, which are available at http://www.hkkhpartnership.org for multiple users such as the general public, technicians, researchers, scientists, and decision-makers, improves the collaborative learning and sharing culture among the stakeholders of all three national parks that are part of the HKKH Partnership Project in Nepal, Pakistan, and China.

The IWP was created and constructed with a customized content management system (CMS) that focuses on the project contents by providing simple and easy administration of information resources via a workflow process and a common framework for information authoring, editing, publishing, and archiving. This framework offers ways to aid in the creation of optimum information environments.

Furthermore, the IWP system was created with beginner users with little or no technological expertise in mind, so that they may use, run, administer, and maintain the web portal integrating a varied user population and remote locations.

The IWP knowledge base is a metadata management system used by the HKKH Project to improve data and information resource access, usage, and sharing. The knowledge base system enables systematic metadata cataloging in a defined format for information resource description, with a focus on geographical and bibliographical metadata. The Dublin Core standard metadata for bibliographical records was

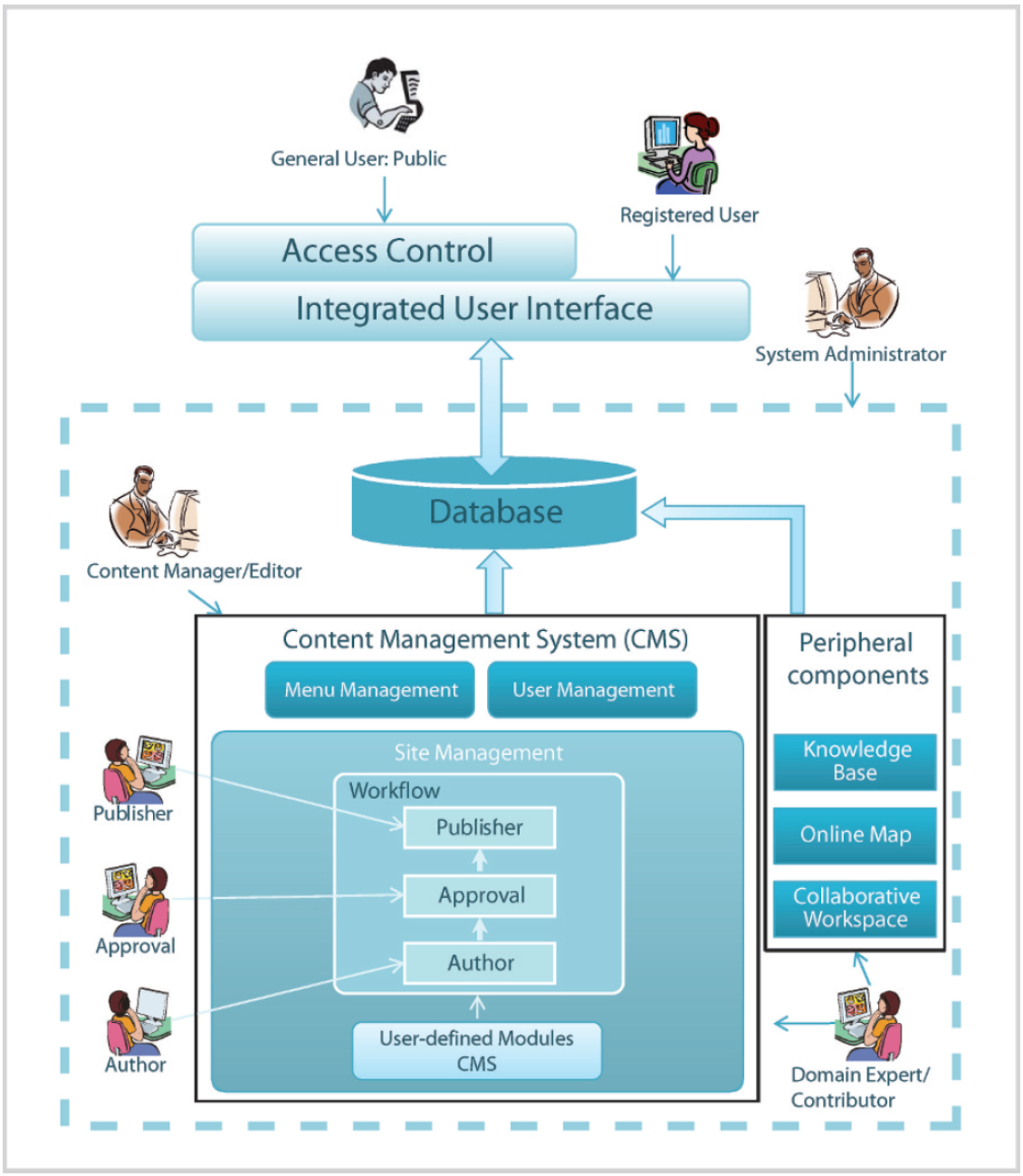

Figure 2.1. The Integrated Web Portal System Architecture[5]

changed, as were ISO 19115 requirements for geographical data. The system is built on the GeoNetwork open source platform established by the United Nations Food and Agriculture Organization.

The Portals program is an international collaboration of doctors, radiologists, and microbiologists from countries with high rates of drug-resistant tuberculosis and data scientists and information technology specialists. Portal is a library of socioeconomic/geographic, clinical, laboratory, radiographic, and genomic data from drug-resistant tuberculosis patient cases supported with physically shareable samples. There are now 1,299 cases from five countries (Azerbaijan, Belarus, Moldova, Georgia, and Romania), 976 (75.1 percent) of which are multidrug or extensively drug resistant, and 38.2 percent, 51.9 percent, and 36.3 percent include X-ray and genomic data[1].

Beijing, T1, and H3 are the most common Mycobacterium TB lineages found in collected samples, while single nucleotide polymorphisms (SNPs) that confer resistance to isoniazid, rifampin, ofloxacin, and moxifloxacin are the most common. These data and samples have aided drug development efforts as well as research into genomics and quantitative image analysis to better diagnoses, while also acting as a useful resource for researchers and clinical practitioners. The TB Portals database and accompanying initiatives are constantly expanding, and we welcome new partners and partnerships.The TB Portals data and the tools are available at https://tbportals.niaid.nih.gov/.

Despite the large number of TB data resources available, the most of them specialize in a certain sort of data. They frequently lack linked patient case information or samples. The TB Portals program is developed under the leadership of the National Institute of Allergy and Infectious Diseases (NIAID), with the mission of uniting genomic, radiological, clinical, laboratory, and socioeconomic/geographic data from prospective and retrospective TB cases and their associated clinical samples, and freely sharing these curated data, including powerful and user-friendly analytical tools, with researchers and health care specialists worldwide.

This mission is accomplished through international collaboration with clinical research sites and scientific research organizations in countries with a high burden of drug-resistant tuberculosis, and the establishment, support, expansion, and promotion of a multifactor repository of anonymized clinical data from patients with drug-resistant tuberculosis. The repository, as well as the supporting country-specific portals and analytical tools, is referred to as the TB Portals.

The Portals were created to synchronize and publicly share data from any foreign contributors. Users (researchers, clinicians, students, biostatisticians, and policymakers) can browse and search through clinical cases of MDR-TB patients, including all of their related data, using the TB Portals' Web interface. More crucially, users can create virtual cohorts utilizing the TB Portal's analytical capabilities, which allow them to execute statistical analyses and visualizations of these cohorts using a user-friendly graphical interface. The TB Portals allow experts to learn from the experiences of nations that have already been hit hard by MDR-TB.

The TB Portals' cases are based on genuine patients and are accompanied by physical samples that can be shared. The accessible data and access to the underlying samples will encourage technologically advanced research projects that investigate the pathogen and disease in many forms.Extensive research on cases that

are unique or difficult to detect using routine diagnostics are welcome, in order to generate treatment recommendations for MDR-TB patients that result in enhanced survival and shorter treatment durations.

The large range of unique and useful data collected from TB patients and maintained on a user-friendly, open-access, and readily searched and analyzed online platform is a key product of the TB Portals program. The TB Portals program has also spawned a number of applied research projects (ARPs), including genome sequencing, quantitative image analysis, and drug discovery efforts. The data from ARPs has since been re-entered into the TB Portals database[12].

When this tool's adjustments were applied to data from the TB Portals in an attempt to forecast the pathogen's medication resistance based solely on imaging data, it was able to make 75 percent of right predictions. As the database increases, performance will improve even more. The TB Portals include a large and diverse data collection that can be easily searched and browsed using filters that allow users to select subsets or cohorts of patient data depending on disease or patient characteristics that are essential to them.

For instance, the filters can quickly identify all patient cases in a specific country where the age of onset was 45 to 64 years, the gender was male, and the patient died as a result of drug-resistant tuberculosis infection, and then view or download all associated demographic, social, clinical, imaging, and genomic data. Users at any level can utilize this method to do comprehensive data searches and create custom case cohorts.

The Portals Data Exploration Portal (https://depot.tbportals.niaid.nih.gov/) allows physicians and health care researchers to compare bespoke cohorts with statistical rigor in addition to viewing or downloading them.

It takes advantage of the TB Portals' uniformly annotated data to allow users to search the entire database, create cohorts of patients with the same or similar clinical, genomic descriptors, and conduct comparative multi factor analyses of the most important determinants of treatment success and survival.

Different detection approaches, such as antigen testing or the use of CXRs or CTs to detect abnormalities in the lungs, could be viable options.The information in the TB Portals can help with attempts to improve current TB diagnostics and develop new ones. Data collecting, data analysis, and the creation of a predictive model are all part of the process of developing a novel diagnostic test. To express statistical power and demonstrate effectiveness, a new diagnostic test must contain a suitable number of well annotated data. The information in the TB Portals may be useful in this process. Conclusion. The TB Portals program is designed to create a worldwide collaborative feedback loop of data sharing and analysis, which will help to expand scientific knowledge and provide useful clinical insights.

Algorithms and new tools will be refined as the international data repository expands. Hopefully, new genetic and/or imaging traits will be discovered that can be exploited for diagnostics and treatments,also predict treatment outcomes in a better way.

Due to its widespread disease burden, M. tuberculosis is one of the most dangerous diseases on the planet, and the rising incidence of medication resistance poses a

threat to the global community. The Portals were created to help with the global and multidisciplinary teamwork that is essential to combat this expanding danger. International network's mission is to create a path from clinical samples to organized and curated data, which includes putting sophisticated and user-friendly analytical tools in the hands of health-care professionals. Join the mission to obtain a better knowledge of drug-resistant TB through worldwide collaboration as a data contributor, analyst, bioinformatician, clinical specialist, or other health care professional.

Only one of the twelve universities and university organizations with headquarters in the department of Norte de Santander provides a platform for keeping academic content (institutional digital repository), dissertations, and undergraduate theses at the regional level. Within the macro-research project "Development of a strategy to manage the construction of a digital repository that will strengthen the visibility and national and international impact of the academic and research output of the Universidad Francisco de Paula Santander-Ccuta," the project will design and develop the Institutional Digital Repository (IDR) for dissertations and undergraduate theses[6].

Engineering, Basic Sciences, Business Sciences, Education, Arts and Humanities, Health Sciences, Agricultural and Environmental Sciences, and 33 Academic Programs comprise the Institution; each of these Faculties has its own undergraduate and postgraduate programs, labs, and research groups. During these training procedures, useful information is created by professors and students in the form of papers, learning objects, theses, and articles, among other things; knowledge that is not always shared with the entire university community, but also with the entire area.

Similarly, the University's Eduardo Cote Lamus Library has a web portal that provides access to a variety of services, including free or subscription access to databases, viewing and downloading of digitized books (e-books), book search and reservation, and a section with links to very important free access repositories where work and research from various universities around the world are stored. In general, all of these services, both physical and technical, are valuable and contribute to university development, but there is a lack of an IDR that allows students and professors to save and consult projects, research, and theses work in a flexible, easy, and quick manner.

It was outlined as an objective to create the Institutional Digital Repository (IDR) to support the dissemination and accessibility of scientific documentation. As a knowledge-generating institution, the UFPS requires processes and tools that enable researchers to publish papers, documents, literature, and projects and also ensure that these are not lost due to limited accessibility, affecting the visibility of researchers' production.

The generated Institutional Repository is an administrable platform that allows the search of content by filtering based on the university's scientific and research production, which is concentrated in the same place, in the UFPS-Ccuta digital repository, it is said that production is discriminated by faculties, programs, and collections, providing an order and grouping with the goal of increasing the university's visibility. The platform enables the creation of faculties, programs, and collections. These programs and faculties are configured by faults, but it is possible to create, edit, or remove those that have already been made. Publications (theses, research)

can be published at the collection level, allowing for grouping and improved order when doing a search on the platform. It is also possible for students and teachers to register (via the university's institutional email) and upload their works; however, this does not guarantee that they will be published; these publications will enter a workflow where they will be thoroughly checked to see if they meet the minimum requirements for publication, such as sufficient metadata.

The IDR provides a variety of statistics, such as the number of visits and downloads the repository has received, which may be categorized by month, year, and country (via a map). These information can be shown using a bar graph for easy comprehension and study[13].

2.2 Previous works

On a technical and organizational level, the Open Access experience has been a success. The on-line Lecture Notes Series available on the ICTP website www.ictp.it is an example of Open Access offerings at ICTP[7]. These notes are properly designed teaching material on sophisticated issues aimed at young students and researchers, particularly those working under difficult circumstances. Another example is the ICTP's African Physical Review (www.aphysrev.org), which provides new opportunities for scientists and aids in the dissemination of African peers' research. These encounters provide both broad and specific insight on "Science Dissemination."

One of the most well-known and respected open indexes is PubMed Central. PubMed Central (www.pubmedcentral.nih.gov), like commercial indexes, gathers metadata from a variety of journals (all in the subject of medicine, of course) and compiles it into a single searchable database. The primary distinction is that open indexes are frequently supported by the government and made freely available. Medical journals published by the OJS should make every effort to be listed in PubMed Central. To help with this, OJS has an exporting tool that creates a file containing all of your journal's metadata, which you can send directly to PubMed.Only their own published information is included in certain open indexes, such as BioMed Central or Chemistry Central. It is not an option for journals not published by BioMed Central or Chemistry Central. Other open indexes include Agricola (www.agricola.nal.usda.gov), which is sponsored by the United States Department of Agriculture, and ERIC (www.eric.ed.gov), which is sponsored by the United States Department of Education, Institute of Education Sciences.

2.2.1 Benefits

Many open databases will also be more ready to accommodate content from new journals, valuing the quality of your content and your Open Access policy over a big library of previously published information. Furthermore, open databases will generally include your work more rapidly. For researchers, open datasets are becoming increasingly vital. While they may not have the same clout or clout as commercial indexes, being a part of one or more of them will greatly improve your journal's profile among a broader population of readers.

2.2.2 ConNECT

For context, the ConNECT Framework was created to integrate a health equity lens across the translational research continuum, from discovery to dissemination, by providing five executive principles: integrating CONtext, fostering a Norm of inclusion, ensuring Equitable diffusion of innovations, harnessing Communication technology, and prioritizing specialized Training[2].

The ConNECT Framework, for example, was created to incorporate a health equity lens across the translational research continuum, from discovery to dissemination, by providing five actionable principles: integrating CONtext (by addressing social and contextual determinants of disparities), fostering a Norm of inclusion, and integrating CONtext (by addressing social and contextual determinants of disparities) (by maximizing diversity of research participants),ensuring equitable diffusion of innovations (by engaging different users for dissemination, participatory approaches to engage stakeholders from conception to dissemination), and prioritizing specialized Training (mentoring disadvantaged investigators, transcultural relevance of the trainings, health equity as a guiding principle of education, and workforce development for healthcare professionals and researchers).

2.2.3 Open Access

Institutional digital repositories, according to an introduction to application architecture, are collections of content produced by instructors and students that are open to the academic community and science. A format that allows unrestricted access to scientific products for no cost. These repositories raise the visibility of digital content created by universities' researchers while also ensuring its preservation[3].

The main purpose of institutional repositories is to make it easier for international scientists to access the results of their members' research and to increase the exposure of the institution's scientific output. Similarly, to aid in the preservation of digital documents put therein, as well as other important items found in an institutional repository, such as publications, articles from scientific journals, and research-related papers.

The Open Access initiative was taken into consideration because it allows any digital content to be freely published, read, downloaded, copied, printed, and referenced, removing legal, economic, and technological barriers and allowing for greater accessibility to documents in educational, academic, and scientific materials, as well as accessing information without prior registration or paid subscriptions for the general public according to OAI protocol.

These are gathered and can take any shape that a community determines. This led to the creation of the first open source institutional digital repositories, such as EPrints, developed by the University of Southampton School of Electronics and Computer Science, and the usage of the OAI protocol, which allows document management systems to communicate with each other (repositories and scientific journals).

Third parties were able to alter and enhance the SPACE project's functions and offer digital collection management services with support for a variety of data types such as video, pictures, theses, and books when it first opened[14].

Later, the Bethesda Statement on Open Access Publishing enabled and encouraged organizations to make a quick and effective transition to open access publishing.

The UFPS digital repository is envisioned as a digital space that will house the University's researchers' investigative findings from their research projects. Electronic records of any form developed by university researchers as a consequence of their academic, teaching, and research activities must be kept, categorized, conserved, and disseminated in open access for this purpose. It is an institutional initiative with the purpose of visualizing the outputs of the academics' study since it is a product of the University's technological advancement.

The technique was designed in accordance with the nature of the objectives that had been established for its development. In terms of knowledge level, the first set of specific objectives used an exploratory-descriptive methodological scheme to identify and analyze the requirements of researchers in the University's research groups. As a consequence of this assessment and analysis of academic and research units' communication practices, a realistic reporting unit model was created. This method promotes access to, visibility of, and distribution of scientific output inside the Institution.

2.2.4 AHRQ-PSRCC

Dissemination and implementation are complex procedures involving several disciplines and actors within a firm. There is no single technique or plan that will work in every circumstance. As a result, in order to traverse their distribution path, researchers must apply a range of methodologies and tools.

There is a framework that gives context for patient safety researchers' distribution tactics. The Framework for Knowledge Transfer of Patient Safety Research includes knowledge development and distillation, mass diffusion and targeted dissemination, organizational adaptation and utilization, and organizational adaptation and use[9]. In response to the steering committee's request, the AHRQ-PSRCC created a practical planning tool to assist researchers in conveying actionable knowledge to potential users as a consequence of this conceptual framework.

New study findings in the field of patient safety improvement are constantly being produced, but efforts to put the findings into practice are uneven. As a result, a practical tool is required. The Patient Safety grantees of the Agency for Healthcare Study and Quality (AHRQ) were given the Dissemination Planning Tool to help them disseminate their research findings. It was created to assist researchers in thinking about major aspects of dissemination, such as packaging research findings, identifying target users, involving connector organizations, identifying hurdles, defining success measurements, and assigning resources to put the plan into action. The tool was created in stages, starting with the adaptation of Rogers' foundational diffusion theory. Health care, sociology, organizational development, psychology, and social sciences literature was studied, giving a diverse range of dissemination theories and practices. The tools that are currently being employed in field-specific situations were examined. All of these sources went through a process of refinement, professional assessment, and testing before being combined.

New study findings are released on a regular basis, providing a wealth of information for improving health care. Unfortunately, putting these findings into practice frequently falls short of expectations. Even when research findings are successfully distributed, innovation dissemination is gradual, if at all. It can take decades to put research into practice in many circumstances. Most grant-making organizations prefer to fund basic research over intervention or implementation projects. The Agency for Healthcare Research Quality (AHRQ), a subsidiary of the Department of Health and Human Services, is an exception, as it is dedicated to bridging the gap between scientific knowledge and improved patient care. AHRQ's Translating Research into Practice (TRIP) initiative, for example, aims to increase the influence of research on patient care by forming partnerships between researchers and health care organizations to improve clinical outcomes and cost effectiveness and efficiency. AHRQ began awarding grants and contracts in 2001 to encourage research and demonstrations in patient safety and medical mistake reduction. The AHRQ Patient Safety Portfolio was formed from these grants and contracts. In partnership with the coordinating center's steering committee, whose members represent patient safety grantees across the portfolio, AHRQ's Patient Safety Research Coordinating Center (AHRQ-PSRCC) provides help and support for the Patient Safety Portfolio. As with the TRIP project, AHRQ is committed to publicizing the findings of this portfolio's research in order to improve patient care practices and, as a result, make the health-care system safer.

2.2.5 Menoci

Dissemination of research data and digital research artifacts is shifting from best practices of individual researchers or groups to project- or organization-wide service infrastructures. An extensible web-portal is required to facilitate and assist this structural change process. This portal[8] contributes to an ecosystem of research data sharing platforms created particularly to serve biomedical research undertakings. The need for systematic approaches to research data management across disciplines is amplified by emerging data-driven research methodologies and the demand for open and reproducible science. Data science and "big data" analytic applications necessitate expedited data collection and metadata annotation by the original producers of source data, i.e. researchers and experimentalists in the lab, while keeping the biological context in mind. RDM is frequently defined as a life cycle task that encompasses the design of a data-generating experiment, the collecting of primary data, processing and analysis, publication and sharing, data preservation, and re-use [15].

The issues of long-term data management have reached a point where structural interventions, such as funders mandating specific data management strategies in grant applications [17] are being implemented. Further political and technological initiatives to permanently incorporate high-quality data management in the scientific process are being backed by commitments to the FAIR Guiding Principles [16] in numerous scientific fields, including the life sciences (Accessible, and Reusable data).

Enabling tools for FAIR data sharing include unique and persistent resolvable identifiers (PID)[18] and descriptive metadata compatible with semantic web technologies. Infrastructural software development should prioritize their smooth integration into ordinary procedures and information systems in biomedical research.

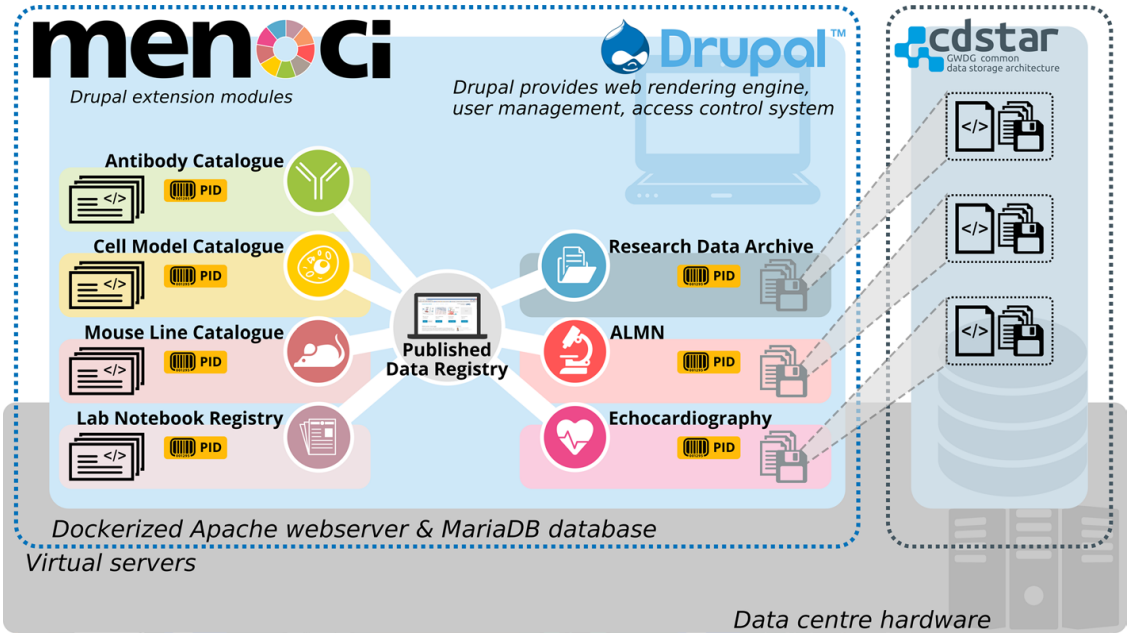

Figure 2.2. System Architecture Schema of the Menoci System [8]

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A possible deployment configuration of the menoci system is depicted wherein both the Drupal webserver and database and the independent CDSTAR storage service a run from separate virtual servers within the same data centre. Drupal installation is again virtualized using Docker container technology for ease of installation and updating. The menoci system consists of eight modules providing distinct features The Published Data Registry module is at the centre of the arrangement as it provides the integral list of scientific publications which is the entry point of linked assets and data. Antibody Catalogue, Cell Model Catalogue, Mouse Line Catalogue, and Lab Notebook Registry on the left each provide specific metadata schemas for experiment asset documentation. Research Data Archive, Advanced Light Microscopy and Nanoscopy (ALMN), and Echocardiography module on the right allow for result data storage. Data and annotated metadata are persistently stored using the CDSTAR service. All assets and data documented through menoci are assigned persistent resolvable identifiers from the Handle system. Menoci icons have been created using images from Flaticon and Freepik.

Data management requirements for biomedical research initiatives come from a variety of places, including funding agency standards, publication regulations, discipline best practices, and the demands of their own users. Based on several years of experience implementing data management for the CRC 1002 and CRC 1190, functional and quality criteria are specified. A fully equipped data management software should improve experiment and material documentation, enable data storage and sharing according to the FAIR Guiding Principles, and maximize usability, information security, and software sustainability and reusability while maximizing usability, information security, and software sustainability and reusability.

In biomedical research initiatives, the modular web portal program menoci is introduced for data collecting, experiment description, data dissemination, sharing, and archiving. Menoci modules are built on the Drupal content management system,

allowing for quick deployment and setup while also allowing researchers to integrate study data management with a customizable project home page or collaborative platform.

Individual researcher or group best practices are giving way to project- or organization-wide service infrastructures in the management of research data and digital research artifacts. A critical ecosystem of open source software tools is required to facilitate and support this structural change process. Menoci is a part of a growing ecosystem of research data management solutions aimed primarily at biomedical research initiatives.

Since 2012, the participating researchers' data management needs have been gathered and translated into an integrated online platform that allows for easier recording of biomedical laboratory procedures, internal data exchange, results publication, and data transfer to public repositories. The design, implementation, and advantages of the produced system are described here, as well as the possibility of reusing the software packages in other biomedical project scenarios.

The system's objectives may be summarized as follows. Increase documentation and findability of experimental data, cell lines. Improve experiment documentation by collecting metadata at the time of initial execution. Enable data storage and data sharing between researchers from different domain. Increase adherence to the FAIR Guiding Principles for all information.

All of the aforementioned must be implemented as a system that: follows information security requirements, follows software sustainability best practices, maximizes usability, and is designed to be reused in other biomedical research initiatives.

2.2.6 School Research Dissemination

The subject of research dissemination via websites is part of the wider question of research usage, and the authors begin with a survey of literature on dissemination theory and best practices.[10]The second phase of the research is an exploratory assessment of the websites and dissemination methods of 30 research institutions specializing in family-school collaboration problems. The researchers assess each website and build a list of potential practices by using the literature review as a reference to look at the websites. Although the findings are preliminary, they raise critical considerations concerning the target audience and the inclusion of all stakeholders in the research-dissemination process.The findings also offer some practical website recommendations for both researchers and family-school cooperation initiatives.

The vast majority of research utilization process studies sorrow the enormous gap between research and practice usage. Early conceptions regarding research utilization envisioned the user as a receiver with an empty bucket, or sponge that would accept information from essays and apply the research studies' conclusions precisely as they were received. it is mentioned this as the classic agricultural extension paradigm, in which the primary goal is to share news.

2.3 Common Issues

Invisibility to the broader research community is one of the key issues that researchers in developing countries encounter. This invisibility has at least two primary consequences: low awareness of discoveries, fields of work, interests, and presence; and poor access to mainstream publishing circuits.

Chapter 3

Methodologies

3.1 Introduction

In this section, the details of the technologies used and the implementation of the project will be discussed. With regard to the final project, it is necessary to first examine its complexities, because the final project determines the appropriate solutions that must be adopted. That's why first the existing technologies is considered. What criteria have led to the selection of technologies needed in this project, and they will be implemented for project development. This section takes the most time to turn the idea into a usable product. Finally, the quality and performance of the project using other tools will be examined.

The figure 3.1 shows the first page of the portal. This is a page where visitors can see brief and useful information about the project, team members and related events. Through the menu at the top of the page, users can easily switch between pages and see other sections of the portal.

For example, the page related to publications, about us and contact us, All these pages have the feature of simplicity and high performance so that the user can easily and without the least amount of time, access to important and required information. Because the main purpose of the portal is to provide a suitable platform without unnecessary information as well as providing the best user experience for visitors.

The figure 3.2 shows the structure of the project. This project consists of various components, each of them is described in detail below.

1. The core of the project is NodeJs Server, which is responsible for receiving and providing information to users' requests.
2. All information is stored on the MongoDB database, which has a very high speed and performance.
3. The Public Panel section, which is accessible to everyone, displays information stored on the server. Users will never be involved in the complexities of information and what happens on the survey, and they can easily get the information they need through this panel.
4. Finally, a Dashboard specifically designed for project owners to easily add, modify, or handle user interactions without the need for technical knowledge.

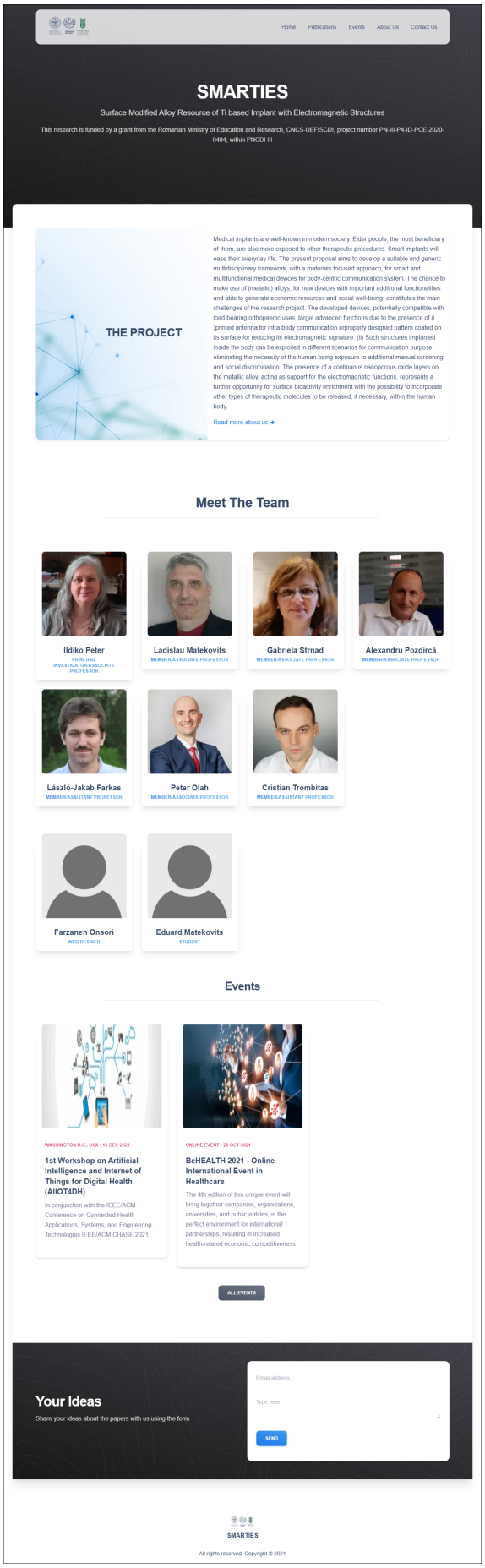

Figure 3.1. Homepage of SMARTIES

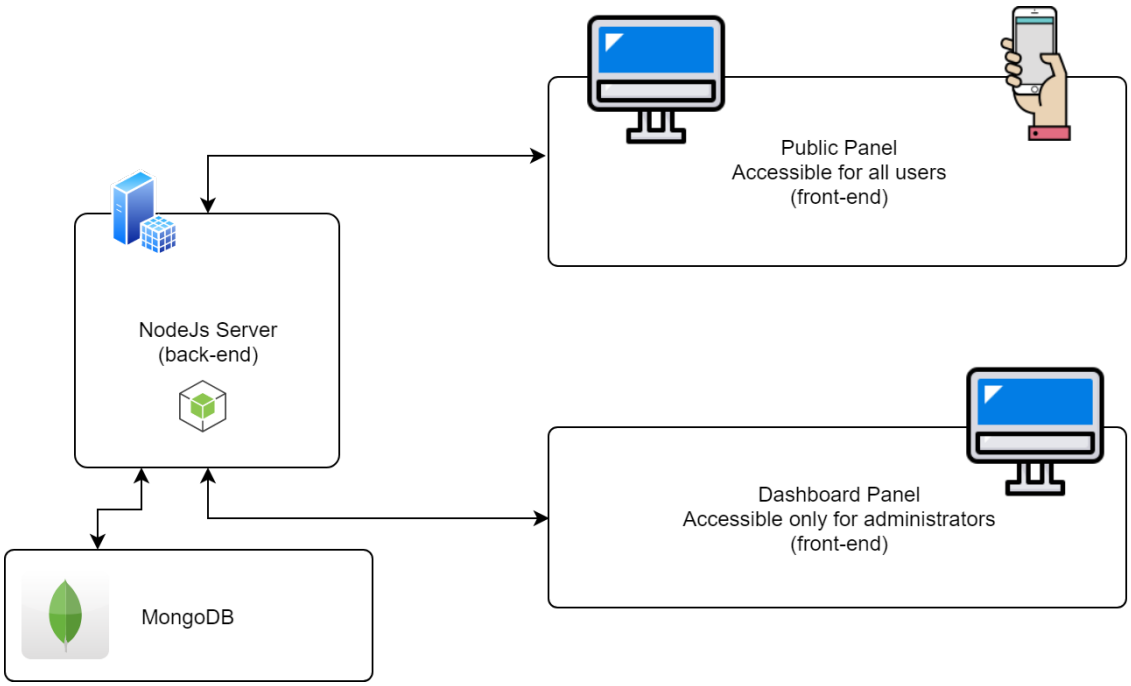

Figure 3.2. Project's Structure

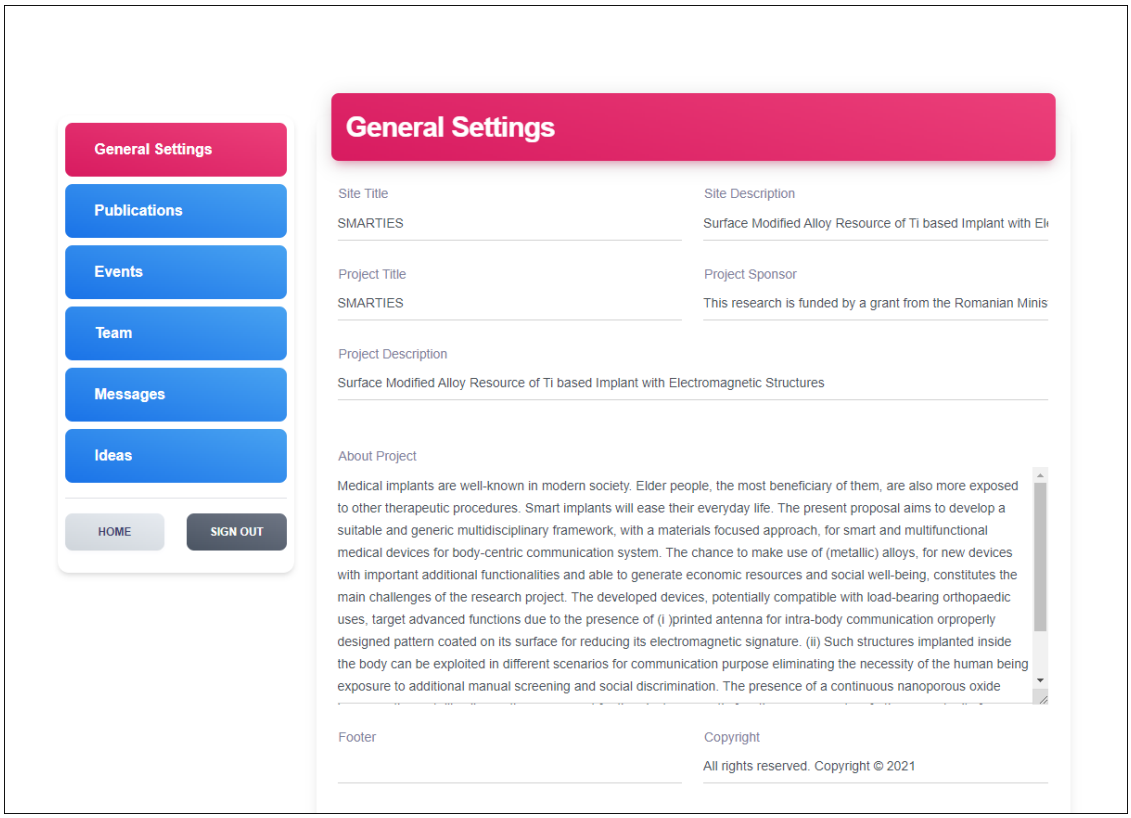

Figure 3.3. Dashboard

3.2 The Project Executive Summary

Medical implants are well-known in modern society. Elder people, the most beneficiary of them, are also more exposed to other therapeutic procedures. Smart implants will ease their everyday life. The present proposal aims to develop a suitable and generic multidisciplinary framework, with a materials focused approach, for smart and multifunctional medical devices for body-centric communication system. The chance to make use of (metallic) alloys, for new devices with important additional functionalities and able to generate economic resources and social well-being, constitutes the main challenges of the research project. The developed devices, potentially compatible with load-bearing orthopaedic uses, target advanced functions due to the presence of (i) printed antenna for intra-body communication or (ii) properly designed pattern coated on its surface for reducing its electromagnetic signature. Such structures implanted inside the body can be exploited in different scenarios for communication purpose eliminating the necessity of the human being exposure to additional manual screening and social discrimination. The presence of a continuous nanoporous oxide layers on the metallic alloy, acting as support for the electromagnetic functions, represents a further opportunity for surface bioactivity enrichment with the possibility to incorporate other types of therapeutic molecules to be released, if necessary, within the human body.

3.3 Technologies and Tools

In this web-based platform, it is tried to use tools that help the dynamics of the pages and get closer to the main goal of the project, which is to be seen more and more in the Internet environment.

Web portals offer a wide range of items to users Properly organized information. In this platform, the possibility of informing and publishing scientific articles and projects is considered. The current process requires a well-defined mechanism to organize, store, access information in web portals as a source for publishing information about a particular set of domains.

The web portal is developed using tools that ultimately help to optimize it. The platform uses various tools such as HTML to describe portal structure, CSS3 for styles and JavaScript as a programming language.

HTML: Separates content into structural categories such as paragraphs, blocks, lists, pictures, tables, forms, and comments, among others. You can use HTML to add headings, create lists, format paragraphs, control line breaks, emphasis text, insert images, create links, build tables, and control certain styling, among other things. CSS: Specifies how each sort of element should be presented in the browser, which may differ depending on the media like screen, print or handheld device. JAVASCRIPT: Instructs the browser on how to alter the web page in response to actions such as clicking on something or changing the value of a form input.

3.4 Node.Js

It is an open source and cross platform, runtime environment for executing javascript code outside of a browser. quite often we use node to build back end services also called APIs or Application Programming Interfaces. These are the services that power our client applications like a web app running inside of a web browser or a mobile app running on a mobile device. These client applications are simply what the user sees and interacts with. they are just a surface and they need to talk to some services sitting on the server or in the cloud to store data, send emails, or push notifications,kick off workflows and so on. node is ideal for building highly-scalable, data intensive and real-time back-end services that power our client applications. what is special about node? node is easy to get started and can be used for prototyping and agile development and also it can be used for super fast and highly scalable services. It is used in production by large companies such as paypal, Uber, netflix, walmart and ... In some applications node was built twice as fast with fewer people.fewer lines of code and fewer files and more importantly they double the requests serve per second while decreasing the average response time. so node is an excellent choice to build highly scalable services.

Another reason of using node is that in node applications, we use JavaScript. Front-end developers can reuse the JavaScript skills and transition to a full-stack developer.

On the other hand when JavaScript is used both on front end and back-end, the source code will be cleaner and more consistant so the same name in conventions, the same tools and the same best practices can be used.

And finally another reason for using node is that it has the largest ecosystem of open-source libraries available to the programmers, So for pretty much any features or building blocks that is going to be added to the applications, there are some free, open source libraries that can be used and it does not need to build these building blocks from scratch and instead we can focus on the core of the application.

More over The Node.js platform is not limited to any browser and can run on a variety of operating systems such as Windows, Linux and Mac . A large community of Node.js users can be an important factor in choosing this platform. The Node.js platform itself owns a web server, so if you are using a web server, Node.js does not use it, because it has its own and uses command lines to run the program (Command Line is actually an interactive way to communicate with the server, and as the name implies, when we want the server to do something for us, we can do so by writing a series of specific commands, which is naturally faster.)

You are typing a website address, or entering a page on a website, or any connection you make with the server as a user, in the server-side programming languages, creates a thread and this thread is temporal. It will close when you have reached your request, for example the page of the website you want to open for you. Now suppose you are going to enter a popular website, a website that has a lot of visitors and of course all these people are searching among the pages of this website or looking for different content, in this case many threads are created. This is where the server probably gets stuck, and we have to upgrade existing servers, which is an additional cost. Of course, it should be said that the main problem here is the high volume of input and output information.

In the example above, the mode that was common is mentioned, but now we want to examine the Node.js approach in these cases. The difference with Node.js is that it uses input-output or I / O operations as an event-driven feature that is non-blocking (this is called non-blocking I / O). In fact, in this method, each connection that the user makes to the server is defined as an event, not a thread (all requests and connections are managed as events when only one thread is formed). In other words, by creating an event-driven mode, it is not needed to wait for input / output operations to achieve the result that the user is looking for, here are just the events that cause the result to be received.

3.4.1 The Architecture of Node

runtime environment:At first node JavaScript was used to build applications that only run inside of the browser. Every browser has JS engine that takes the JavaScript code and converse it to code that a computer can understand, for example microsoft edge uses Chakra, firefox uses SpiderMonkey and chrome uses V8. Due to the veraitey of engines. sometimes JavaScript code behave differently in one browser oranother. A browser provides a runtime environment for JavaScript code. For example in browsers we have the window or document object, these objects allow us to work with the environment in which the code is running. Up to 2009 the only way to execute JavaScript code was inside of a browser, then it was understood that it would be a good idea to be outside of a browser so Google V8 engine which is the fastest JavaScript engine out there and embeded it inside the C plus plus program and call that program Node.exe. So simallar to a browser Node is a runtime environment for JavaScript code.

3.5 React

Why should we use React js instead of other JavaScript frameworks like Angular? React js is one of the best and fastest JavaScript libraries. The library is managed and maintained by Facebook and Instagram and other development communities. React is really an open source library and it is completely free to users. React js is an open source JavaScript library used to build applications with a specific user interface for single-page applications. This library is also used to manage display layers for web and mobile applications.

The React js library also allows you to design and create reusable components. React js was originally designed by Jordan Walk, who worked as a software engineer at Facebook. React js was first implemented on Facebook Newsletter and on Instagram.

The React js library allows developers to design web applications that can be changed without reloading the page. The main purpose of the React js library was to be fast, scalable and simple.

This library only works on the user interface in applications. React can communicate with the MVC instance. It can even be used in combination with other JavaScript frameworks or libraries such as Angular js in MVC.

In React js, JSX is used for formatting instead of the usual JavaScript. JSX is a simple JavaScript that follows HTML and uses these HTML tag commands to represent subcomponents in React. The HTML language is processed by the React framework to respond to JavaScript calls. Here we can even write code in the pure old language of JavaScript.

single line information flow in React js

In React js, a set of immutable variables are passed to the component provider as attributes in their HTML tags. Components can not directly change any properties but can accept the return of a called function so we can apply our changes. All of these processes are known as: "The flow of properties decreases, the flow of reactions increases."

Virtual Document Object Model React js creates a data structure in cache that calculates the changes made and then updates the browser. This provides a special feature so that the entire page is actively waiting for a change so that when a change occurs the page will be updated again and display new information. The React library only updates and displays components that have actually been changed.

3.5.1 The Benefits of React js

React js has a lot of simplicity that you can understand correctly. The component-based approach ensures the life cycle of the application, and the use of a JavaScript framework makes React learning very easy, so that professional web and mobile applications can be easily designed and supported.

React uses a special language called JSX that allows you to integrate HTML and JavaScript. There is no need to use this method and the programmer can use simple JavaScript, but JSX will make things much easier.

React can be used to design mobile applications (React Native). React is a strong proponent of reusability, which means it supports a wide range of code reusability, so we can run both Android and iOS and web applications at a specific time.

React uses a one-way data connection and program architecture called Flux to control the flow of data to components through a distributor control point, allowing large applications generated in React to automatically Easily debug components.

Developers had to use other frameworks to modify a lot of code to change existing components. What they needed was a framework that would allow them to decompose the complexities of the components and be able to reuse those components to make the project easier and faster.

Allows developers to write their own applications in JavaScript. JSX is the only great feature that makes React js easy and fun. Developers can easily view it instantly while creating a new UI. It even allows your HTML code to be imported directly into JavaScript.

Components allow developers to parse complex UIs. The idea of components is what makes React js unique. No more worries about the whole web or mobile application as the complex UI or UIX can be broken down into simpler components. Facebook, Uber, Instagram and Airbnb have used React js to solve user interface issues.

3.6 Next.js

Next is a react framework for the production phase. This sentence can also be written as a fullstack frarmework for react, ie a fullstack framework (including backend and frontend) for the react library! next.js is simply a framework that uses react and builds the entire program (server side and client side).

Next.js and some interesting features:

1. Server-rendered by default React programs on the server side.
2. Using code splitting automatically for faster page loads (Automatic code splitting for faster page loads).
3. Simple client-side routing (page-based).
4. Use a Webpack-based development environment that supports Hot Module Replacement (HMR).
5. Possibility to implement with Express or any other Node.js HTTP server that exists.
6. Customization with your Babel, Webpack project settings.

3.6.1 The Features of Next.js

This section discusses the features and applications of Next.js

1. Server-side Rendering: Server-side Rendering means rendering pages (creating and displaying them) on the server side. In react, the data is taken from the server and on the client side (in the user's browser) from that data to build and display the page (render it).) Is used. In this case, we have created and displayed the page on the client side, but server-side rendering is like when PHP is used to generate HTML pages! That is, the pages are created on the server side and then sent ready to the user so the user does not need to do processing.

SPA or Single Page Application websites do not have real pages, but they are created with JavaScript and dynamically. Such programs do not pose a serious problem (depending on what program you build), but one of the disadvantages is that the user has to wait a relatively long time on their first visit to the site. Why? Because the server first sends the JavaScript files to the user, then the user's browser executes these files, and only at this stage the page data is received from the database and the server. That's why in many SPA programs you see a loading or spinner sign telling the user to wait. "Relatively long" is by today's fast-paced cyber standards. In most cases, this interruption is not a problem.

Another problem with SPAs is the problems with search engine optimization (SEO). If the application is private (for example, the admin page on a website), this page will never be read by search engines, so the issue of SEO does not matter at all, but if the main purpose of the website is to go up in Google and sell the product or It is a special service, you have to think about SEO. Why? Because search engines initially see only a blank page that has JavaScript, but after a few moments, they

receive the content of the page. This interruption can hurt SEO. Also, in a few cases, search engines can not see the content of a SPA page at all, which is very bad in terms of SEO.

This is where server-side rendering comes in handy. If the pages are created on the server side and then we send that ready page to the user, we will not have any problems in terms of SEO. Also, that initial pause no longer exists and the pages are displayed to the user instantly. It should be noted that React by default has features that allow you to do server-side rendering in the react itself, but it is a bit difficult to configure and set up, and in terms of functionality does not reach Next.

2. File-based Routing: The second and most popular feature of Next.js is File-based Routing. In the react library, by default, there is no router that monitors the user's path and changes the browser URL, but packages such as react-router is used. The job of such packages is to change the URL in the user's browser to prevent the browser's default behavior (sending an HTTP request) and then display different content on the same page, so there is a kind of trick, user thinks our program has different pages.

One of the disadvantages of these packages is that we have extra coding in them and we have to combine them with React. Also, there is no connection between our React components and the program routes, except what we have explicitly specified with the code. Next.js solves this problem by introducing its own navigation system! In Next.js we use files and folders to define a new route! In fact, in Next.js projects we have a folder called pages that should have the exact same name. Now inside this folder, there will be other folders and files and the structure of these folders and files will be exactly the routing system of website!

Such a system has several important advantages for building a route. First of all, there is no need to write code to generate routes, but Next.js does it for us. Secondly, due to less code writing, the readability of the code is increased and the project is prevented from being crowded. Thirdly, it is much easier to understand the routing system in this case, because by looking at the pages folder, you can easily see the site paths. Naturally, this routing system has all the features of modern navigation systems: for example, there is access to nested routes, dynamic routes, dynamic parameters, and so on.

3. Fullstack Capabilities: React is built for the client side (user browser). What Next.js does is simplify combining react code with server-side code (site logic). If Next.js is used, it will be very easy to build an API on the server side to work with React. With this account, processes that require a server and API will be easily accessible. For example, the process of user authentication, data retrieval, data storage and the like are all easily done.

We can have a react project without Next.js and write the API separately. In both cases, we have to write the API ourselves, but in Next.js projects, in addition to the previous advantages, we also have the advantage that the server-side code (for example, Node.js) and the client-side code (React) are in one project and together. So it will be much easier to manage.

4. Stable incremental static reconstruction: This feature allows to generate static content dynamically. In this project there is a website platform (like the Rocket

website) full of educational articles. When someone clicks on / news / [link] (this [link] can be anything), it is wanted to give a static page as soon as possible.

We do not want this page to load completely at the same time, as this will take a long time. In some cases, this is not possible at all at the time of construction. Also, sometimes content may change, such as quickly editing a blog, so we really don't want to have a completely static page forever.

The solution is Next.js, static pages in a dynamic way and update them can be generated. This means that when Next fetches that particular URL, it stores it as a static page and serves it statically whenever someone visits that path. At the same time, there will be dynamic acceptance of new routes. Not only this can be done, but with a validation parameter specifying that Next.js updates static pages in the background once every x seconds if it changes!

3.6.2 Advantages and Disadvantages

Like any other tool in the world of programming, Next.js has its advantages and disadvantages. There are three main advantages to using Next.js for a project:

It has a much better UX or user experience, because it does not have an initial interruption in loading pages and the loading speed will be much better. Website speeds increase, especially when server caching is used so that pages do not always have to be created on the server side. In caching, it saves pages that do not change, and in subsequent requests, without having to rebuild, it sends them directly to the user, which is a very fast process. Regular and very fast development due to the integration of the project on the client and server side.

On the other hand, using Next.js also has disadvantages. These disadvantages usually include the following:

1. Routing system inflexibility: Although the routing system is preferred, it cannot be changed. There is no way to change that.
2. Server-side language limitations: The Next.js framework selects its server-side technology Node and cannot be changed. For example, if you want to use PHP instead of Node, it is not possible. Even if you want to use a very similar technology like Deno instead of Node, it is still not possible.
3. Lack of state-manager: Although Next.js is a complete framework, it does not have a state manager, so you have to fix this yourself. This problem is solved on the client side with packages like Redux.

3.6.3 SSR & SSG

Besides all of the amazing features that Next.js has to offer, there's one in particular that is very powerful: the ability to use different pre-rendering techniques. Server-side rendering (SSR) and Static site generation (SSG) in the same Next.js application.

SSR (server-side rendering) Modern JavaScript frameworks have made the development of websites much easier. Developers can create powerful, rich web applications using many different rendering techniques.

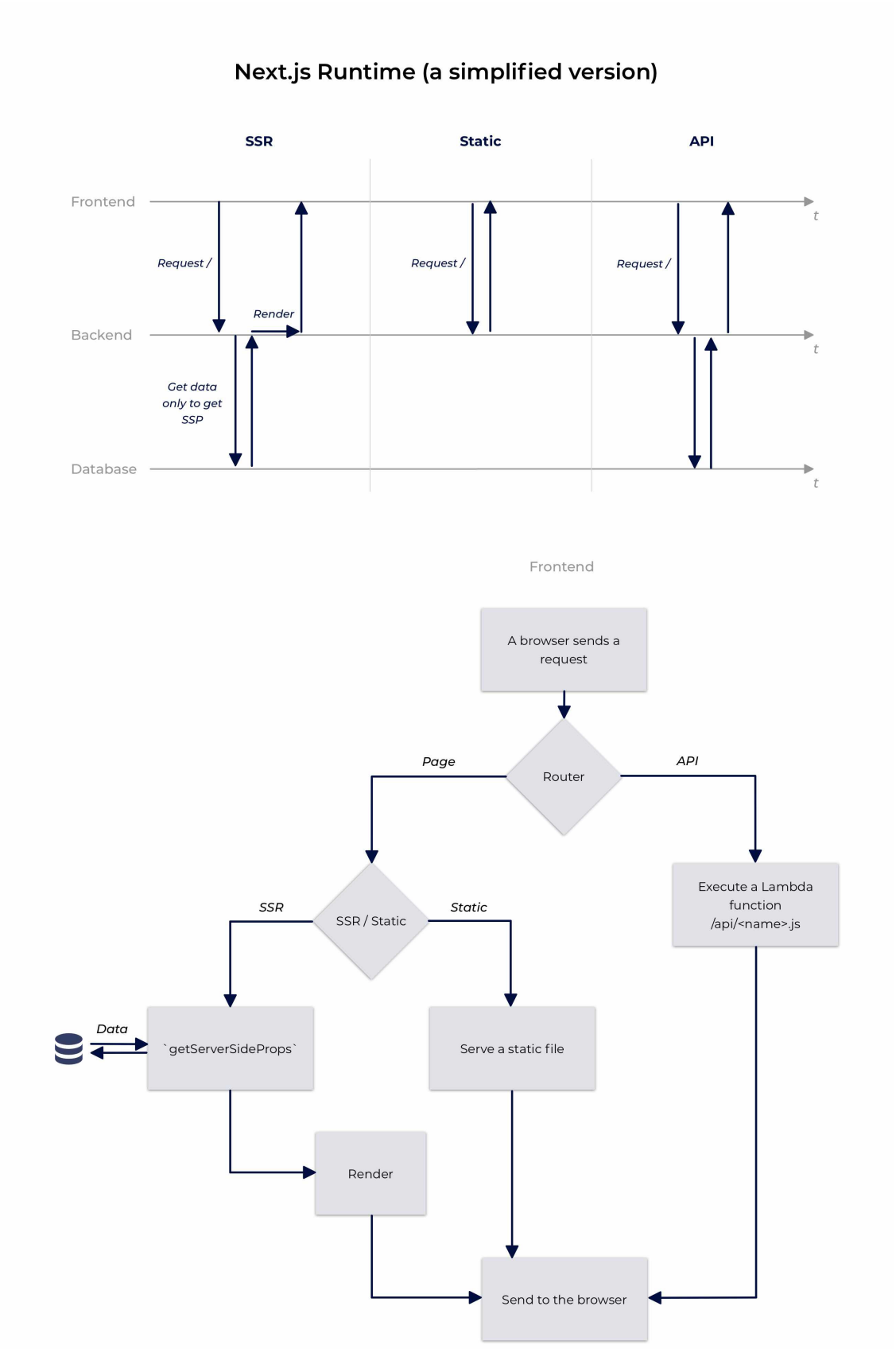

Figure 3.4. Next.Js Runtime Diagram

A single page application is an application that is rendered at the client side, even if the data might be fetched from the server. Server-side rendering (SSR) is the exact opposite of this. SSR describes the process of pre-rendering the page on the server, which is then generated upon each user request.

When the pre-rendered page reaches the browser, JavaScript code is run to make the page interactive. This whole process makes the load speed faster. It also makes it easier and preferable to use server-side rendering for applications that depend on SEO. Next.js does this work out of the box. By default, it will try to detect which pre-rendering technique the application is using and fetches data.

SSG (static site generation)

Years ago, before JavaScript became so mature and powerful, developers usually returned HTML files based on HTTP calls. It was a very common technique to process the response on the server side using a server-side language (usually PHP) and returning a static HTML file.

Static-generated websites are nothing new for developers. We have been building them since the beginning of the web. Building rich web experiences can be hard, but with Next.js we can do so easily.

Next.js has introduced a better way of building static-generated websites with more dynamic performance. SSG describes the process of building websites that render at build time. The output is an HTML file, assets such as JavaScript and CSS, and a few other static files. When using SSG with Next.js, the page is pre-rendered at compile time. That means that the user won't have to wait for the page to load at the browser; the page will simply be rendered.

For data fetching, Next.js provides three different functions:

1. **getStaticProps:** The page will be pre-rendered at build time
2. **getServerSideProps:** The page will be pre-rendered at runtime
3. **getStaticPaths:** This function generates a list of pages that will be pre-rendered at build time

The biggest disadvantage of using SSG is that the build time can get very long. There is no problem when there are only a few statically-generated pages, but as the application grows, the build time will increase. The worst case scenario is when there are hundreds of statically-generated pages. The build time will take a long time, and if you have dynamic content on those pages, it can end up with too many builds.

Which one should be used? Next.js makes it easy to pick the correct pre-rendering technique for each page. Note that Next.js does static site generation by default. It simply works out of the box. However, it will try to detect which pre-rendering method you're using for each page.

There are definitely some cases in which choosing the right function for fetching your data will make a difference. It should be taken in consideration because it can cause a huge impact on the user experience. Imagine that we are creating a simple blog website. The content will be totally statically-generated, right? We will have only a few pages and the content will be fetched from our server, so it makes total sense to go with SSG in this case.

```
smartiesusr@proiect-nodejs:~/portal$ npm run build

> web@1.0.0 build /home/smartiesusr/portal
> rm -rf .next & next build

info  - Loaded env from /home/smartiesusr/portal/.env
info  - Using webpack 5. Reason: Enabled by default https://nextjs.org/docs/messages/webpack5
info  - Checking validity of types
warn  - No ESLint configuration detected. Run next lint to begin setup
info  - Creating an optimized production build
info  - Compiled successfully
info  - Collecting page data
info  - Generating static pages (3/3)
info  - Finalizing page optimization

Page                                         Size     First Load JS
┌ λ /                                        3.35 kB         86.2 kB
├   /_app                                    0 B             67.6 kB
├ o /404                                     194 B           67.8 kB
├ λ /about                                   2.19 kB         80.9 kB
├ λ /contact                                 2.63 kB         85.5 kB
├ λ /dashboard                               1.34 kB         76.8 kB
├ λ /dashboard/events                        1.81 kB         77.9 kB
├ λ /dashboard/events/[eventId]              1.69 kB         81.8 kB
├ λ /dashboard/ideas                         1.56 kB         77.1 kB
├ λ /dashboard/messages                      1.59 kB         77.1 kB
├ λ /dashboard/publications                  1.79 kB         77.9 kB
├ λ /dashboard/publications/[publicationId]  1.8 kB          81.9 kB
├ λ /dashboard/settings                      1.94 kB           82 kB
├ λ /dashboard/team                          1.75 kB         77.8 kB
├ λ /dashboard/team/[teamId]                 1.86 kB         81.9 kB
├ λ /events                                  3.89 kB         78.3 kB
├ λ /events/[...eventId]                     2.48 kB         81.2 kB
├ o /login                                   2.26 kB         77.8 kB
├ λ /publications                            3.94 kB         78.4 kB
├ λ /publications/[...publicationId]         2.63 kB         81.4 kB
└ λ /team/[...memberId]                      61.7 kB          136 kB
+ First Load JS shared by all                67.6 kB
  ├ chunks/framework.717d42.js               42.2 kB
  ├ chunks/main.8d1561.js                    23.3 kB
  ├ chunks/pages/_app.587abe.js              577 B
  ├ chunks/webpack.666cb8.js                 1.55 kB
  └ css/7343fc369b1ffa220a00.css             57.3 kB

λ  (Server)  server-side renders at runtime (uses getInitialProps or getServerSideProps)
o  (Static)  automatically rendered as static HTML (uses no initial props)
●  (SSG)     automatically generated as static HTML + JSON (uses getStaticProps)
   (ISR)     incremental static regeneration (uses revalidate in getStaticProps)
```

Figure 3.5. Page Generation

3.7 MongoDB

In recent years, NoSQL databases have gained a lot of popularity among startups and programmers, and one of the most famous was the MongoDB database. MongoDB is a NoSQL database that, unlike databases such as SQL Server and MySQL, does not follow a relational structure. In the MongoDB database there are no table, column, and row concepts, but instead the database structure is Document Base, so that the data in MongoDB database is stored as documents with a structure similar to json.

Documents used in MongoDB do not have a fixed schema, unlike relational database tables. The MongoDB database is completely open source and written using the C plus plus, JavaScript, Python, and GO programming languages. Most popular programming languages such as Java and Csharp or Python, PHP, etc. have libraries for accessing the MongoDB database. The MongoDB database is very fast and runs on all common operating systems in the world such as Windows, Linux, Mac OS X, Solaris and FreeBSD.

One of the reasons for the high speed of the MongoDB database is that, unlike relational databases, MongoDB does not need to store document structure information separately, and all of this information can be extracted from the document itself.

MongoDB is currently one of the most popular databases in the world. Object mapping is very easy in object-oriented programming languages in the MongoDB database. With features such as Indexing, Load Balancing, JavaScript execution by the server and support for very large databases, MongoDB is an ideal option for programmers to implement various projects.

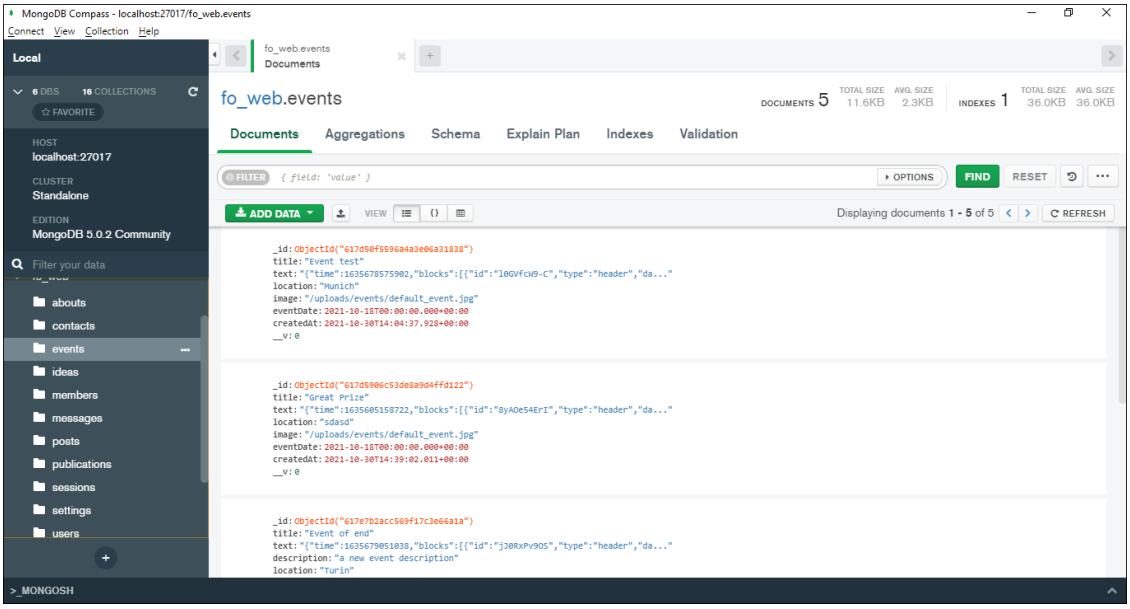

Figure 3.6. Project's Database

The record in MongoDB is a document, the structure of this document contains data that consists of two parts, field and value, MongoDB documents are similar to the JSON structure in JavaScript, but uses a variable called Binary JSON, BSON And thus the Mongo database can be adapted to more types of data.

The fields in the documents depend on the columns in the relational database, and the values in these documents can vary as much as the data types, which according to the MongoDB Guide can include other documents, arrays, and array documents.

The documents that should be the primary key in MangoDB as a special identifier are the base unit in MongoDB. Sets include a set of documents and operations that are equivalent to tables in relational databases. But the limitation is that the data in a set cannot be published in different databases.

The BSON data exchange and storage format used in MongoDB provides a two-dimensional view of JSON-like documents.

3.7.1 Strengths and Weaknesses

The following is a list of the pros and cons of the MongoDB database:

Strength

1. It is free and you do not need to pay to use it
2. It has a very high performance
3. It is very flexible
4. It is very dynamic and has high scalability
5. It is based on documents
6. Distributed
7. Easily integrates with Hadoop in metadata
8. It has high geographical support
9. It is almost as powerful as the SQL language

Weakness

1. The size of data in MongoDB is usually larger than other databases
2. It has less flexibility in query (for example, it does not support JOIN)
3. Transactions in this database are complex

MongoDB database is suitable for the following:

1. Blogs and content based systems
2. Online Stores
3. Instant statistics services like Google Analytics
4. Geography-based services
5. Social networks on web and mobile platforms

Many companies have used MongoDB to implement their services:

Craigslist: Craigslist is a very large-scale on-demand service Uber: A very large online taxi service. SourceForge: A gateway-like code repository that allows programmers to share their code there. The New York Times: One of the largest and most famous American newspapers. The Guardian: One of the largest and most influential English newspapers.

Like other NoSQL databases, MongoDB does not require predefined models and stores any information, giving users the flexibility to build any number of fields in a document, thus comparing MongoDB databases compared to relational databases are easier.

One of the advantages of using documents is that these components draw the main types of data using multiple programming languages, and having these documents inside the database reduces the need to connect databases, which can reduce costs. .

As mentioned earlier, the main feature of MongoDB is that it has horizontal scalability, which makes MongoDB a useful database for companies launching big data-related applications.

Although MongoDB has a lot of advantages, there are disadvantages. Since MongoDB has a FailOver strategy, a user installs only one primary node in the MongoDB cluster. If the primary node does not work well, the sub-node automatically replaces the main node. .

This change ensures the continuity and stability of the program, but it does not happen immediately and may take up to a minute. In contrast, Cassandra NoSQL databases support several main nodes, if one of them does not work well, another node is put in place to provide a highly accessible infrastructure for the database.

The main node of MongoDB also limits the speed at which data is written to the database, data writing must be recorded on the main node, and writing new information to the database is limited by the capacity of the main node.

The Graphical User Interface (GUI), known as Compass MongoDB, allows users to work with document structures, search, sort data, and more. By connecting to the NoSQL database users can access their business intelligence tools, visualize the data and generate reports using SQL queries.

The SMARTIS platform development process has a life cycle. The following factors were considered during the creation of the SMARTIS platform: Preparation, with the goal of finding and accumulating information that would allow for the identification of both structural and organizational qualities that would define the platform as a repositoryciterodrigez18. Establishing laws and guidelines for the platform's establishment and use, as well as examining the various norms and standards utilized in the distribution of data and information from the web-based platform. The interfaces and visual components of the platform were designed based on the institutional identity to organize and portray the materials to be included in the platform, as well as the design of some of the primary services. Over the course of a Free Software distribution, components and visual interfaces are installed and configured. Create the platform while adhering to the norms and standards that have been created for platforms of this type, as well as the needs and dissemination rules[20].

As well as all software projects, this process required four steps:

1. Project planning: Depending on the type of project, the time required for development is estimated.
2. Design: It should be ensured that it is easy to understand.
3. Coding: Specifies where the programmer should implement and modify his code.
4. Tests: The performance of the implemented code is tested and determined.

3.8 Platform Design

Design phase consists four main steps:

Step 1: Design the wire frame First, according to the type of platform and needs, an overview of the platform should be designed. This view contains a general map of the site pages and determines the position and arrangement of various elements. This stage of platform design is called "wireframe design".

Step 2: Graphic design of the platform Once the location of the site elements is determined, we need to design the platform. At this stage, the platform is designed according to the type of special software for coloring and graphics.

Step 3: Coding and programming Depending on the designed site and needs, at this stage, different methods can be used to manage the site. Content management systems, in this case a dedicated programming framework. Decisions in this area are made based on costs and needs.

Step 4: Set up the platform After completing the previous 3 steps, the platform in the global context of the Internet will be launched. At this stage, after preparing a "host" and "appropriate domain name", configure the platform and make it available to the public.

3.8.1 Website Content Sections

Content Management System (CMS), is a computer program, which allows the user to publish content, edit, manage, delete, etc. for a web-based platform. Managing a website with the help of tools available in CMS is very simple. So that the author or site administrator can add content to the site or modify and delete it without any coding or programming knowledge. The content management system is installed on the host space or the web server, and then the change in the appearance of the site, content management, communication with users and any action that takes place on the platform, is implemented through the same CMS. When building the site, any type of CMS can be used.

Usually all dynamic sites use a content management system. Otherwise, the slightest change in the content or format of the site will require programming.

3.9 Search Engine Optimization (SEO)

Search engines are technologies that aid in the discovery of information on the Internet. Search engines collect descriptive metadata and keywords from the fulltext of various online sites and generate vast, searchable indexes using programs known as'spiders,' which 'crawl' the 'web.' Some search engines, like Google (www.google.com), try to cover the entire web, while others specialize in a certain type of content[7].

For example, Scirus (www.scirus.com) indexes only scientific websites, while Google Scholar (www.scholar.google.com) includes only academic information. A similar service is Microsoft's Live Academic (www.academic.live.com) Getting found, staying found, and boosting impact.

Your library will be able to direct you to the most appropriate search engines for your journal. Search engines are becoming the first research choice not only for students, but for a growing number of experts as well, despite being nowhere near as smart or focused as the resources previously listed. Getting your site properly indexed in a number of search engines will help you reach a larger audience.

One of the most difficult tasks facing your journal is ensuring that it gets 'crawled' and indexed by the major search engines, and that the indexing terms gathered will be beneficial in assisting people in finding your content. With many search engines providing hundreds of thousands of results for practically any search, you want your journal to appear as high as possible in the result list. Because most people only look at the first ten results, therefore optimizing ranking is critical. Each search engine will have its own system for ranking relevance. For example, Google Scholar "aims to order articles the way researchers do, weighing the entire text of each article, the author, the publication in which the article appears, and how often the piece has been mentioned in other scholarly publications," according to the company.

The right use of metatags, keyword positioning, and regularly submitting your site for search engine indexing are all crucial tips for improving your journal's position in a variety of search engines.

Search Engine Watch (www.searchenginewatch.com/webmasters/) has a wealth of information on these and other topics. Google's Webmaster Central (http://www.google.com/web) and their support website for academic publishers (http://scholar.google.com/intl/en/scholar/publ) both offer assistance with indexing in specific search engines.

Each time a user enters a word or phrase into their browser's search box, thousands of results are listed, usually on multiple pages, with ten on each page. But how do search engines decide which sites to display on the first page? Every search engine has many algorithms for ranking sites. Take Google for example; This search giant has algorithms and criteria for reading and categorizing sites. With the help of robots and various methods, it reads the pages of a site and decides what rating to give to the site according to the available content. SEO is the art of optimizing search engine behavior, reading, and website content. Items such as valuable and non-duplicate content, relevant keywords, optimized images, site loading speed, responsiveness, number of visitors, user satisfaction, and the like, make your site valuable and Appear in better results.

One of the positive features of this platform is its responsiveness. Today people surf the web with different devices, it is necessary to optimize the sites for all devices.

That means, for phones, tablets, laptops and desktops to be displayed in full screen and completely optimized. Sites that resize to fit each screen are called Responsive. The responsiveness of the site is one of the factors that make the user interface easy and ultimately help to get a better ranking.

For example; On a site that is not responsive, text words are too small for mobile users. Even if the user zooms in on the phone screen, it is necessary to constantly scroll left and right, which is not at all satisfactory. It is natural that such a site loses its mobile users, which are not few today, and this will not go unnoticed by Google. As a result, the ranking will drop!

In the past, those who cared about mobile users used to build sites for both mobile and PC versions. This was both costly and time consuming. SEO is very sensitive to the responsiveness of the site and one of the first steps to be taken to optimize the site is to use an optimized template for the site.

3.9.1 SEO and Usage of JSON/LD

People who produce and consume information on the Web can benefit from Linked Data. It's a method of connecting Web sites through a network of machine-readable data based on industry standards. It enables an application to start with one item of Linked Data and then follow embedded links to other pieces of Linked Data located on various sites throughout the Internet.

JSON-LD is a Linked Data format that is simple to use. Reading and writing are simple tasks for humans. It's built on the popular JSON format and aims to make JSON data more interoperable at Web scale. For programming environments, REST Web services, and unstructured databases like Apache CouchDB and MongoDB, JSON-LD is an excellent data format.

JSON-LD: Publication[1]

```
<script type="application/ld+json">{
      "@context": "https://schema.org",
      "@type": "NewsArticle",
      "mainEntityOfPage": {
      "@type": "WebPage",
      "@id":"http://smarties.umfst.ro/publications/619bad1dfe
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            Metallic%20Alloys%20for%20Biomedical%20Purposes"
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[1] https://developers.google.com/search/docs/advanced/structured-data/article.

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            "name": "Metals 2021,11,1626.",
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            }
      },
      "description": "In the present research paper, two systems
         based on Ti-Nb-Zr-Ta and Ti-Nb-ZrFe, containing non-toxic
         elements, are considered and investigated. The first aim
         of the paper is to enlarge up-to-date developed -type Ti
         alloys, analyzing three different compositions,
         Ti-10Nb-10Zr-5Ta, Ti-20Nb-20Zr-4Ta and
         Ti-29.3Nb-13.6Zr-1.9Fe, in order to assess their further
         employment in biomedical applications. To achieve this,
         structural, microstructural, compositional and mechanical
         investigations were performed as part of this study. Based
         on the results obtained, the alloy with the highest Nb
         content seems to be the most appropriate candidate for
         advanced biomedical applications and, in particular, for
         bone substitution.",
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         elements, are considered and investigated. The first aim
         of the paper is to enlarge up-to-date developed -type Ti
         alloys, analyzing three different compositions,
         Ti-10Nb-10Zr-5Ta, Ti-20Nb-20Zr-4Ta and
         Ti-29.3Nb-13.6Zr-1.9Fe, in order to assess their further
         employment in biomedical applications. To achieve this,
         structural, microstructural, compositional and mechanical
         investigations were performed as part of this study. Based
         on the results obtained, the alloy with the highest Nb
         content seems to be the most appropriate candidate for
         advanced biomedical applications and, in particular, for
         bone substitution."
}</script>
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JSON-LD: Event[2]

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[2] https://developers.google.com/search/docs/advanced/structured-data/event.

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            }
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}</script>
```

3.10 What Is GTMetrix?

With Google revealing in recent years that page speed is a crucial element in search results rankings, there has been a greater focus on website performance than ever before. There are a variety of online tools that may be used to improve the performance of your website, each with its own set of costs and features.

GTMetrix is a page speed and performance analysis tool. It assigns page ratings and includes Pagespeed and WiSlow. It is a free application that has been shown to be useful in obtaining thorough reports on the operation of a website. It assigns scores to the pages and makes ideas for how to improve them. It enables clients to do precise analytics. GTMetrix's main goal is to analyze a website's performance and present a list of practical recommendations for improving it.

The ability to collect important performance information quickly and easily is one of GTMetrix's most enticing features. The users are provided the Full Loaded Time when the analysis is completed, which reveals how long it takes for the website to load in seconds. They're also provided the Total Page Size, which allows them to figure out how many megabytes the page is. Finally, in Requests, they are given the total number of assets used by the website at any given time. If you offer them this information, they can use GTMetrix to get a good understanding of their website's performance.

One of the KPIs in GTMetrix is the Page Speed score, which is reported as a percentage and ranked from A to F. In the breakdown, users will find a full list of over 25 metrics that influence page performance. Each statistic is given a grade based on how well it is doing. They can expand on the recommendations by clicking the accordion list, for example, in Image Optimisation. They're provided a list of all the photos used on the page, as well as advice on how much each image should be compressed. Following up on the image optimization example, GTMetrix explains how to choose the right image compression and how to create new compressed images for use on a website.

In addition, each statistic has a priority associated to it, ranging from low to high, so the user can identify which actions should be prioritized.Each statistic is classified so that the user can put comparable jobs together to evaluate if there are any performance difficulties. When evaluating the performance of a website, this can be valuable if the analysis reveals that numerous difficulties stem from the same source. Content, CSS/JS, pictures, and server are all common categories.

Google Page Speed Insights (PSI), which is frequently confused with GTMetrix, offers a similar service. There are a few minor differences between the two; for example, GTMetrix has seven regional test servers, but PSI is Geolocated, meaning the test results are based on the user's current location. GTMetrix is built on top of the open-source Google Page Speed library. Since then, Google has made a number of changes to the scoring algorithm, but the open source version has not been updated. As a result, because to the likelihood of differences, the findings from both tools and questions should not be compared. Finally, GTMetrix uses genuine browsers for browser testing, whereas PSI uses emulated browsers. As a result, emulators are frequently complicated and obsolete engines, implying that genuine browsers provide a more accurate representation of website performance.

The users are provided a breakdown under the YSlow tab that explains over 18 major problems that could cause the page to take longer to load than necessary. Page Speed Score and YSlow both offer comparable information; however, Page Speed Score focuses on an examination of the current configuration and how to improve it, whereas YSlow is more concerned with problems and how effectively your website avoids them. YSlow summarizes the page's primary components, with a focus on server-side optimizations rather than on-page content[19].

YSlow recommends using Material Delivery Networks (CDNs) to ensure that content is delivered to a website from the closest server accessible.The necessity of limiting the amount of HTTP requests and avoiding the use of URL redirection is also covered by YSlow. This emphasizes the significance of addressing server-side issues in order to improve the website's overall performance.

YSlow, like Page Speed Score, assigns a score to the recommendations depending on how well the website performs. YSlow divides suggestions into Types, with server, content, and cookie being frequent examples. Each suggestion is assigned a priority, allowing us to see the most crucial activities right immediately.

Chapter 4

Evaluation and Results

4.1 Introduction

Due to the diversity of users and various aspects of web platforms, researchers use a variety of methods and tools to evaluate them.

In a general definition, any scientific and methodical study to find the strengths and weaknesses of web based platform can be considered as a kind of evaluation of websites. The process of evaluating web platform comes in many forms and types. Web based platform can be evaluated from different angles and in different ways. Indicators and evaluation criteria, as well as how the evaluation process is performed, show the level and type of evaluation. Depending on the scope of evaluation and the types of indicators that are considered in the evaluation of web based platforms, different methods and tools are used to evaluate web platform.

4.1.1 The Importance of Evaluation

Platforms have a wide variety of uses. From office and banking services, and online shopping to e-learning and digital libraries and cultural and advertising affairs, everything is done through web based platforms. The main goal of web based platforms is to provide fast and easy services, and to satisfy users, and this goal can only be achieved by ensuring the correct and optimal performance and performance of platforms. Assessing the performance and measuring the effectiveness of platforms is not possible except by evaluating them, and only in this way can the strengths and weaknesses of platforms be achieved and steps taken to improve and complete or improve and develop them.

4.1.2 The Purpose of Evaluating

The goal of web based platform evaluation is to look at and identify the strengths and shortcomings of platforms so that they may enhance the quality of their services and content. Platform visitors, as well as webmasters and sponsors, do assessments on the sites they visit. The majority of user evaluations are focused on the content element, with the goal of ensuring the quality of the material and the trustworthiness of the information provided by the platforms. Platforms are also evaluated by

managers and supporters in order to learn about the quality of service they give to users, as well as to promote and grow them. Only after assessing a platform, you will be able to judge its quality.

4.2 Evaluation Methods

The most common methods of website assessment are descriptive research and survey research, with the evaluation result generated by evaluating the research data. It should be emphasized that website evaluation methods are not confined to this category, and researchers can review websites based on a variety of aims and methodologies. Another aspect to consider is that the outcomes of each of the evaluation techniques may vary. The many techniques of assessing websites are briefly discussed in the following sections.

For evaluating SMARTIES, 12 participants took part in a test and answer the questions. Figure 4.1 shows the personal information of the participants where can be understood that the majority of them have PHD degree and the rest of them have master degree. This result was predictable due to the end users of the platform.

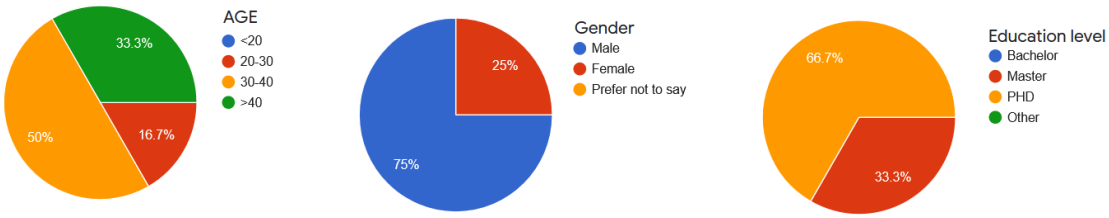


Figure 4.1. The Personal Information of the Participants

4.2.1 Types of Evaluation Methods

In terms of the subject of evaluation, there are some methods which are done for SMARTIES platform in order to find out an appropriate result.

Structural evaluation: The structure of a website is the area that allows visitors to access the website's content. The user interface of the website, as well as the tools for browsing and accessing information, other tools and facilities that make the website usable, are frequently checked and evaluated during the structural examination. Because the issue of website usability, or the ease and simplicity of using the website, is clearly related to the issue of optimizing the structure of the web based platform, evaluating the structure of the platform frequently leads to the evaluation of usability; it is possible to judge the usability of the platform based on the results obtained from the structural evaluation. As it is shown in figure 4.2 according to the twelve users who were in the test, the majority of them, around 80% express that the overall appearance and page load time is very good,18% of the users declare that the page load time is good and just 1% of them declare that the load time is poor which means it can be because of some technical problems on the user side.In GTMetrix

evaluation 4.4 that is done by the tool shows that the load time is very good, "Fully Loaded Time: 1.2s".

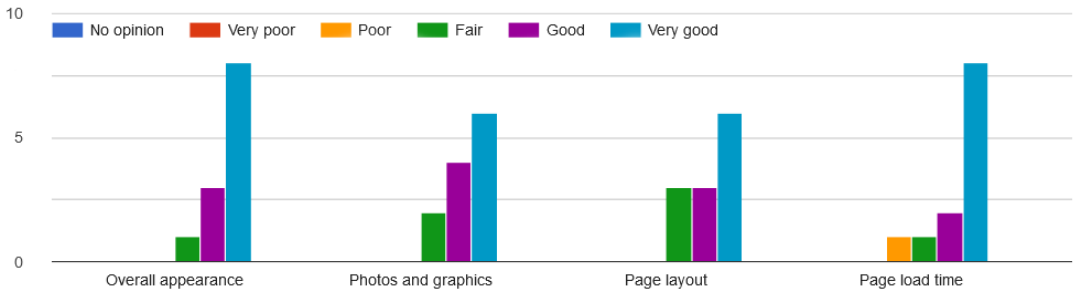


Figure 4.2. Structure Evaluation Through Questionnaire

Content evaluation: Users may be concerned about inaccurate, worthless, or deceptive information and material on the Internet. As a result, information sources and material offered on platforms are evaluated in numerous research linked to web-based platform evaluation. The content of platforms is evaluated to determine the quality and trustworthiness of the information they give. Although content assessment can encompass a wide range of platform information, including as textual, visual, audio, and multimedia material, it is most typically used to analyze the quality of textual content and scientific data. Based on figure 4.3, it has been also observed that more than 75% of the users find the information useful and declare that the organization of the information is very good, around 20% express that the usefulness of information is good and just 1% declare that it is fair.As a result the overall quality of information according to the users' idea is very good.

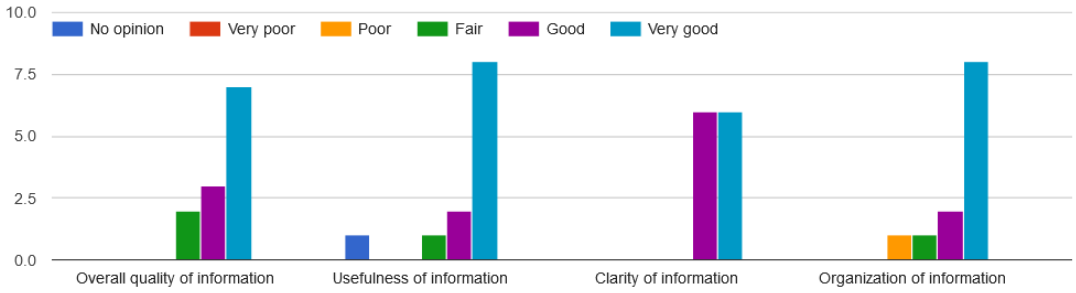


Figure 4.3. Content Evaluation Through Questionnaire

quality evaluation: Due to the variety of services provided by platforms, there is no precise and clear definition of the quality of website services and the dimensions of quality are different in different types of web based platforms; But what is clear on scientific platforms is access to useful and up-to-date information in the shortest possible time and easily. However, satisfying users and satisfying their demands is the most important quality factor and quality indicators and criteria are adjusted based on how users interact with the platform and their views. Qualitative evaluation of platforms is mostly done using questionnaire tools. According to figure 4.4 an interesting note is that the users find SMARTIES a user friendly platform, more than

95% of users declare that the overall ease of use is very good and the rest of them express that it is good.

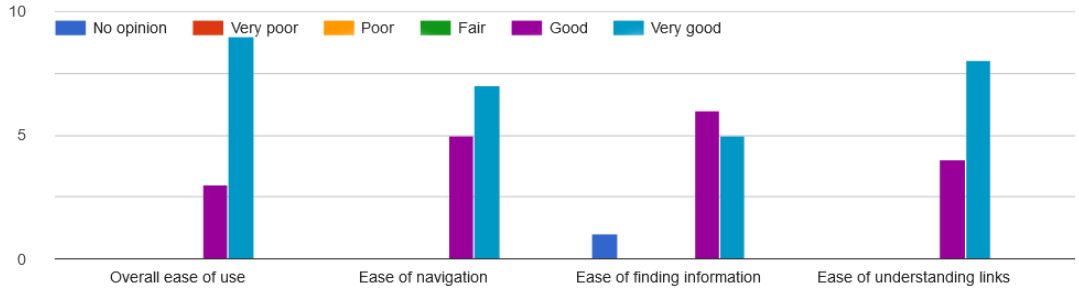


Figure 4.4. Quality Evaluation Through Questionnaire

4.3 Evaluation Model

According to the types of evaluation and the type of platform the specific model of evaluation should be considered.

4.3.1 Platform Evaluation

SMARTIES is evaluated by using combined evaluation in order to get accurate feedback.Manual evaluation and automatic evaluation both are done, because many experts believe that a mere evaluation method does not guarantee accurate evaluation of platforms.

Manual evaluation which is based on user experiences is done by using questionnaire. Sometimes, expert evaluation requires users to perform tests on the platform. This evaluation method is used in a variety of structural evaluations such as: accessibility, usability and user interface evaluation. The first impression of the user is significant, too.

Participants has reported positive experience of using SMARTIES platform. Figure 4.5 shows the first impression of the participants. they were asked to Rate their first impression of SMARTIES on a scale from 0 to 5 (Strongly disagree: 0; Strongly agree: 5).The majority of the participants like the platform.

Likewise, figure 4.6 shows that around 70% of the participants surely recommend SMARTIES to their friends which is excellent for the dissemination as the objective of the platform.

Another important issue is how many participants use the Internet to get information. The chart 4.7 shows that about 70% of them do this on a daily basis, and the remaining 30% use the Internet a few times a week to get information. It can be concluded that the Internet is a platform on which participants use for information.

One of the most important points that can be deduced from this test is how much the participants use the Internet and social media to publish; disseminate their research and how familiar they are with it. From the percentages received from the

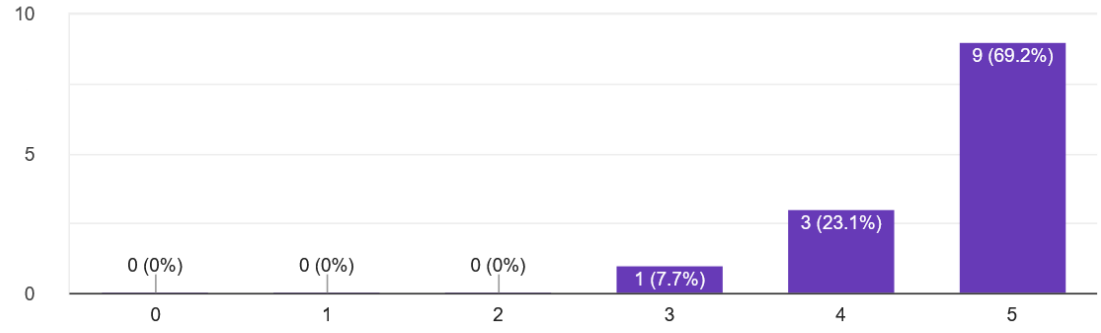


Figure 4.5. First Impression of the Participants

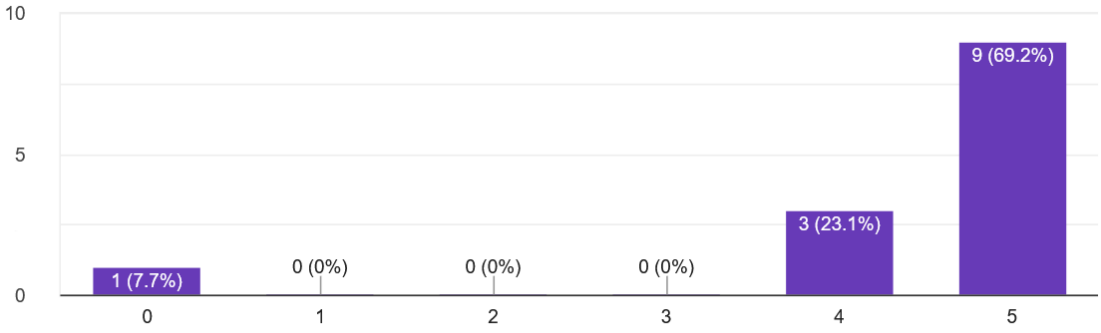


Figure 4.6. Quality Evaluation Through Questionnaire

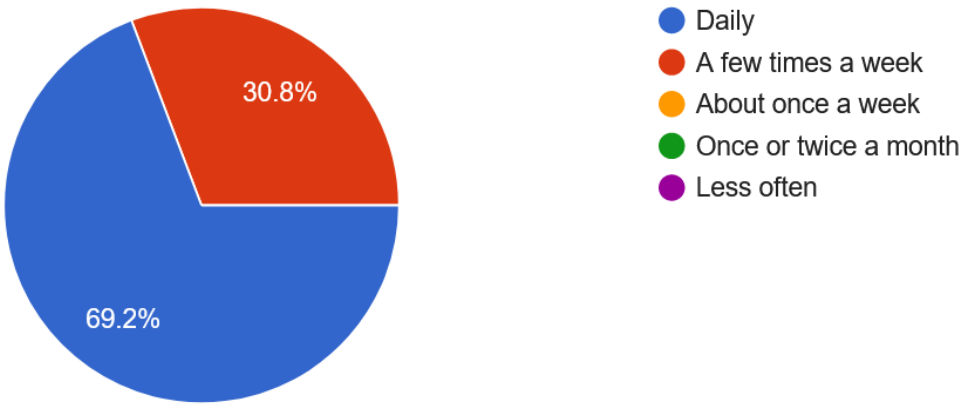


Figure 4.7. The Percentage of Participants Who Use Internet to Get Information

graph 4.8, it is inferred that around 30% of the participants are extremely familiar with the subject of dissemination, as well 30% of them are moderately familiar, and 23% are somewhat familiar. But the problem is that only about 8% of them use social media to publish and talk about their research on a daily basis, and about 31% of the participants less often use the Internet to publish their research which means the researchers need to work on the dissemination of their publications and research result.

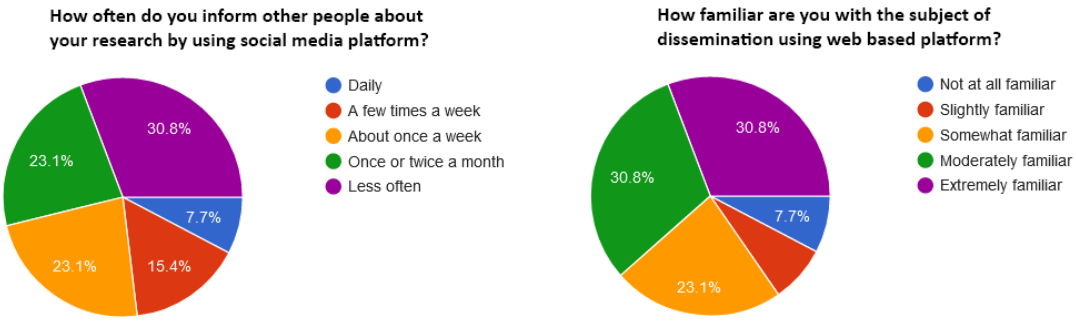


Figure 4.8. Internet Usage by Participants

Automatic evaluation which is based on Some types of assessments that can be organized using automated assessment tools. The automated evaluation model is especially useful for evaluating the performance, structure and accessibility of platforms. A list of automated assessment tools is available. Automatic tools, after receiving the address of the web based platform in question, review and evaluate it based on the indicators and strategies of Consortium.SMARTIES is evaluated by GTMetrix tool which is mentioned in previous chapters.

4.4 GTMetrix Evaluation

As it is mentioned in section 3.10 GTMetrix is a tool which SMARTIES is evaluated by it. Report below shows that the performance is ranked "A" which means SMARTIES achieve an excellent result.

Performance Report for:

http://smarties.umfst.ro/

Report generated: Sat, Nov 27, 2021 5:49 PM +0100
Test Server Location: London, UK
Using: Chrome (Desktop) 90.0.4430.212, Lighthouse 8.3.0

	Performance	Structure	L. Contentful Paint	T. Blocking Time	C. Layout Shift
A	99%	97%	930ms	45ms	0

Top Issues

IMPACT	AUDIT	
Med-Low	**Use a Content Delivery Network (CDN)**	20 resources found
Med-Low	**Use HTTP/2 for all resources**	Potential savings of 950ms
Low	**Reduce unused CSS**	Potential savings of 66.9KB
Low	**Avoid an excessive DOM size**	266 elements
Low	**Avoid enormous network payloads**	Total size was 417KB

Page Details

1.2s
Fully Loaded Time

Total Page Size - 417KB

Total Page Requests - 37

HTML JS CSS IMG Video Font Other

How does this affect me?

Today's web user expects a fast and seamless website experience. Delivering that fast experience can result in increased visits, conversions and overall happiness.

As if you didn't need more incentive, **Google has announced that they are using page speed in their ranking algorithm.**

About GTmetrix

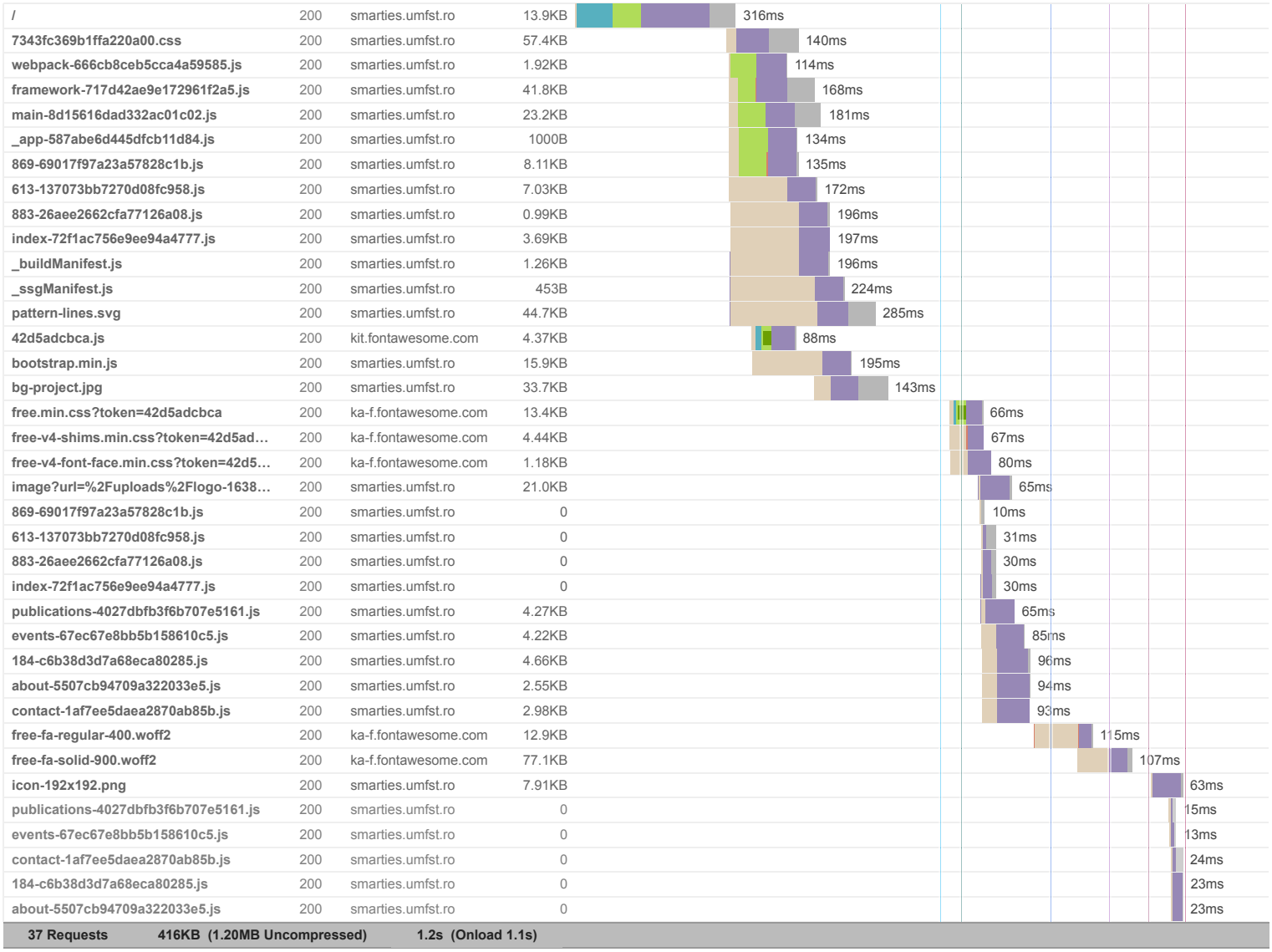
CARBON60 THE MANAGED CLOUD COMPANY

GTmetrix is developed by the good folks at **Carbon60**, a Canadian hosting company with over 25 years experience in web technology.

https://carbon60.com/

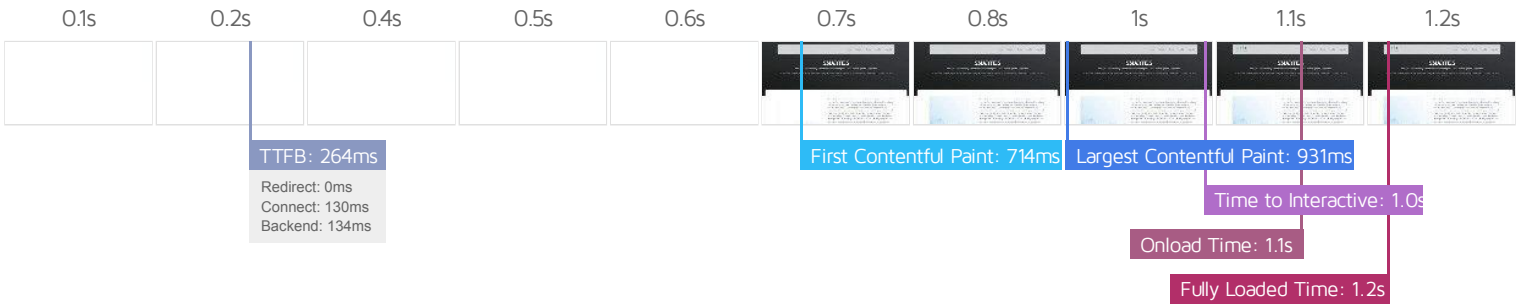
The waterfall chart displays the loading behaviour of your site in your selected browser. It can be used to discover simple issues such as 404's or more complex issues such as external resources blocking page rendering.

SMARTIES | Home



/	200	smarties.umfst.ro	13.9KB	316ms
7343fc369b1ffa220a00.css	200	smarties.umfst.ro	57.4KB	140ms
webpack-666cb8ceb5cca4a59585.js	200	smarties.umfst.ro	1.92KB	114ms
framework-717d42ae9e172961f2a5.js	200	smarties.umfst.ro	41.8KB	168ms
main-8d15616dad332ac01c02.js	200	smarties.umfst.ro	23.2KB	181ms
_app-587abe6d445dfcb11d84.js	200	smarties.umfst.ro	1000B	134ms
869-69017f97a23a57828c1b.js	200	smarties.umfst.ro	8.11KB	135ms
613-137073bb7270d08fc958.js	200	smarties.umfst.ro	7.03KB	172ms
883-26aee2662cfa77126a08.js	200	smarties.umfst.ro	0.99KB	196ms
index-72f1ac756e9ee94a4777.js	200	smarties.umfst.ro	3.69KB	197ms
_buildManifest.js	200	smarties.umfst.ro	1.26KB	196ms
_ssgManifest.js	200	smarties.umfst.ro	453B	224ms
pattern-lines.svg	200	smarties.umfst.ro	44.7KB	285ms
42d5adcbca.js	200	kit.fontawesome.com	4.37KB	88ms
bootstrap.min.js	200	smarties.umfst.ro	15.9KB	195ms
bg-project.jpg	200	smarties.umfst.ro	33.7KB	143ms
free.min.css?token=42d5adcbca	200	ka-f.fontawesome.com	13.4KB	66ms
free-v4-shims.min.css?token=42d5ad…	200	ka-f.fontawesome.com	4.44KB	67ms
free-v4-font-face.min.css?token=42d5…	200	ka-f.fontawesome.com	1.18KB	80ms
image?url=%2Fuploads%2Flogo-1638…	200	smarties.umfst.ro	21.0KB	65ms
869-69017f97a23a57828c1b.js	200	smarties.umfst.ro	0	10ms
613-137073bb7270d08fc958.js	200	smarties.umfst.ro	0	31ms
883-26aee2662cfa77126a08.js	200	smarties.umfst.ro	0	30ms
index-72f1ac756e9ee94a4777.js	200	smarties.umfst.ro	0	30ms
publications-4027dbfb3f6b707e5161.js	200	smarties.umfst.ro	4.27KB	65ms
events-67ec67e8bb5b158610c5.js	200	smarties.umfst.ro	4.22KB	85ms
184-c6b38d3d7a68eca80285.js	200	smarties.umfst.ro	4.66KB	96ms
about-5507cb94709a322033e5.js	200	smarties.umfst.ro	2.55KB	94ms
contact-1af7ee5daea2870ab85b.js	200	smarties.umfst.ro	2.98KB	93ms
free-fa-regular-400.woff2	200	ka-f.fontawesome.com	12.9KB	115ms
free-fa-solid-900.woff2	200	ka-f.fontawesome.com	77.1KB	107ms
icon-192x192.png	200	smarties.umfst.ro	7.91KB	63ms
publications-4027dbfb3f6b707e5161.js	200	smarties.umfst.ro	0	15ms
events-67ec67e8bb5b158610c5.js	200	smarties.umfst.ro	0	13ms
contact-1af7ee5daea2870ab85b.js	200	smarties.umfst.ro	0	24ms
184-c6b38d3d7a68eca80285.js	200	smarties.umfst.ro	0	23ms
about-5507cb94709a322033e5.js	200	smarties.umfst.ro	0	23ms

37 Requests **416KB (1.20MB Uncompressed)** **1.2s (Onload 1.1s)**



Performance Metrics

First Contentful Paint

Good - Nothing to do here

How quickly content like text or images are painted onto your page. A good user experience is 0.9s or less.

713ms

Time to Interactive

Good - Nothing to do here

How long it takes for your page to become fully interactive. A good user experience is 2.5s or less.

1.0s

Speed Index

Good - Nothing to do here

How quickly the contents of your page are visibly populated. A good user experience is 1.3s or less.

706ms

Total Blocking Time

Good - Nothing to do here

How much time is blocked by scripts during your page loading process. A good user experience is 150ms or less.

45ms

Largest Contentful Paint

Good - Nothing to do here

How long it takes for the largest element of content (e.g. a hero image) to be painted on your page. A good user experience is 1.2s or less.

930ms

Cumulative Layout Shift

Good - Nothing to do here

How much your page's layout shifts as it loads. A good user experience is a score of 0.1 or less.

0

Browser Timings

Redirect	0ms	Connect	130ms	Backend	134ms
TTFB	264ms	DOM Int.	355ms	First Paint	714ms
DOM Loaded	755ms	Onload	1.1s	Fully Loaded	1.2s

IMPACT	AUDIT	
Med-Low	**Use a Content Delivery Network (CDN)**	20 resources found
Med-Low	**Use HTTP/2 for all resources**	Potential savings of 950ms
Low	**Reduce unused CSS**	Potential savings of 66.9KB
Low	**Avoid an excessive DOM size**	266 elements
Low	**Avoid enormous network payloads**	Total size was 417KB
Low	**Properly size images**	Potential savings of 18.9KB
Low	**Avoid long main-thread tasks**	4 long tasks found
Low	**Reduce JavaScript execution time**	128ms spent executing JavaScript
Low	**Serve images in next-gen formats**	Potential savings of 17.7KB
Low	**Reduce initial server response time**	Root document took 134ms
Low	**Avoid serving legacy JavaScript to modern browsers**	Potential savings of 51B
Low	**Avoid non-composited animations**	1 animated element found
Low	**Avoid chaining critical requests**	2 chains found
N/A	**Largest Contentful Paint element**	1 element found
N/A	**Minimize main-thread work**	Main-thread busy for 828ms
N/A	**User Timing marks and measures**	4 user timings
N/A	**Reduce the impact of third-party code**	Total size was 114KB

Chapter 5

Conclusion and Future Work

5.1 Conclusion

This thesis work has led to a web based platform that Increases Visibility, Communication and Dissemination of Biomedical Research Projects. Web portals give a wealth of information about a specific topic. There is a need for guiding concepts and effective tactics to enable and sustain such efforts, as well as to track progress toward knowledge equity. The platform is well designed to enhance and leverage the interaction between the researchers and the others such as students, investors, and academic people. Events, programs, and collections can all be defined on the platform. Defects can be used to setup these programs, but they can also be used to generate, edit, or delete those that have already been produced. Journals, conferences, and other publications can be published at the collection level, which allows for grouping and higher order while searching on the platform.

The platform provides a variety of information, such as visitors, which can be categorized by month and year, nation (through a map). These statistics may be shown using a bar graph for simple comprehension and analysis.

The good news is that this study found some potential techniques that will aid in bridging the gap between research and practice, and also help biomedical collaboration programs to make their projects better. The platform should have the following general characteristics:

- User feedback
- Materials
- Targeted audiences
- Links to additional resources
- Publications and resources
- On-time with frequent updates

5.2 Future Works

We need to do a lot more effort to understand dissemination and its function in research usage in the field of biomedical collaborations. The first step in this process should be to improve collaboration between scholars and practitioners. Collaboration is a two-way street that requires participation from both scholars and practitioners at every level. Practitioners must communicate their goals and requirements, and researchers must pay attention. Before they begin, researchers must determine what the research needs and interests are, and practitioners must be included from the beginning. Research dissemination is also not a one-way path. When the study is shared, there should be plenty of opportunities for discussion and comment regarding the implications of the findings. Practitioners must be involved in the entire research-dissemination process. It was difficult to verify whether some of the websites assessed in this study were truly implementing their dissemination plan because many of them were never explicit about their intended audience.

Researchers must establish a distribution plan centered on a specific, targeted audience from the start of the study design, and then ask a series of questions to determine whether stated aims and measured effect are congruent.

Researchers validated the requirement for a dissemination tool in their review. "What a great concept!" and "This platform is a significant addition; there appears to be a widespread lack of realistic distribution planning tools for academics, and it is encouraging to see this gap filled." Researchers who used the program gave it excellent reviews, saying things like "I learned a lot using it" and "It enables explicit and precise thinking."

The positive response to this dissemination tool, as well as the scarcity of such resources, highlight the need of converting dissemination theory into practical tools and procedures. This is especially true as scientists work to put biomedical innovations into practice. We see the need to continue developing a dissemination tool kit that would give further self-help aids, such as comprehensive workbooks, project management templates, and resource tracking grids, in light of these dynamics.

Traditionally, researchers have not been obligated to consider how their findings may be disseminated for application in practice. Researchers will benefit from knowing the dissemination process and its practical application, given the recent and continued significance placed on turning research into practice by funding organizations. This does not mean that researchers will become professionals in dissemination; rather, it means that they will become more aware of the value and potential that this process offers. The Dissemination Planning Tool is intended to help researchers become more aware of how and where their findings may and should be used in practice. It gives academics a framework for thinking about what might appear to be a hazy charge to which they are increasingly asked to answer. More significantly, it assists students in appreciating the significance of the research’s usage and application in the real world.

Future Works:

1. Multiple administrators that with different roles that based on their roles, they can only access the specific

2. Increase security with Two Factor Authentication
3. Improving dashboard features
4. Using CDN to host portal’s static data to increase the

Chapter 6

Questionnaire

6.1 Before Experience Questionnaire

Before and after tests with real researchers as end users, a questionnaire is answered by team members.

6.1.1 Personal Information

1. Age
2. Gender
3. Education level

6.1.2 Background Information

How familiar are you with the subject of dissemination using web based platform? (Not at all familiar, slightly familiar, somewhat familiar, moderately familiar, extremely familiar)

1. How often do you use web based platforms?
2. How often do you use web portals to get information?
3. How often do you use social media to talk about your research?
4. How often do you inform other people about your research by using social media platform?
5. How often do you use academic platforms?
6. How often do you visit the specific website? (Daily,A few times a week, About once a week , once or twice a month, Less often)

6.2 After Experience Questionnaire

6.2.1 First Impression

Rate this statements on a scale from 0 to 5 (Strongly disagree: 0; Strongly agree: 5)

1. How do you rate your first impression of SMARTIES platform?
2. How likely are you to return?
3. How likely are you to recommend SMARTIES to your friends?

6.2.2 Device

Which devices do you use to visit SMARTIES website?

1. Desktop or laptop computer
2. Tablet
3. Phone
4. Other

6.2.3 Platform Evaluation

How would you rate SMARTIES website on the following? (Very good Good Fair Poor Very poor No opinion)

1. Overall quality of information
2. Usefulness of information
3. Clarity of information
4. Organization of information
5. Overall appearance
6. Photos and graphics
7. Page layout
8. Page load time
9. Overall ease of use
10. Ease of navigation
11. Ease of finding information
12. Ease of understanding links

6.2.4 User Ideas

1. What do you like most about SMARTIES website?
2. What do you dislike most about SMARTIES platform?

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