

Learnify:

Spotify for learning

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Abstract

Web-based online learning is seeing great adoption alongside the traditional brick-and-mortar classroom model. Online collaborative applications, tutorials and learning platforms have been a great source of knowledge for users. However, most of these applications do not provide much organizational structure to help guide and motivate users in learning new skills. In addition, many of these applications could be improved in their level of assistance for engagement and collaboration among learners to help stimulate learning in the first place.

This Master's report presents the new developed application Learnify, which helps users manage and inspire learning. Learnify enables users to organize their resources in an 'easy to file' way and create a structure following the "playlist" metaphor. Learnify enables users to discover interesting skills and find predefined set of relevant resources by following other users' playlists. Evaluation of Learnify has been done qualitatively and quantitatively through a user study. All participants agreed that Learnify provides enhanced opportunity and more convenience to discover new skills and find relevant resources throughout the learning process.

1. Introduction

The online education industry has grown by 200% since the inception of Web 2.0 [3]. The business and software built around this idea has become one of the most profitable areas in the education sector, with projected market share of \$325 Billion by 2025 [4]. An attractive aspect of online e-learning, from a provider standpoint, is that some of the responsibility for directing learning can be shifted to the learner, away from the traditional teacher-centric models common in traditional universities. Indeed, self-driven learning products, in which the student selects the topics to study and takes responsibility for setting the pace through the course of study, are one of the most common approaches used in many websites and online courses (such as Coursera [11]). Some of these platforms only pay teachers to create the initial content and, perhaps, to grade assignments at the end of the courses.

However, despite the cost-attractive nature of this approach, a massive challenge is building on the revenue side. These e-learning solutions based on the self-driven model are seeing revenues drop by 6.1% per year for the last few years [4]. It turns out that students enrolled in such courses often choose not to finish; they lose their motivation along the way and, in fact, may even lack the motivation to start a second course.

While the for-fee educational industry faces this threat to its revenue, similar issues affect more informal learning that occurs, especially outside of formal courses. For example, on an everyday basis, learning a new skill can involve Google searches, following relevant posts, bookmarking resources, reading books, attending classes/training, participating in online forums, or reaching out to appropriate people. During these different phases of learning, users often come across resources and tend to write it down or bookmark it somewhere for reference. A multitude

of tools, such as Google Docs or Notes, exist to track such resources. Online bookmarks or collaborative workspace notes are also available ways to manage online resources.

Nonetheless, lacking even a formal course to keep students engaged and motivated, such software does not provide much inspiration to discover and find relevant resources. Moreover, even if a learner does find and read one resource, these tools lack any features to stimulate and motivate users to proceed with finding and learning from the next resource, in order that they can gradually accumulate expertise and build mastery.

In short, there exists an opportunity to innovate and fix two types of issues in the current process of learning.

Efficiency in the process of learning: Learning a new skill involves research and planning. As part of research, a typical learner will research for content and people, at the minimum. This takes time and effort to collect and organize the findings. If a learner is learning more than one skill at a time (which is very likely scenario), the overhead to manage increase. This causes drop off or an inefficient process. This kind of inefficiency can manifest in delay and sub-optimal learning results.

Inspiration to learn: Learning is an ongoing continuous process that does not happen on its own. It requires inspiration and motivation even to get started. Now, if you are interested in music, you can go to Pandora or Spotify and “discover” what others are listening to in areas that interest you. That encourages you to create your own playlist with a combination of others that already exists. It gives you a starting point. Suppose that there was a place where you could explore multi-dimensional *learning* topics, with multiple resources properly organized. Could such a “Pandora-for-learning” provide an effective kick-start to the learning process?

To improve the efficiency in the process of learning and provide users better chance in developing multiple skills; this master's report presents a new application called "Learnify." It helps users by managing their resources through bookmarking online web resources, providing curated playlists of resources from other people, and offering well pre-defined journeys to learn any skill. Users can arrange their web resources easily in the form of playlists and can create/share playlists of any skills that they are learning. Users can subscribe to other people playlists to revise any skills or follow other user's journey in discovering new skills. Thus, Learnify helps users make plans on how to learn multiple skills effectively, users can stay organized by creating their own playlists, and users can find inspiration to learn through subscriptions to other peoples' playlists.

Learnify was assessed through a user study, which indicated that it is useful for inspiring and guiding students through the process of learning. All users in the study found Learnify to be more convenient in finding relevant online resources in learning new skill than the current suit of applications like Google Docs commonly used for informal learning.

The remainder of this document is organized as follows. Section 2 outlines Related Work and limitations of existing systems. Section 3 presents the newly developed application and its implementation in detail. Section 4 discusses the user study and results used in evaluating the claims for this application. Lastly, Section 5 summarizes the conclusion and scope of future work.

2. Related Work

There are multiple ways to manage learning and organize resources effectively. Most of the current software is built around the idea of providing the user with a seamless experience of storing resources. Users generally need to scout multiple systems to find relevant playlist for their choice of learning, which creates a barrier to the learning process, as users cannot even start

learning (in these environments) without first finding those resources. The below sub-sections will be reviewing each type of software and their current limitation in the process of effective learning.

2.1 Productivity Tools

Software Productivity tools are one of the most popular software people use to manage their work. The most popular software productivity tools include, for example, Google Docs, Microsoft Office, Slack, Evernote, and GitHub. All these are excellent software and provide state-of-the-art functionality, but when it comes to inspiring efficient learning, they generally fall short. The users need to spend considerable time making searches and/or collaborating with multiple users across these platforms to collect resources to learn any skill.

2.1.1 Google Docs

Google Docs, at approximately 800M daily active users [5], is one of the most popular platforms to manage resources. It is mainly used for collaborating on work items – research, assignment, personal or professional work. When users want to learn new skill, they need to manually create the document, which they can then populate with material gathered from the web or by reaching out to their peer network. Both phases cause an additional step for users in their learning process, which can lead to users losing interest in learning any new skills. Nonetheless, even despite these limitations, I have found in conversations with my peers that Google Docs is still by far one of the most common tools used by students to gather and organize resources for learning new topics.

2.1.2 Evernote

Evernote is again a very powerful note-taking application to store online resources in browsing any relevant content [6]. The application is very common among users and has close to 300M daily active users [6]. It provides a seamless integration to add any resources from the browser and can be shared or managed across people. Through Evernote users can add relevant resources and create notebooks, but it again does not solve the process of finding relevant resources. The users need to reach out to peers to share their notebooks or find relevant notebooks (if available) in the internet. This again takes time and causes inefficiency in learning. Also, being a licensed product, it introduces additional constraints and make it inaccessible for some users.

2.2 Social Media Platforms

Social Platforms have emerged as an alternative platform to accelerate user's learning, even though most social platforms are generic (not learning-specific) and thus do not provide much advantage specially in process of learning. Examples such as Twitter, Facebook, LinkedIn, Pinterest, and Flipboard are perhaps more useful for showcasing skills once they already have been obtained.

2.2.1 LinkedIn

LinkedIn is a great platform to find jobs and build useful professional connections. It is used by more than 675M people [7] and is the largest professional network in the world. LinkedIn also provides a search function that can be used to locate experts if the user chooses to follow or reach out to such people [8]. The user can then attempt to contact an expert (who may or may not

reply), or to read the content posted by that expert (at which point, the platform starts to function more like a Tutorial or Blog, which Section 2.3 discusses in more detail below). Although LinkedIn recently began offering online courses called LinkedIn Learning, these generally require a fee, which creates a *barrier* to learning that does not help with the key challenge of inspiring people to learn.

2.2.2 Pinterest

Pinterest is still one of the most popular social networking sites in 2020 to showcase one's work, with the presence of more than 320 Million monthly active users [9]. It lets users create topic boards and pin any ideas or relevant resources to their boards which they can share with the community. Also, it lets users find relevant boards when searching for any pins(topics). Unlike tools mentioned above, such as Evernote or LinkedIn, the Pinterest platform is specifically geared toward inspiring people. Users can post engaging photographs or other pictures that visually captivate other peoples' attention (in some ways much like Spotify does, aurally, to get users interested in new music). Unfortunately, Pinterest falls short as a learning platform because the thumbnail/zoom nature of the user interface can only convey visual information (versus, for example, detailed technical information that is best communicated via words rather than a single picture).

2.3 E-Learning Content Publishers

The online learning tutorials and blogs are one of the great repositories for resources in the process of learning. These applications provide a great source for learning any skills. The blogs and forums do help but generally do not provide a curated list of resources or pre-defined journey

in learning. In real life, users refer multiple tutorials and blogs to learn any skills and that is where these applications reach its limitations. The advantage of getting curated lists speed up learning which is not observed with these set of applications.

2.3.1 Informal Tutorials and Blogs

Informal tutorials and blogs are seeing a great engagement from the community with the popularity of E-learning. The blogs websites like Medium, WordPress and Blog Press help people create content for any relevant skills that can be used for learning. There is abundance of these resources available which users can refer. However, majority of these sites have content which are unstructured, and users must search to get started. This creates a barrier and require user to organize sequences of pages and to stay on track during learning process.

2.3.2 Online Courses

Massive Open Online courses (MOOCs) have seen meteoric rise in recent years and is predicted to grow by USD 17.70 billion in the next 5 years [10]. Most popular MOOCs like Udemy, Udacity, edX, Khan Academy, IXL, Coursera etc. are used by millions of people for learning [11]. They are great resource to learn and provide a systematic way to get started in the process of learning. Some of the courses on these platforms are free but majority of them require users to pay money which creates obstacle and limit the usage in the learning. Also, most of these courses are seeing great drop rate. The recent study showed that more than 87.3% students drop out of the courses [12] and do not complete it. This figure is alarming and raises the effectiveness of these MOOCs in the process of learning. With only 12% completion rate by users for the

coursera highlights that these MOOCs are not self-sufficient and do not provide enough motivation in the process of learning.

3. Solution

Learnify provides a systematic and organized way to learn multiple skills. The application helps people fast-track their learning and provides a playbook which can be used at any phases of skills development, including at that crucial moment of inspiration that ignites an urge to begin learning a new topic.

The application helps users create customized playlists of the skills that they are learning by collecting or grouping relevant resources to appropriate sections. This helps in staying organized in learning and provides a playlist in revisiting material in the future. The users can create these playlists either logging into the application or using a provided Chrome plugin to add relevant resources.

Through Learnify, users can share playlists to social media platforms like Twitter, LinkedIn, and Facebook. This way, users can integrate or showcase their learning with the community developed through these social networks.

The application also helps users learn any new skill by providing a starting set of well-defined resources. Users can subscribe to other peoples' playlists to find a good/authenticated starting set of resources. Users can rate or report these playlists, which in turn can help in quality control and finding a good relevant starting set of resources.

Learnify let users discover new skill which is popular and is suitable for users' interest and existing skillsets. The recommendation engine of the application provides "TOP 5 recommended

playlists” for the users. The data collected through Learnify could be used, in the future, to design and implement even more advanced recommendation subsystems.

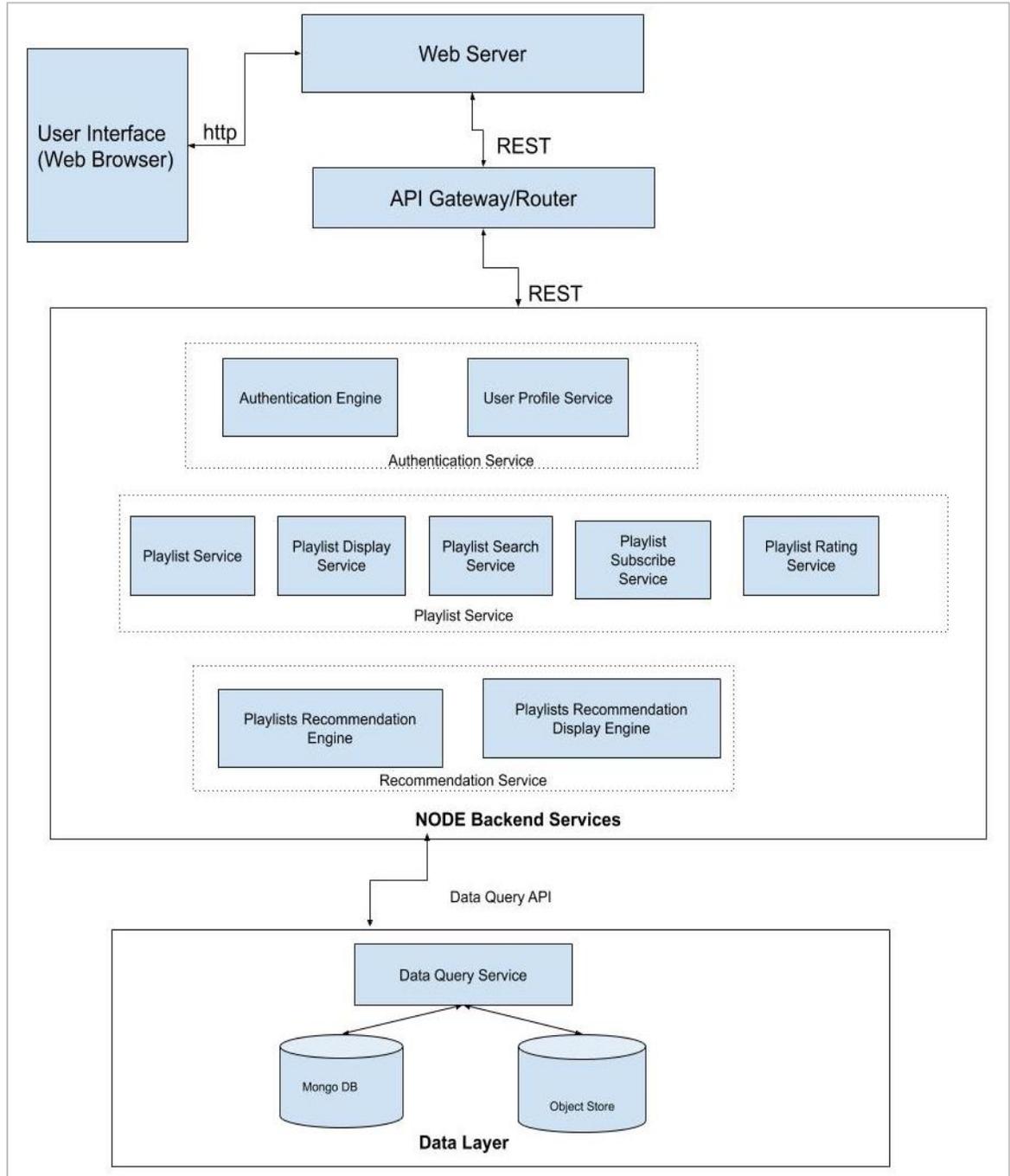


Figure 1: High Level System Architecture Diagram of Learnify

Figure 1 displays the overall system design architecture of the application. The below subsection discusses each components and services in details.

3.1 User Interface

This section will discuss the different interfaces of the application and how users can interact with the application. Below are the different screens and user interactions with the application.

Authorization/Profile Page: - The user needs to login/signup to use this application. This helps in understanding the user and providing a good initial recommendation of skills for the users. Figures 2 and 3 show how the user signs up for the application and fills out the relevant profile information.

Home Page: - Once the users have logged in, they will able to create a new playlist, as well as see the top 5 recommended playlists and other peoples' playlists. Figure 4 shows how the application will look for a new user.

Create/View Playlist: - The user can create a playlist of any skill they are learning by categorizing the resources to each section, so it can be referred and managed effectively. Below figures (5 – 7) are related to this behavior. In Figure 5, the user is creating a playlist related to machine learning. Once the playlist is created, the user can add relevant resources and sections to build a learning plan.

Figure 6 demonstrates the resulting playlist that a user could create. In this way, Learnify provides the user a single consolidated view of all resources in a learning track, which they can edit/view as desired.



Welcome to Learnify

Name *

Email *

Age *



Username *

Password *

REGISTER

Already a member? [Log in](#)

By continuing, you agree to our [Privacy Policy](#)

Figure 2: Sign Up Page of Learnify application

Account Basics

Email

Password

Gender
 Male Female Other
 Prefer Not to Say

Profile

Name

About

Interests

Experience

Figure 3: Profile Information Page of Learnify application

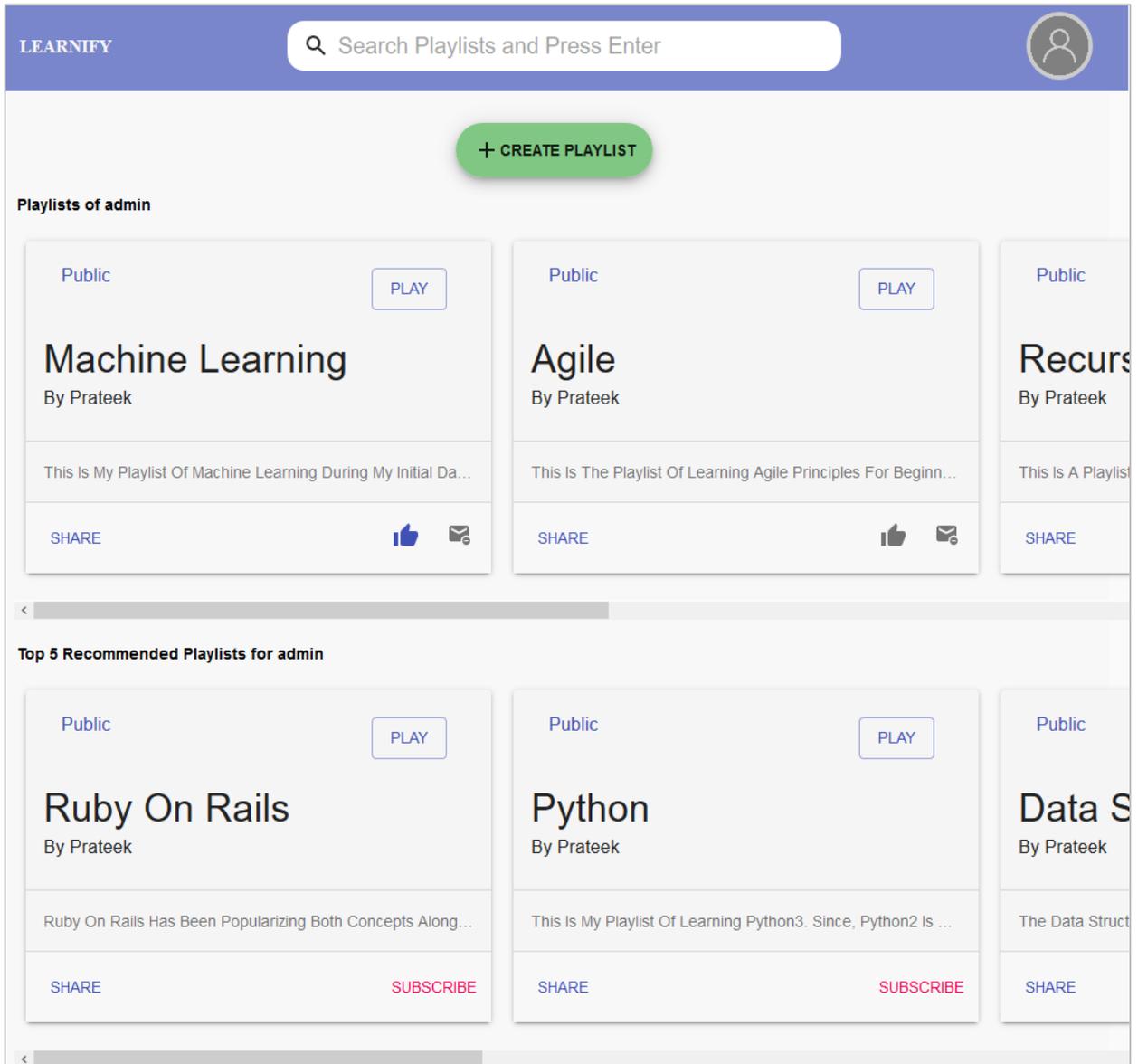


Figure 4: Home Page of Learnify Application

Enter Playlist Name

Machine Learning

Enter Categories for this Playlist

Machine Learning × ML × Supervised ×

Unsupervised Learning × Data Science ×

Enter Playlist Description

This is my playlist of Machine learning during my initial days of learning. It captures various resources I referred and found to be useful. I have kept the sections as per my understanding and hope to be useful. Also, I have added some section of various open source projects and

Private

PROCEED

Figure 5: Playlist creation page of Learnify application

LEARNIFY Search Playlists and Press Enter 



Machine Learning !

by Prateek

2 Likes | 1 Subscribers

Machine Learning
ML
Supervised
Unsupervised Learning

Data Science

This is my playlist of Machine learning during my initial days of learning. It captures various resources I referred and found to be useful. I have kept the sections as per my understanding and hope to be useful. Also, I have added some section of various open source projects and code bases. The playlist is designed to be useful for all levels of students be it amateur, professional or beginners. Please like and subscribe to my playlist.

Online Courses	Videos
<p>Stanford Course</p> <p>Basic tutorial for getting used to machine learning. https://see.stanford.edu/Course/CS229/47</p>	<p>Andrew NJ Video</p> <p>No explanation needed https://www.youtube.com/watch?v=UzxYibK2c7E</p>
<p>Udacity</p> <p>This is the best course i found on Udacity from referring and analyzing other courses. https://www.udacity.com/course/intro-to-machine-learning--ud120</p>	<p>Khan Academy</p> <p>This one is not very common but i personally recommend this tutorial. https://www.youtube.com/watch?v=DWsJc1xnOZo</p>
<p>Udemy</p> <p>Not much useful but may be a good resource for gaining practical experience. https://www.coursera.org/learn/machine-learning</p>	<p>Stats Refresher</p> <p>This channel with all videos are really great and I find it very useful. https://www.youtube.com/channel/UCYLUtTgS3k1Fg4y5tAhLbw</p>

Figure 6: Display playlist page of Learnify where resources are organized in sections

Lastly, Figure 7 shows the screen where user can view any resource and play the resource (if required).

×
Stats Refresher

Description
This channel with all videos are really great and I find it very useful.

Link
<https://www.youtube.com/channel/UCtYLUtGtS3k1Fg4y5tAhLbw>

Preview



StatQuest with Josh Starmer

StatQuest breaks down complicated Statistics and Machine Learning methods into small, bite-sized pi...

youtube.com 🔗

Figure 7: View Page of a resource in Learnify

Subscribe a playlist: - Learnify helps users to subscribe to other peoples' public playlists. Once the playlist is subscribed, it will be added to the user profile. This creates a well-defined set of resources for users to improve the learning. In Figure 8, the user can view available playlist and subscribe to it.

Rating a playlist: - The user can “like” (thumb up) any playlist. This feature helps users give feedback on other people playlists and keep the quality in check. Figure 9 shows that a user subscribed a playlist for “Agile” and “liked” the playlist.

Sharing a playlist: - Learnify helps the user share playlists across different social media platforms (including Twitter, LinkedIn, and Facebook). The sharing feature creates a custom message and provides a public URL to view this playlist. This helps in sharing the resource with the community outside Learnify, as well as gaining more insights about the resources.

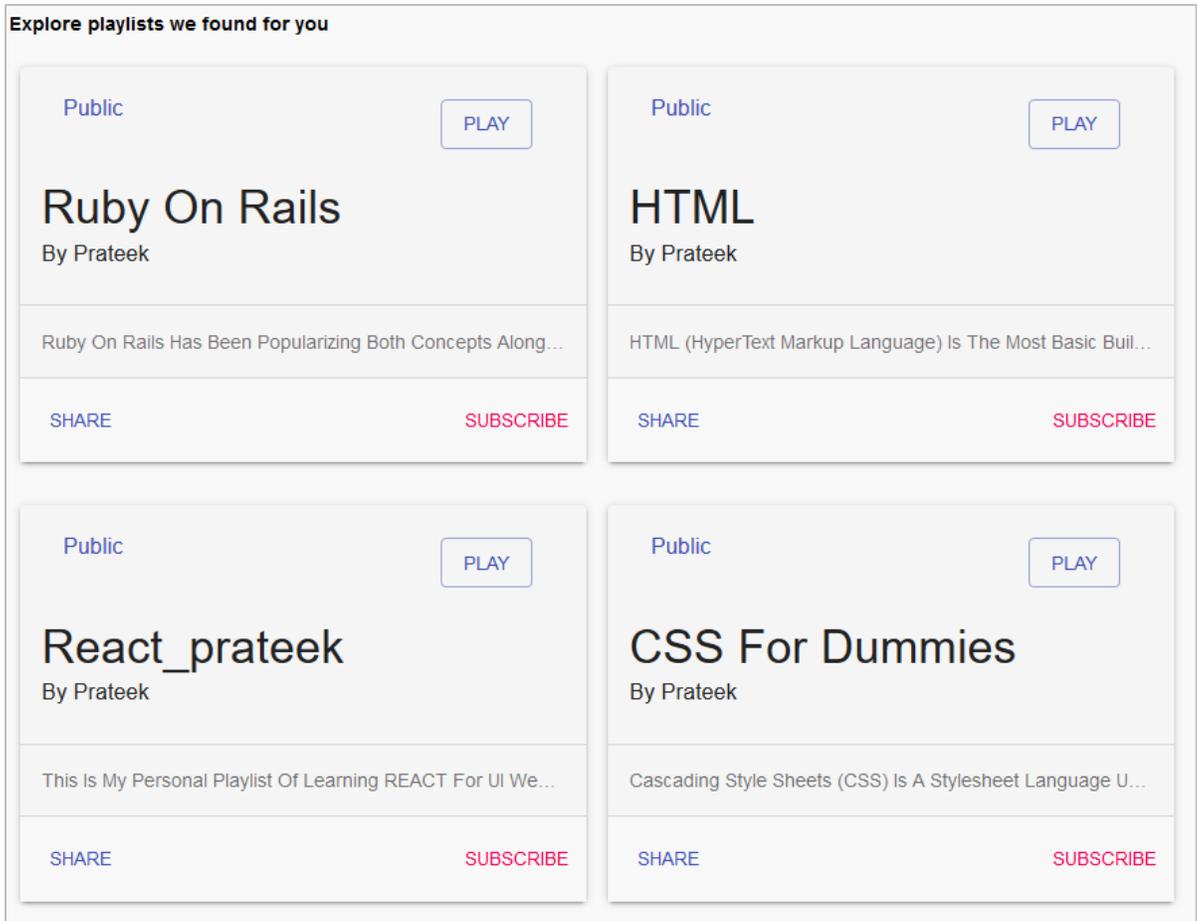


Figure 8: Subscribing a playlist in Learnify

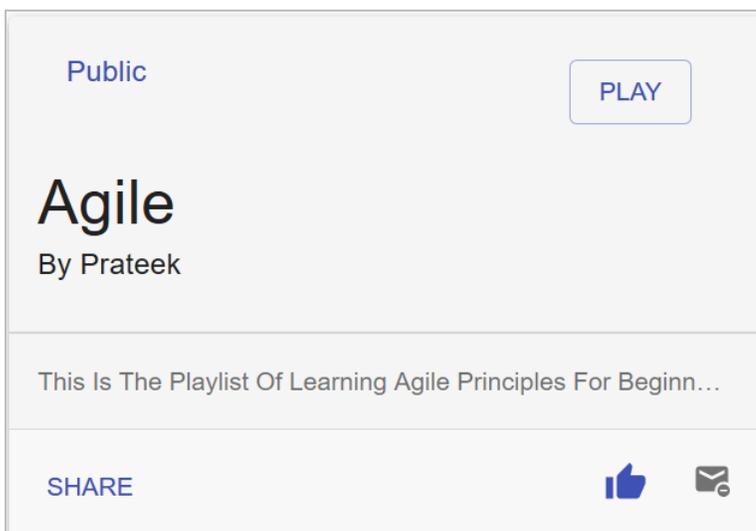


Figure 9: Rating a playlist by liking it in Learnify

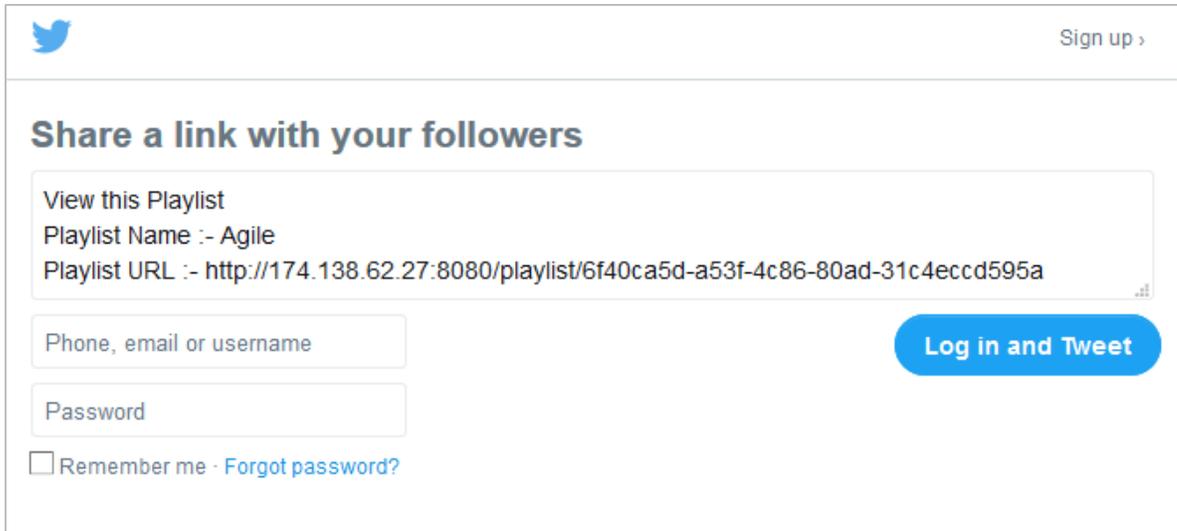
The image shows a Twitter sharing interface. At the top left is the Twitter logo, and at the top right is a "Sign up" link. The main heading is "Share a link with your followers". Below this is a preview box containing the text: "View this Playlist", "Playlist Name :- Agile", and "Playlist URL :- http://174.138.62.27:8080/playlist/6f40ca5d-a53f-4c86-80ad-31c4eccd595a". To the right of the URL is a small icon. Below the preview box are two input fields: "Phone, email or username" and "Password". To the right of these fields is a blue button labeled "Log in and Tweet". At the bottom left, there is a checkbox labeled "Remember me" and a link "Forgot password?".

Figure 10: Sharing a playlist – in this case user is sharing in twitter through Learnify

3.2 Web Server

The web server uses REST APIs to communicate among the services. The main logic of web server is to take the requests from client and pass it to the backend Node.js services, which process the requests and provide relevant learning resources and output. The web server is designed as an independent process and is run on a different virtual machine to separate it from backend services.

3.3 API Router & Gateway

The API router service mediates access to the backend service, so it provides a façade or a Service router to allocate appropriate services to the backend engine. This design decision is made so the system can be flexible and scalable for future enhancements. This service provides an abstraction between client side and backend services so that any change in API will not cause major changes in the front end. The API router reads the requests and through API end points

decides what services to call. I would think of this as command design pattern and minified version of the Service oriented architecture [13]. In addition, following a REST architecture gives an easy and clean way to communicate and manage resources among backend services.

3. 4 Backend Services

Backend services were developed in node.js, and all the services were designed to potentially operate in separate virtual machines, as a way of planning for future scalability. However, for the current scope of the application, all these services were generally deployed to a single machine and run within a single process.

Learnify has 3 main critical backend services – Authentication Service, Playlist Service and Recommendation Service. The next subsections discuss each of these components in more detail.

3.4.1 Authentication Service

Learnify uses JSON Web Token (JWT) [14] for authentication and authorization for users between services. JWT helps user to access routes, services, and resources only after authenticated and authorized; it achieves this through pure server-stateless authentication by using JSON objects. The design decision to use JWT is to avoid additional overhead in authentication of users and provide a seamless and highly lightweight JSON based service. Once the user is logged in, subsequent API calls are added with the authentication header so that only valid users' requests are handled. This will help the application to scale (if required) for future requirements. Specifically, JWT can aid future scalability because when a client makes a request to an instance of a server, it provides the JSON object containing sufficient information to let the server positively

identify the user and verify authorization, even if the server hasn't yet seen this particular user. In this way, additional servers can be started up dynamically to meet user demand, without having to synchronize authentication state among the servers.

Authentication services also manages the user profile object to store relevant user information. The API for this authentication service is defined as below: -

- POST <https://learnify.com/v1/users/>
- GET/PATCH/DELETE <https://learnify.com/v1/users/:id/>
- POST <https://learnify.com/v1/users/:id/interests/>
- DELETE <https://learnify.com/v1/users/:id/interests/:interest/>
- POST <https://learnify.com/v1/users/:id/experience/>
- DELETE <https://learnify.com/v1/users/:id/experience/:experience/>

3.4.2 Playlist Service

The Playlist Creation Service (PCS) manages the creation and modification of playlists for users. It allows users to change the scope of the playlist and store it in the backend database. The object data store stores the image artifacts related to the playlist.

Playlist Display service (PDS) aggregates playlists information of each section/resources from DB and object store and return a JSON object for the UI widget to display.

Playlist Search Engine (PSE) uses keywords to search in Mongo DB and help in retrieval of relevant playlists. PSE creates keywords by parsing the data of each playlists and generates relevant categories. These keywords are then stored in a separate document in database for fast retrieval.

Playlist Subscribe Service (PSS) is the one-many relationship service which tracks what users are subscribing to any playlists. Once, a subscribe event is triggered from user it registers an event in the backend. Finally, all these events are persisted in the database.

Playlist Rating Service (PRS) is the rating service of Learnify. Users can rate playlists by first subscribing it to it. The Like count feature ensures the quality of the playlists and help users choosing highly rated available playlists.

Below are some of the APIs designed for the Playlist Service component: -

- POST <https://learnify.com/v1/playlists/>
- DELETE <https://learnify.com/v1/playlists/:id/>
- GET <https://learnify.com/v1/playlists/:id/>
- GET <https://learnify.com/v1/playlists/>
- GET <https://learnify.com/v1/playlists/>
- POST <https://learnify.com/v1/playlists/:id/subscribers/>
- DELETE <https://learnify.com/v1/playlists/:pid/subscribers/:sid/>
- POST <https://learnify.com/v1/playlists/:id/likes/>
- DELETE <https://learnify.com/v1/playlists/:pid/likes/:uid/>

3.4.3 Playlist Recommendation Service

The Playlist Recommendation Service (PRS) gives users the option to discover interesting skills and knowledge. PRS works on two main heuristics – user’s profile section and most popular playlists in the Learnify platform. To avoid repeated scoring of users, recommendation [15] is performed only once in 12 hours for each user. This service is designed for limited scope and can be extended further.

3.6 Addition Features & Discussion

The data layer of the application uses a NoSQL [16] database called MongoDB. The decision to use MongoDB is based on extending the system easily for future purposes. MongoDB provides less constraints than a traditional relational database on how data objects need to be stored. This helps in writing services for querying the data more easily/efficiently. Large objects are stored externally (on Amazon S3) and then linked by URL from the MongoDB. This helps in faster retrieval of backend data due to offloading onto the Amazon servers. All the services in the backend are loosely coupled and can operate in independent processes (or machines). The module base microservice type of architecture is done for future scalability and extensibility. The additional chrome plugin is also developed for users so they can interact with this application through multiple channels. The material UI framework provides a unified consistent interface for the application. Overall, the application keeps the experience seamless and consistent for users across different browsers and devices.

4. Evaluation

The user study evaluated the following claims about Learnify:

- Users can make plans on how to learn multiple skills at the same time effectively.
- Learnify helps the user stay organized by providing a predefined journey of learning any skills by creating their own playlists or following other people playlists.
- Being able to see what other people are learning inspires users to discover interesting technologies to learn.

4.1 User study

The user study was conducted with participants from different backgrounds. The main aim of the study was to evaluate Learnify against the competitor Google Docs on the convenience score. This was a reasonable competitor because it is the most widely used tool mentioned in the Related Work (Section 2) and certainly is well-known already to students at Oregon State University, who could participate in the evaluation. The study defined convenience score as the score that each participant gives to Learnify and the competitor Google Docs based on their usage and effectiveness. The scoring of this attribute is kept between 0 to 10 for standardization purposes.

Study: In particular, the study focused on three questions: (1) Could users create multiple playlists conveniently as compared to Google Docs? (2) Could these users feel more organized reusing existing playlists for revising any skills as compare to using traditional google documents? (3) Would users feel more motivated by using any playlists from Learnify when learning any new skill as compare to using Google Docs? Lastly, all users were asked to fill out a participant survey evaluating these claims more holistically.

Participants: Twelve participants were selected from different technical domains. These participants were recruited by sending emails to OSU Graduate students and peers. All these participants were asked to accept Learnify data privacy and policy. Additionally, these participants were divided into two categories randomly. The categories determine the sequence of tasks for this study (either Learnify and then the competitor, or first the competitor and then Learnify).

Procedure: Each participant was scheduled a 40-minute time slot for the study. Before the tasks, each participant was given a 5-minute demo of the application Learnify. Afterwards, each participant was asked to create an account on the Learnify application. For each participant, the concept of convenience score is explained and the overall expectations of this study.

The participant was asked to perform three set of operations: (1) Creation of two playlists on Learnify. (2) Reuse existing playlist on Learnify and create same playlists on Google Docs by searching relevant resources. (3) Subscribe to playlists of any new skills from Learnify platform and find/create similar playlists using Google Docs. (Half of participants performed the study with Learnify first, as outlined above; the other half used Google Docs first).

Lastly, each participant filled out the survey highlighting the claims about Learnify. The Figures (11 - 14) provides the questions asked in the sample survey for this study. The survey is divided into four sections: (1) Asking users about familiarity with bookmarks and online learning. (2) Multiple choice questions discussing claims and viability of Learnify. (3) Short note about the features user liked in Learnify. (4) Areas of improvement or additional features in Learnify.

Data acquisition: After performing each task; users were asked to give a convenience score rating to each tool (Learnify and competitor), on a scale of 0 to 10.

Statistical Analysis: All the self-reported convenience scores were statistically analyzed by performing non-parametric one-tail pair signed Wilcoxon test. This test is analogous to paired t-test, without any assumption that the data are normally distributed [17].

Learnify Participant Survey

Thank you for participating in the study and trying Learnify.

Please fill below this survey as you complete the study. All responses to this survey are anonymous unless you provide your name, which is optional.

* Required

Email address *

Your email _____

How often do you use technologies/tools like browser bookmarks or Google Docs ? *

- Several times a week
- Once per week
- Once per term
- Once per year
- Never

How often do you need to learn new technologies from resources available on the web? *

- Several times a week
- Once per week
- Once per term
- Once per year
- Never

Figure 11 Survey Questions: Familiarity with bookmarks and online learning

Please indicate how much you agree/disagree with the following statements.

Learnify is better than Google Docs for helping me to make effective plans for how to learn multiple skills. *

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

Learnify is better than Google Docs for helping me to stay organized by providing a starting point when learning new skills. *

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

Learnify provides a better ability than Google Docs to see what other people are learning and to discover interesting technologies. *

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

By creating public playlists, Learnify helps me more than Google Docs to share what I am learning with other people. *

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

Figure 12 Survey Questions: Claims about Learnify

What do you like most about Learnify ? *

Your answer _____

Figure 13 Survey Question: Good features about Learnify

What do you think can be added/improved in Learnify? *

Your answer _____

Figure 14 Survey Question: Areas of Improvement in Learnify

4.2 Results

As shown in figures 15-18, all users agreed with all claims about Learnify. All users felt that Learnify provides value to their learning and do see it as an application they would continue to use. Additionally, 100% users agreed that they would recommend this to their colleagues and friends. The statistical analysis on convenience scores further confirmed the desirability of Learnify ($p < 0.00001$, test statistic = -5.1594). Overall, users uniformly and vigorously preferred Learnify.

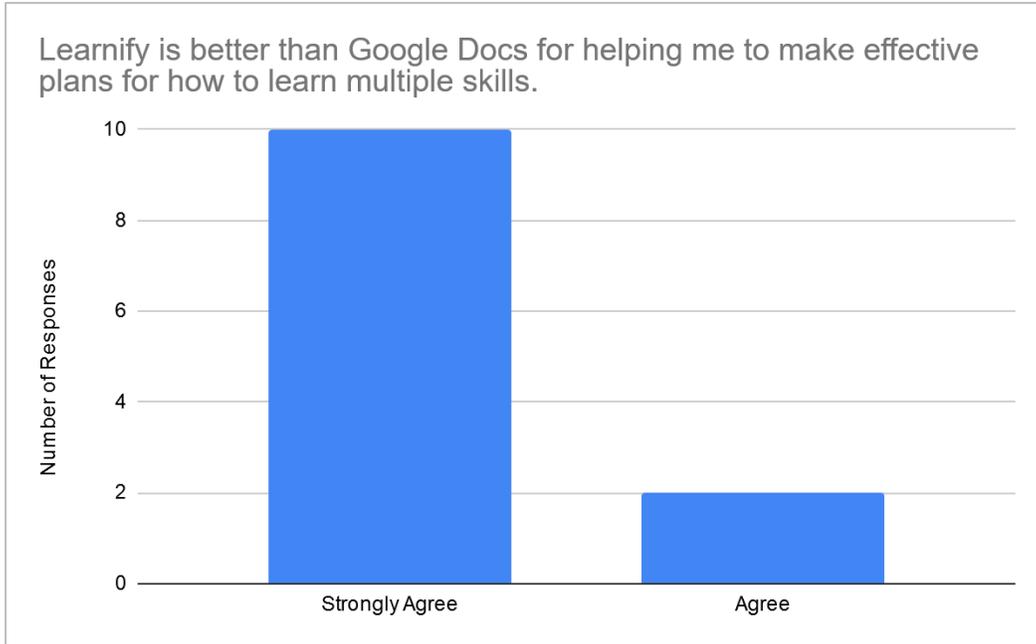


Figure 15: All participants agree that they can make effective plans on learning multiple skills through Learnify.

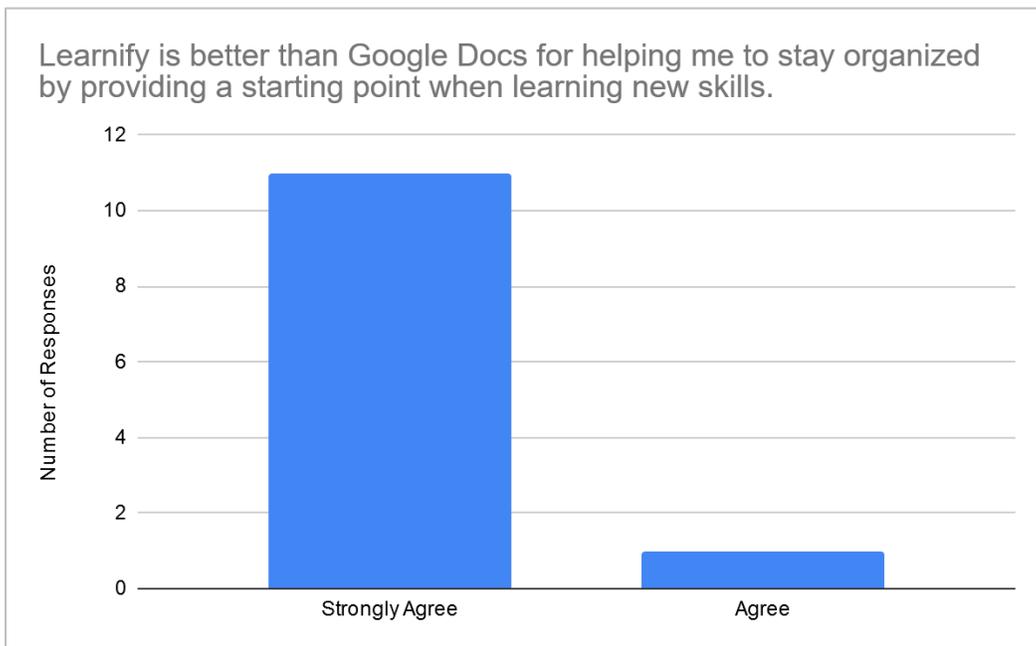


Figure 16: All participants agree that they feel more motivated to learn new skills through Learnify application.

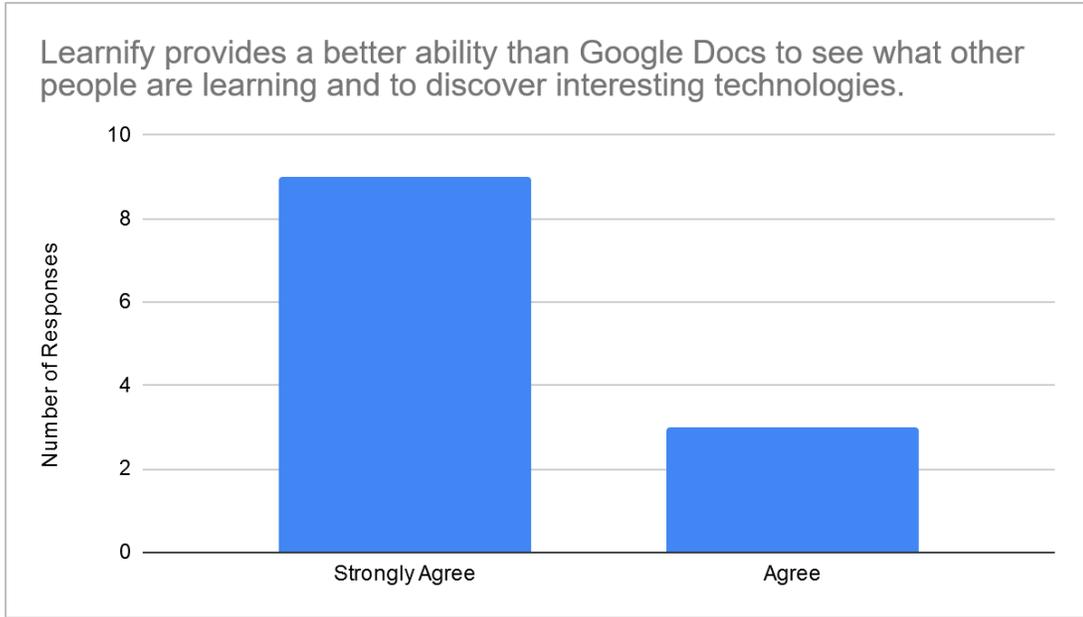


Figure 17: All participants agree that Learnify provides better ability to discover new technologies than Google Docs.

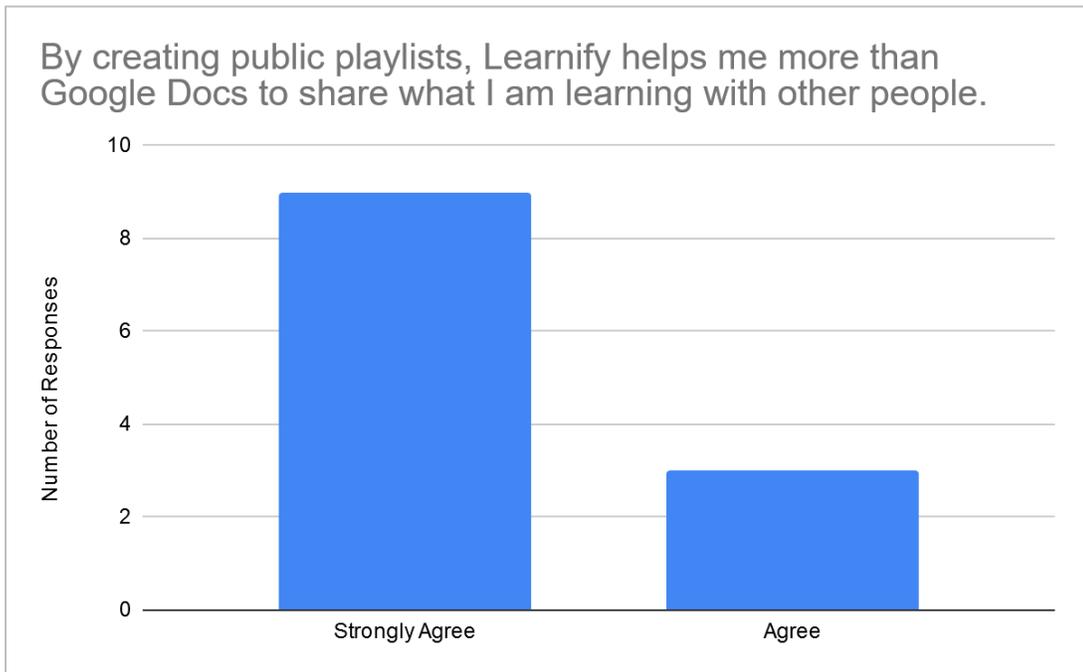


Figure 18: Participants feel they can share their learnings with other people more than using Google Docs.

5. Conclusion

Learning is a continuous process and is the critical part for any individual's success in life and career. This raises the important questions as how this process of learning can be made more efficient, how to give each individual or students a better chance in learning, and how to inspire learning in the first place. Learnify increases users' ability to stay organized by providing pre-defined journey of revising or learning any new skills. Learnify makes it more convenient for users to see what other people are learning, and it makes it more efficient to find relevant resources. It creates a launch pad for inspiring a journey of learning.

The user study provided great insights about the application and gave good data points on how users perceived this application. The study showed that 100% of users agreed on adopting this application in their process of learning. Also, all users agreed that they can fast-track their learning by using Learnify and subscribing to playlists. One user in the study mentioned the considerable time he/she spent on the online forums of Leetcode, Hackerrank or Geeks for Geeks looking for curated playlist for learning, and he expressed excitement about how Learnify helped to get these playlists quickly. Overall, everyone in the user study was willing to recommend it to their colleagues and this highlights the importance of Learnify and its usage in the process of learning.

The study also provided great feedback on additional features that can be incorporated in Learnify. Users feel that the functionality to track progress of learning would be helpful going forward. This would be mean highlighting the resources that have been studied and providing some sort of tracking bar to check the progress. Some users would like to see a plugin for other common browsers like Mozilla and Safari. These two features requests were raised by majority of users in the study and thus will be incorporated in future versions.

In the Learnify application, people create playlists and rate it based on their experience. In future, the recommendation engine could be enhanced, through both more detailed ratings and in using a more complex model for issuing recommendations. Other enhancements could be to add website resource details automatically using web scraping, as well as automatically generating summaries of these resources.

In conclusion, the application is an innovation aimed at fueling the learning experience for people and fast-tracking their learning multiple skills. The application has shown good results in the study and with the existing architecture and design it can be extended to support more functionality and can be scaled easily.

6. References

[1] Book - Teaching & Learning Online: New Pedagogies for New Technologies by John Stephenson. Published in 2001 by British Library.

[2] Collis B., Moonen J. (2006) The Contributing Student: Learners as Co-Developers of Learning Resources for Reuse in Web Environments. In: Hung D., Khine M.S. (eds) Engaged Learning with Emerging Technologies. Springer, Dordrecht.

[3] E-learning Growth Forecast: <https://elearningindustry.com/top-elearning-statistics-2019> by Christopher Pappas, published on September 24, 2019 using research from <http://www.brandonhall.com/blogs/brandon-hall-group-research-published-june-5-june-11/>

[4] E-learning Market Share: <https://elearningindustry.com/top-elearning-statistics-2019> by Christopher Pappas, published on September 24, 2019 using research from <https://www.strategyr.com/market-report-e-learning-forecasts-global-industry-analysts-inc.asp>

[5] Google Usage Stats: <https://www.theverge.com/2018/7/25/17613442/google-drive-one-billion-users> published by Shoshana Wodinsky on Jul 25, 2018.

[6] Evernote Usage Stats: <https://expandedramblings.com/index.php/evernote-statistics/> published by Craig Smith on Feb 1, 2020.

[7] LinkedIn Usage Stats: <https://www.omnicoreagency.com/linkedin-statistics/>

published by Omnicore Agency and last updated on Feb 10, 2020.

[8] LinkedIn Perception: <https://www.mindtools.com/pages/article/linkedin.htm>

published by Mind Tools Content team.

[9] Pinterest Usage Stats: <https://sproutsocial.com/insights/pinterest-statistics/>

published by Lauren Cover.

[10] MOOCs Market Share: <https://www.technavio.com/report/moocs-market-industry-analysis> published by TechNavio.com on Feb 2020.

[11] E-Learning: <https://www.forbes.com/sites/tjmccue/2018/07/31/e-learning-climbing-to-325-billion-by-2025-uf-canvas-absorb-schoolology-moodle/#221c6da63b39>

published for Forbes by TJ McCue.

[12] Research Analysis on MOOC Course Dropout AND Retention Rates published in Turkish Online Journal of Distance Education-TOJDE ISSN 1302-6488 Volume: 17 Number: 2 Article 1 on April 2016 by Dr. Marcela Gerogina and Lorena Aleman De La Garza.

[13] Service Oriented Architecture:

<https://www.javaworld.com/article/2071889/what-is-service-oriented-architecture.html>

<https://www.cuelogic.com/blog/microservices-with-node-js>

[14] JWT (Java Web Tokens):

<https://github.com/auth0/node-jsonwebtoken>

<https://medium.com/better-programming/authentication-and-authorization-using-jwt-with-node-js-4099b2e6ca1f>

[15] Nearest Neighbor:

<https://towardsdatascience.com/prototyping-a-recommender-system-step-by-step-part-1-knn-item-based-collaborative-filtering-637969614ea?gi=dd5c3db71916>

[16] NoSQL:

<https://www.udemy.com/course/mern-stack-front-to-back/>

<https://codingthesmartway.com/the-mern-stack-tutorial-building-a-react-crud-application-from-start-to-finish-part-1/>

[17] Non-Parametric Test:

<http://www.statstutor.ac.uk/resources/uploaded/wilcoxonsignedranktest.pdf>

<https://www.socscistatistics.com/tests/signedranks/default.aspx>