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Evaluation Model for Software Tools
Using Merinova's TAS System as a Case Study and Outlining the Key
Principles in respect to the Design, Development and the User

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ABSTRACT

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The objective of this thesis was to firstly, to conceive a comprehensive and consolidated method for effectively analyzing and evaluating HRM software tools, and secondly, to provide changes to Merinova's TAS system based on the evaluation methods created.

The primary goal of this thesis was to create an evaluation model that could be used to evaluate software tools in the context of e-HRM systems, or any software that has been designed primarily for business applications, and to do so from the principles of the user, the design, and the developer. The end result was to develop and synthesize a consolidated evaluation model that was both, sufficient, yet succinct in its purpose and with the end goal of allowing the end user of the model to effectively evaluate and judge a software tool, particularly in the case of e-HRM systems.

The secondary goal of the thesis was to then use this model to carry out a case study on a real-life client, Merinova, and their e-HRM system called the TAS System which is used to log employee hours in relation to project assignments and then export the data to help in the proper invoicing of their clients. The case study then was finalized by the proposal of a list of suggested improvements and changes which should be made to the existing TAS System.

This thesis was done, primarily, through the assessment of earlier models and principles that were utilized as secondary research sources. The evaluation model which was created, was then used to carry out the secondary goal of the thesis, which was to evaluate the TAS System.

Keywords	HRM, e-HRM, TAS System, Evaluation Model

Contents

1. Introduction

Today, businesses globally rely on a combination of software tools and programs in efforts to improve their existing business practices. These tools are designed to cater to the business' every function and are often customized for further optimization. An organization's key functions are often generalized to four key components: manufacturing/production, sales and marketing, finance and accounting, and Human Resources (HR). Consequently, today most business-oriented software programs and tools are often designed to aid, and enhance, these four aforementioned functions in one way or another. The focus of this thesis shall be on the programs, software tools, and suites designed to benefit specifically the HR Function.

Human Resource Management (HRM), a key business function of any organization, revolving primarily around the recruitment, training, development, and compensation of employees within an organization. Today, with the advancements made in software design and implementation, many of the key roles of HRM can and have already been automated and enhanced through the development of various programs and tools. /1/

Merinova, an organization part of the energy cluster in the Vaasa Region, shall serve as both, the client, as well as the case study for this report. Merinova, a relatively small organization, with 12 employees makes use of a proprietary tool, TAS, to manage its HR functions, primarily in the field of employee hour-logging and pay-roll calculations. As such, the tool, TAS, can be classified as an HRM systems tool, albeit with a very limited and specific scope and purpose.

The goal of this report is, firstly, to conceive a comprehensive and consolidated method for effectively analyzing and evaluating HRM software tools and, secondly, to develop and provide changes to Merinova's TAS system based on the evaluation methods created.

1.1   Introduction: Merinova, Client and Case Study

Merinova, as mentioned before, shall serve as the real-life case-study and client for the results of this report, is a technology center located in the Vaasa Region with approximately 12 full-time employees. It is important, for the success of this report, to conduct a thorough research and provide a succinct understanding of Merinova, its primary business functions, and the role TAS, the HRM tool, plays in its day-to-day business functions.

It is important to understand the business model of Merinova, and the core business functions of the company itself. Founded in 1989, Merinova aims to "help the energy cluster in Vaasa to grow and prosper" and do so through "their strong project expertise and development services that go deep into the corporate processes." Merinova's core business practices involve either the development and initiation of industry-driven projects, or by offering development services to individual clients on a one-to-one basis. /2/

One of the projects undertaken by Merinova includes EnergyVaasa, an initiative to form a cluster of around 140 companies in the industry and helps develop them into "an engine for Finnish exports." EnergyVaasa today comprises of around 11,000 employees working for the aforementioned 140 or so companies and has a combined turnover of approximately 4.4 billion euros. /3/

Another of Merinova's project is the "Cleantech Kvarken" project, bringing together the two clusters located on either side of the Kvarken archipelago (Finland and Sweden). The goal of this project is "to help the energy cluster in Vaasa to grow and prosper." Merinova is able to make this happen "through their strong project expertise and development services that go deep into the corporate processes." The project is expected to last three years, from 2015 to 2018, and will be achieved through "the cross-border cooperation between towns, municipalities and publicly owned companies, and by improving cooperation between cleantech companies in the area." /4/

The other segment of Merinova's revenue stream revolves around the provision of services to interested clients and parties. Today Merinova offers services relating to: project management, analysis and investigation services, development of processes, and language services. In terms of the development of processes, Merinova aims to help businesses improve their "productivity by enhancing business activity," and through the maintaining of standardized management systems like the ISO9001 standard. The ISO9001 standard is designed to guide various Quality Management principles and can be applied to organizations of any scale and magnitudes /5/. Beginning with some investigative services, Merinova then works closely with their clients to "ensure the building of a quality environment and working system." /6/

Merinova today, according to the information published on their website, is owned by a collection of companies, cities and municipalities, and universities. Approximately 72 % of the business is owned by private corporations such as ABB, Danfoss, Wärtsilä, and many more.

Another 27% of the organization is then owned by the cities and municipalities present in the region such as the city of Vaasa, Lapua, Malax, Korsholm, Kauhava, Laihia, and Isokyrö. The remaining <1% is owned by a few academic institutions such as the Novia University of Applied Sciences, Åbo Akademi University in Vaasa, Foundation Swedish School, and the University of Vaasa.

Merinova's workforce, which consists of 12 highly experience professionals, is a combination of project managers, directors, business developers, and service managers (see fig.1). It can be seen that Merinova has an almost equal division of employees in terms of their two major revenue streams: services and projects. It can be inferred that the business developers, and service managers focus on the services side of Merinova's business stream, while the Project Managers and Development Managers perhaps focus more on the projects that Merinova undertakes.
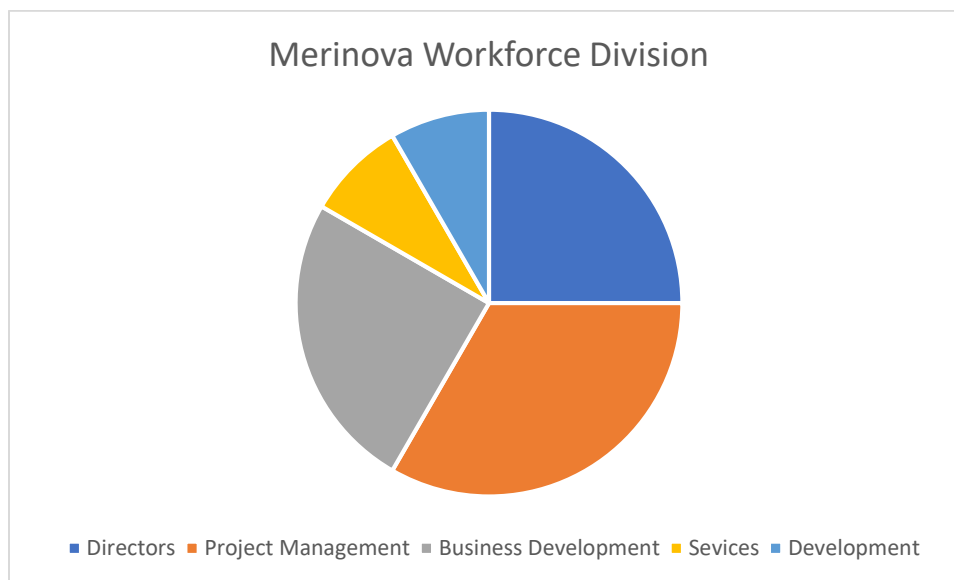
Fig.1 –Employees within Merinova, and their areas of expertise in terms of their specializations.

A brief, yet succinct, introduction of the company, Merinova, is necessary to garner a better understanding of the company's needs and wants, as well as understanding the role HRM Tools, such as TAS, shall play in the day to day running of the business itself.

1.2   Introduction: HRM and HRM Software Tools

Human Resource Management (HRM), the field relating to the "management and development of employees in an organization," and also a major component of this report, is an ever-

expanding, and rapidly growing field in the business world /1/. Today, HRM relates to many employee and workforce related tasks such as: employment, management of human taskforces, development of policies regarding employees and employment, the training of staff, pay-roll related activities, employee hour-logs, and employee benefits and motivation. It is therefore important to understand the key functions of HRM, and how technology, more specifically software tools, can be used to increase efficiency and improve business practices pertaining to HRM. For the purposes of this report, the key functions of HRM to be analyzed and evaluated, based on their relevance to the client, Merinova, and the ability to automate or enhance the function in question through the provision of software tools, programs, and services.

First, the goal of HRM is to serve as body that is responsible for the development of workplace policies. Workplace policies can be used as methods to both, improve business efficiencies, and ensure fairness and unbiasedness throughout the whole organization. An example of a policy designed to increase workforce efficiency is the addition of internet usage policies; for example, restricting access to certain websites such as Social Media outlets like Facebook, YouTube, Twitter, and Instagram. Another example of a workplace policy, this one to promote equality within the workplace, can be the inclusion of dress-code, and ethics policies that apply to all members of staff /7/.

Secondly, another function of HRM is to oversee and monitor the administration of compensation and benefits with the organization. This involves all forms of compensation including the pay-roll of employees, the provision of sick and paid leaves, provision of bonuses, and vacation time allocations. It can be inferred that this role of HRM has been most catered to by the TAS System as it is being used by Merinova for the time-logging of employees, calculating hours worked by each team/employee, and invoicing customers based on the time-logs of the employees. As the TAS System is very focused and limited in terms of it scope, it does not address all of factors mentioned within this function either. However, it should also be noted that the TAS system when originally created, was designed with a very specific function and purpose: both of which are now fulfilled by the current system.

Thirdly, another key function of HRM, which pertains to the focus of this report, revolves around the retention of staff and employees. This function focuses on ensuring that the employees within the organization are satisfied and motivated to work for the organization. Today, there are

several factors resulting in why an employee may choose to leave their workplace: issues with their tasks or superiors, the corporate culture present, or poor workplace environments, and last but not least, for better compensation /7/. It can be said that the TAS system can be developed further to include methods which can be used to increase employee job satisfaction and motivation.

Fourthly, another key function of HRM, once again, which relates to the focus of this report, relates to the training and development of staff. The aim of this function is usually to both, increase employee productivity within the organization, and secondly, to improve employee motivation and job satisfaction. This is because now not only are the employees able to do their tasks faster, as a result of their training, they are also able to equip themselves with new skills to develop and hone their professional aptitudes. This is another key function of HRM that can be enhanced or optimized through the provision of developments on the existing TAS System.

Lastly, it is important to list the remaining less-key functions, which will not pertain directly to the focus of this report. Staffing, referring to the recruiting and firing of employees, is another function of today's modern HRM standards. Another function which HRM has to keep in consideration is to keep an awareness of outside and other external factors. These factors, titled as external, can be referred to as ones that are outside the control and influence of the organization itself. These could be economical factors such as recessions or inflations, political factors such as elections or rather the results of elections, or technological factors such as the developments in the fields of artificial intelligence or automation. As such, it can be mentioned that while listed as a function, the last function is primarily outside the control of the HRM. Instead, HRM is expected to only, at best, be informed and try to mitigate the effects of these external factors on the staff.

Figure 2: Seven key functions which are expected to be managed by today's HRM standards.

To conclude, it can be mentioned that while there are seven main functions that any modern day HRM should serve, there are four main ones which directly pertain to the focus and aim of this report (**see Fig.2**). The four functions are: retention, training and development, development of workplace policies, and the administration of staff compensation and benefits. It can also be stated that the current version of the TAS system pertains only to the last function, the administration of staff compensation and benefits.

2. Evaluation of Software Tools

In order to provide an effective analysis of HRM systems, it is important to develop a framework that allows for a consolidated evaluation of these software tools; both, from the perspective of a user, and that of a developer. As the focus of this report is on HRM systems primarily, the evaluations conducted shall focus mainly on the evaluation of HRM systems from the user's and developer's perspectives. However, as many fundamental principles of evaluations remain constant regardless of systems or their contexts, this report shall also make use of other cases to aid in the development of the framework.

For the purposes of this report, the user shall be the same as what some frameworks may call the end-users. The user, as such, is the person who shall be using the software tools and would not be expected to have an understanding of the technical components of the software itself. As such, the first part of this section shall focus on analyzing various tools as the users.

The second part of this section shall focus on providing additional components to the development of the framework from the perspective of the developer. The developer, for this report, can be defined as someone who "builds and create software and applications, writes, debugs and executes the source code of a software application." /8/

The third and final part of this section shall consolidate the ideas and topics discussed in the first two parts, and consequently, provide a framework that can be utilized in further applications to effectively analyze and evaluate software tools, and more specifically, HRM systems (**see fig.3**). The idea then is to apply this framework onto the TAS System as well as other HRM systems that can serve as benchmarks or case studies for this report.
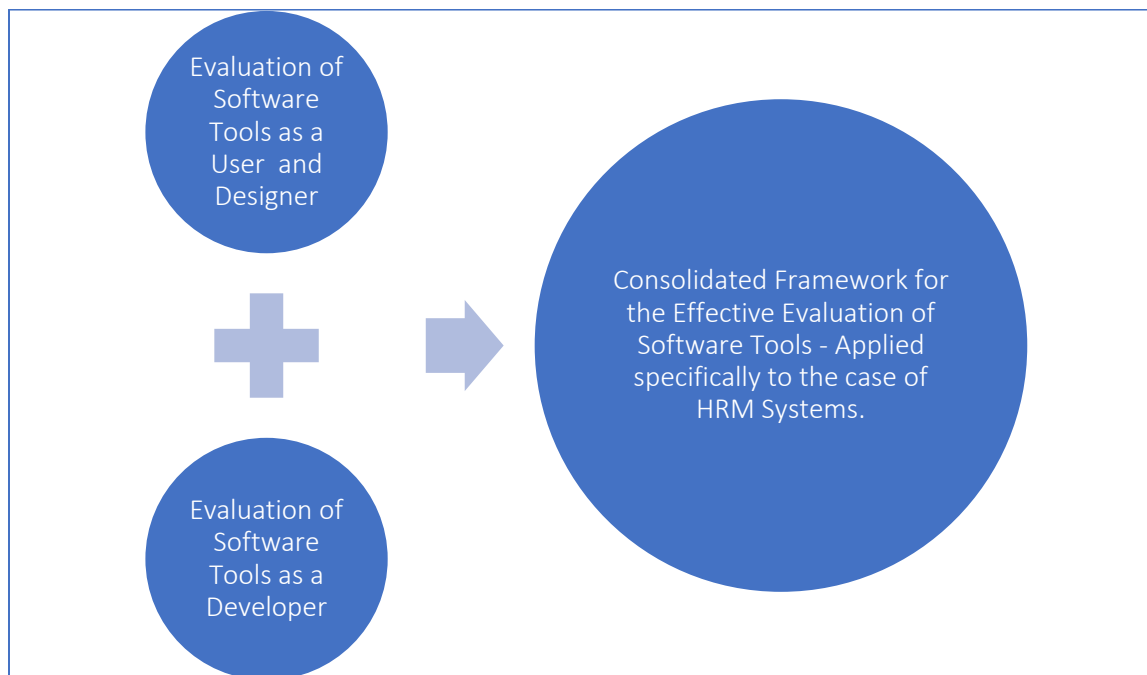

Figure 3: This figure is designed to showcase how the framework for evaluation shall be conceived.

2.1   Evaluation of Software Tools as a User

2.1.1   Outlining Primary Principles of Good Design

Design today is a word and concept that is applied to every industry, process, and organization at differing levels. According to the Swedish Industrial Design Foundation (SVID), design, is "a process of developing purposeful and innovative solutions that embody functional and aesthetic demands based on the needs of the intended user. Design is applied in the development of goods, services, processes messages and environments /18/." Based on their principles, it can be inferred that good products, tools, or services are often the result of a good design, and good design thinking process. These principles, of course, can be applied not just to products, but also software tools and programs. The principles of being purposeful, innovative, and embodying functional and aesthetic demands are all multi-disciplinary concepts that can be used to serve as a frame of reference to good software tool design. Before moving into the principles of UI Design, or principles contextually only applying to the software fields, it would be beneficial to compile of list of multi-disciplinary principles in relation to good design.

Dieter Rams, an industrial designer and closely associated with Braun, the German consumer products company, is known for his "less but better" approach, and the 10 "Good Design" principles. According to Rams, good design is innovative, makes a product useful, is aesthetic, makes the product understandable, unobtrusive, honest, long-lasting, thorough, environmentally friendly, and is as little design as possible /19/. By unobtrusive Rams believes that all products are designed to fulfil certain purposes, much like tools. He, therefore, argues that their design should be neutral and restrained. In regard to design being honest, Rams believes that products should not manipulate, or make false promises to the user. The last principle, seemingly a paradox, according to Rams is the concept that good design concentrates on the essentials. On a conceptual level, many of his principles can be applied not just to physical products and industrial design, but to design in many fields and disciplines including software and UI design.

The government design principles of the United Kingdom (UK), provided by the Governmental Digital service of the UK, also consist of ten principles. These principles, which primarily apply to service design, are that: one must start with understanding the user needs, doing less, design with data, doing the hard work to make it simple, iterate, create design that works for everyone,

understand context, build digital services not websites, are consistent, and make things open. As mentioned earlier, despite applying to primarily the service design sector, many of the principles stated here are similar, if not, identical to the ones mentioned by Rams too. For example, the principle of understanding the context is similar to Rams' principle of making products that are understandable, as they both outline the importance of understanding for whom and for what purpose a product/service is being built. Likewise, the ideals of making the design simple, is similar to Rams' idea of "less but better" as both focus on the importance of focusing on the essentials, and making a product/service that is honest and easy to use.

Moreover, according to CO.DESIGN, in an article by Katharine Schwab (2017), where she interviewed many experts of design from various fields, have outlined eight key design principles. Firstly, good design is both invisible and obvious, according to Ruthia He, a product designer at Facebook. She believes that as design is often the process of problem solving, good design, in theory, is invisible as it is well orchestrated and in the 'background.' Paula Scher, a partner at Pentagram, believes that ignoring trends is important to good design. Another principle outlined in the article is that one should "Ban Mediocrity," that is according to Brett Lovelady, the founder of Astro Studios. Furthermore, Diego Zambrano, a partner at Work & Co, believes that good design is designed to elicit emotion. He also further articulates, in the article, that emotion often is the biggest decision-making tool used by people, often more than other factors such as speed or clarity. Good design should, according to Matt Rolandson, a partner at Ammunition, articulate one's purpose honestly, and explicitly. Gadi Amit, the founder of New Deal Design, argues that good design views users as people, and not merely statistics. As a designer, Amit believes that good design personalizes the product or service in question. Todd Simons, from IBM, argues that design thinking isn't for designers, arguing that by applying a set of thinking principles, one is removing the individuality and personality associated with good design itself. Lastly, Yves Behar from Fuseproject, believes that good design is designed for the big idea. She believes it is about finding the larger idea which can be enhanced by design, as opposed to design being the idea itself. It can be inferred that according to Behar, design is simply a tool to exemplify and realize one's bigger ideas. /21/

In conclusion, it is important to consolidate all of the principles, and apply them to the context of software programs and tools. To do so, it would also be logical to come up with a redefined

set/list of principles and guidelines that can be applied to design (**see Fig.4 and Fig.5**). These principles for good design are chosen based on their relevance to software design, their relevance to the case study involving Merinova, and the uniqueness of their ideals (**see Fig.4 and Fig.5**). It can be concluded that in essence, good design is honest, focuses on the essentials, understanding of its context, simple externally, and humanized (**see Fig.5**).

Principle(s)	Definition of Principle(s)
Good design is honest /19/	Design should be honest and straightforward to user. The design should ensure the final product/service does not over promise or under-deliver. This principle is directly derived from the principles of Dieter Rams.
Good design focuses on the essentials	Design should focus on the main aspects, and avoid attempts to confuse the user or provide too many functionalities, or too much information. Essentials should be the driving force behind the design. This principle is based on the principles of Rams and the Government of UK Principles.
Good design understands its context	Context should be a primary tool used in the design process of the product/service. Context, in this case, refers to the end-user, the environment in which the product/service is to be used, and the desired outcomes of the product/service. This principle is primarily derived from the principles stated by the government of UK.
Good design may be complex internally, but	Good design is a well-executed process and

is always simple externally.	result. This means that while the end user should be able to appreciate the complexity or ingenuity of the solution, they do not need to be subject to it explicitly. That is to say that just because a design may be complex in its conception, it is not necessary to showcase the complexity to the user. This principle is derived from the principle outlined by Ruthia He of Facebook.
Good design is 'humanized'	In this context, humanized is used to refer to the behavior and emotions of humans. Good design should play to one's emotions, and in a way, be a reflection of mankind. This principle was derived from the ideals of Rams, and Diego Zambrano.

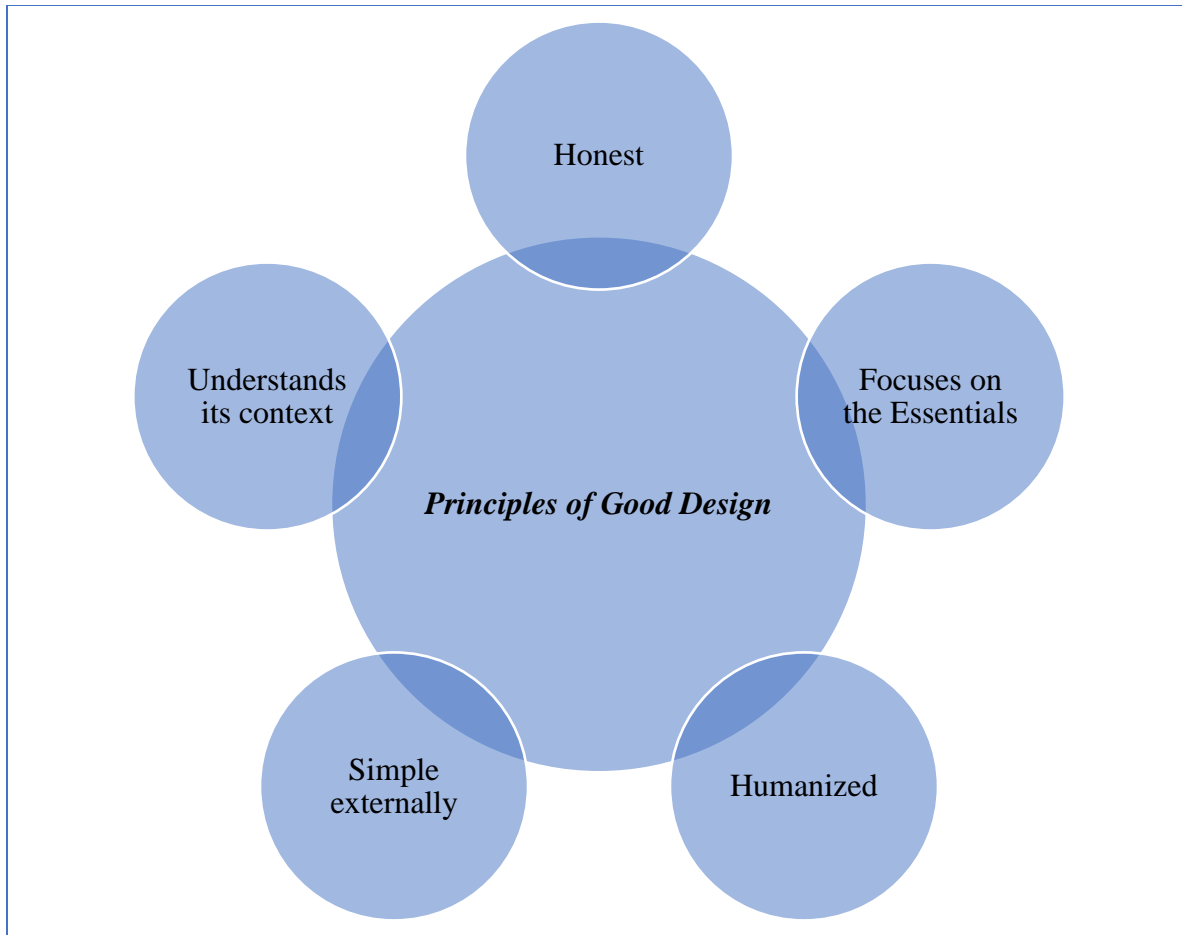Figure 4: Consolidated List of Design Principles

Figure 5: Principles of Good Design

2.1.2   Outlining the Primary Principles of UI Design

There are various principles today that are seen as the leading frameworks on conducting an effective analysis of any software tools as a user. As such, it is important to identify, understand, and choose the most relevant of those principles which shall then be analyzed more carefully throughout this report. The core principles in the fields of User Interface (UI) design can be narrowed down to around ten specific principles, with minor variations depending on the designer, or their school of thought.

According to Jane Portman, an independent UI/UX Consultant, a prototyping and collaborative working platform, the core principles of UI design are: Clarity, Flexibility, Familiarity, Efficiency, and Consistency and Structure /9/. It is now important to provide a more detailed overview of those aforementioned principles (**see Fig.6**). It can be said that many of the

principles, like clarity and efficiency, or consistency and familiarity, often go hand in hand, and are interlinked with one another. It can be inferred that one of them often serves as the basis for the other, and the effectiveness of one of the principles can have a direct impact on the effectiveness of another in this case.

Name of UI Design Principle	Description
Clarity	Users should be well informed and confident in regard to the usage of the program, tool, or application in question
Flexibility	Design something that can be applied to any context or situation.
Familiarity	Make use of conventional standards, designs, flows to one's advantage.
Efficiency	Assessing the main uses of the tool in question, and designing the app to match those needs in the most efficient way.
Consistency and Structure	Introducing structure to the design, and in ways, giving the program its own language, allowing users to familiarize themselves quickly and efficiently.

Figure 6: Concise Descriptions of the main UI Design Principles outlined by Jane Portman.

Similarly, according to John Moore Williams, the director of Content Strategy at Webflow, a responsive Web design tool, CMS and hosting platform., there are nine essential principles that should be considered in the fields of UI design. Those principles are as follows: knowing one's audience, defining how the interface is to be used, setting expectations, anticipating mistakes, give feedback, thinking about element placements and size, not ignoring standards, designing easy to learn interfaces, and making decision making simple /10/. As such, it is important to also provide some additional information and insight into the principles themselves (**see Fig.7**).

Name of UI Design Principle	Description
Know your Audience	Knowing the needs, and hindrances that are currently in the way of one's target user.
Define how the Interface is to be used	Understand features of functions that shall either be direct or indirect interactions done by the user with the tool in question.
Setting Expectations	Having your users know the consequences of their actions done on the tool itself, this can also be done through the use of various color schemes and call-to-actions.
Anticipating Mistakes	Implementation of methods to avoid, or quickly rectify the mistakes that the user may do on the tool, implementing mistake-prevention techniques, i.e. buttons which do not activate till all fields are filled.
Giving Feedback	Giving visual, audio feedback to users to indicate when an action has been conducted, or when an action is awaiting user interaction.
Element Placements and Size	Defining sizes for the various elements on display based on their importance, ease of access, and the frequency of usage.
Not Ignoring Standards	Following standards on aspects that the tool in question may share with other systems, programs, or tool – allowing the user to feel a sense of familiarity with the tool's behavior.
Easy to Learn Interfaces	This can be achieved by limiting the number of things a user may be required to remember, and providing an interface that is as simple and as easy to read as possible.
Simplifying Decision Making	Providing the right number of options to the user at any given point in time, and making it

	easy for the user to know what is required from them at any given point in time.

Figure 7: Concise Descriptions of the main UI Design Principles outlined by John Moore Williams.

Jakob Nielsen, the Principle of the Nielsen Norman Group and a respected figure in the fields of UI Design, has listed "10 Usability Heuristics in the fields of UI Design". Written to serve as "broad rules of thumb," the 10 heuristics are created, like the others, to serve as principles in this field of design (**see Fig.8**). The figure is designed to provide a brief understanding and analysis of the heuristics (**see Fig.8**). /11/

Name of Heuristic	Description
"Visibility of System Status"	Keep users informed about the current status and providing feedback in a timely fashion
"Match between System and Real World"	The system should be designed to "speak" in ways that is similar to the user. Information should appear in a natural order.
"User Control and Freedom"	Support the provisions of undoing and redoing user actions.
"Consistency and Standards"	Following conventions to provide an ease in understanding for the user.
"Error Prevention"	Prevent or remove the occurrences of error-prone settings and conditions.
"Recognition rather than recall"	Reduce the number of things and aspects that a user may need to memorize or keep aware of
"Flexibility and Efficiency of Use"	Allow users to have the ability to accelerate certain actions based on their expertise of the tool.
"Aesthetic and Minimal Design"	Avoid information overload and exclude any

	information that may be irrelevant or rarely needed.
"Help users recognize, diagnose, and recover from errors"	Make use of Error messages and provide concise answers in easy to understand language to the user and suggest constructive solutions.
"Help and Documentation"	Information should be easy to locate, clearly defined, provide clearly outlined steps, and should not be too large in size.

Figure 8: Concise Descriptions of the 10 Usability Heuristics by Jakob Nielsen.

To conclude, it can be stated that the aforementioned UI design principles outlined by the three experts often overlap and highlight certain common characteristics. It would therefore be useful to combine and collate these principles, to create a consolidated list of principles (**see Fig.8**) which can serve as the basis for the research to be conducted in the following parts of this report. The key principles which were reciprocated by all three experts, and can be considered as the 'most key' principles were: flexibility, efficiency in usage, providing familiarity to users, error prevention methods, and feedback provided to users (**see Fig.9**).
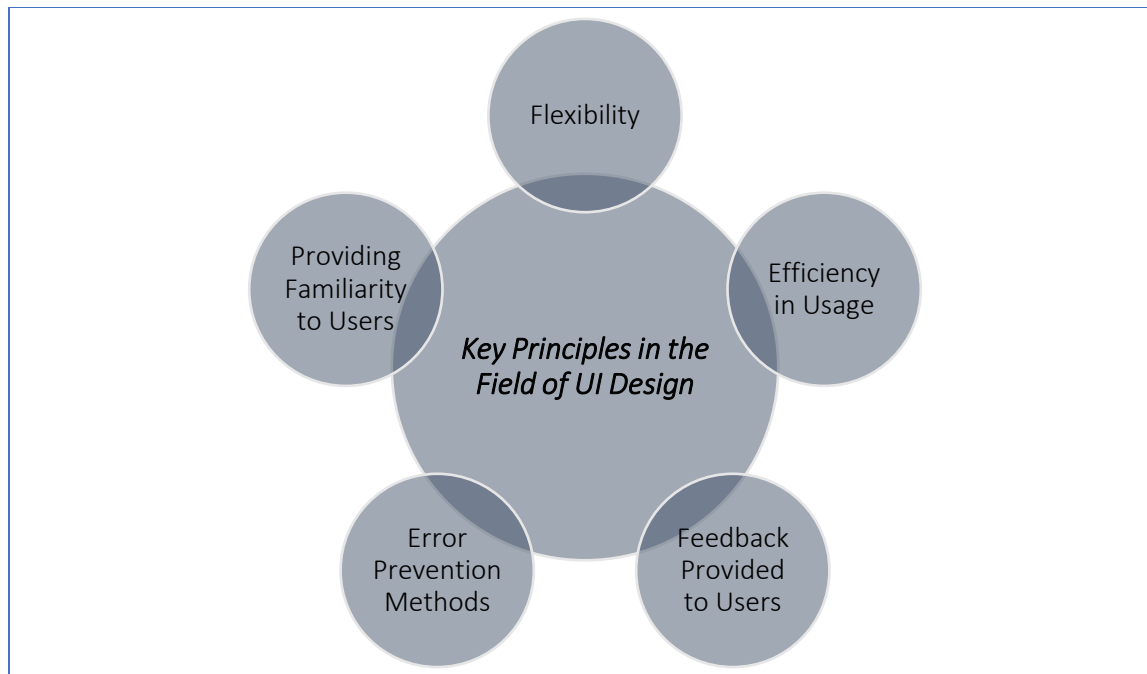
Figure 9: Consolidated list of Key Principles for effective UI Design.

2.1.2.1 Outlining the Primary Principles of UI Design – Catered toward HRM Systems

Now, with the key principles of UI Design in mind, it is important to highlight their importance, as well as relevance to the systems in question: HRM Systems. According to Tanya Bondarouk, Electronic HRM (e-HRM) systems can be distinguished into four major applications: Administrative and Workforce Management, Service Delivery, Strategic HR, and Business Intelligence (BI) applications. Moreover, she also mentions that, an effective indicator of whether the implementation of an e-HRM system has been successful is the "skillful and task-consistent using of the system by its targeted users" /12/.

As most e-HRM systems are designed with the user, and the user profile in mind, it is important, for a thorough evaluation, to create an effective user model to understand the goals and targets of the user in using the e-HRM system.

2.1.3 User Modeling – Design Process

According to various experts, user modeling is a key factor in designing software that is precise, upholds customer expectations, and provides customer satisfaction. Today, user modeling is often done through the creation of personas. Personas should, in essence, help designers: determine the product's use and behavior, communicate with their stakeholders, build consensus

and commitment, measure the effectiveness of one's design, and contribute to other aspects such as marketing and sales plans (in relation to the product). The goal of this tool is to help the designers create a product that fits the needs of its target users – much like the purpose of many e-HRM systems today. Provisional personas, as opposed to rigorous ones, rely on generally available data and educated guesses made by the designer regarding their target user. For the purposes of this report, a provisional persona shall be designed, to help create effective user case scenarios which shall then help in the further development of the TAS System. The main components in the creation of a succinct provisional persona are: developing a user profile, understanding the user's goals, identifying behavioral patterns and behavior variables. /13/

In the case of Merinova and the TAS System, a similar model can be created to help understand the needs and wants of the target user(s) (**see Fig.11**). The information used to create these models has primarily been sourced from Merinova's website /2/.

It is also important to highlight that, for effective modelling of the user persona, it is imperative to provide, as the designer, an understanding of the target user's personality. The Myers Briggs Type Indicator (MBTI) is one of the most commonly used tools to identify one's personality and understanding one's psychological preferences (**see Fig.10**). As such, for the purposes of this report, a simple MBTI personality was allocated to the user persona, based on primary and secondary research of the employees at Merinova.

What's Your Personality Type?

Use the questions on the outside of the chart to determine the four letters of your Myers-Briggs type.
For each pair of letters, choose the side that seems most natural to you, even if you don't agree with every description.

1. Are you outwardly or inwardly focused? If you:

- Could be described as talkative, outgoing
- Like to be in a fast-paced environment
- Tend to work out ideas with others, think out loud
- Enjoy being the center of attention

then you prefer

E
Extraversion

- Could be described as reserved, private
- Prefer a slower pace with time for contemplation
- Tend to think things through inside your head
- Would rather observe than be the center of attention

then you prefer

I
Introversion

2. How do you prefer to take in information? If you:

- Focus on the reality of how things are
- Pay attention to concrete facts and details
- Prefer ideas that have practical applications
- Like to describe things in a specific, literal way

then you prefer

S
Sensing

- Imagine the possibilities of how things could be
- Notice the big picture, see how everything connects
- Enjoy ideas and concepts for their own sake
- Like to describe things in a figurative, poetic way

then you prefer

N
Intuition

ISTJ
Responsible, sincere, analytical, reserved, realistic, systematic. Hardworking and trustworthy with sound practical judgment.

ISFJ
Warm, considerate, gentle, responsible, pragmatic, thorough. Devoted caretakers who enjoy being helpful to others.

INFJ
Idealistic, organized, insightful, dependable, compassionate, gentle. Seek harmony and cooperation, enjoy intellectual stimulation.

INTJ
Innovative, independent, strategic, logical, reserved, insightful. Driven by their own original ideas to achieve improvements.

ISTP
Action-oriented, logical, analytical, spontaneous, reserved, independent. Enjoy adventure, skilled at understanding how mechanical things work.

ISFP
Gentle, sensitive, nurturing, helpful, flexible, realistic. Seek to create a personal environment that is both beautiful and practical.

INFP
Sensitive, creative, idealistic, perceptive, caring, loyal. Value inner harmony and personal growth, focus on dreams and possibilities.

INTP
Intellectual, logical, precise, reserved, flexible, imaginative. Original thinkers who enjoy speculation and creative problem solving.

ESTP
Outgoing, realistic, action-oriented, curious, versatile, spontaneous. Pragmatic problem solvers and skillful negotiators.

ESFP
Playful, enthusiastic, friendly, spontaneous, tactful, flexible. Have strong common sense, enjoy helping people in tangible ways.

ENFP
Enthusiastic, creative, spontaneous, optimistic, supportive, playful. Value inspiration, enjoy starting new projects, see potential in others.

ENTP
Inventive, enthusiastic, strategic, enterprising, inquisitive, versatile. Enjoy new ideas and challenges, value inspiration.

ESTJ
Efficient, outgoing, analytical, systematic, dependable, realistic. Like to run the show and get things done in an orderly fashion.

ESFJ
Friendly, outgoing, reliable, conscientious, organized, practical. Seek to be helpful and please others, enjoy being active and productive.

ENFJ
Caring, enthusiastic, idealistic, organized, diplomatic, responsible. Skilled communicators who value connection with people.

ENTJ
Strategic, logical, efficient, outgoing, ambitious, independent. Effective organizers of people and long-range planners.

3. How do you prefer to make decisions? If you:

- Make decisions in an impersonal way, using logical reasoning
- Value justice, fairness
- Enjoy finding the flaws in an argument
- Could be described as reasonable, level-headed

then you prefer

T
Thinking

- Base your decisions on personal values and how your actions affect others
- Value harmony, forgiveness
- Like to please others and point out the best in people
- Could be described as warm, empathetic

then you prefer

F
Feeling

4. How do you prefer to live your outer life? If you:

- Prefer to have matters settled
- Think rules and deadlines should be respected
- Prefer to have detailed, step-by-step instructions
- Make plans, want to know what you're getting into

then you prefer

J
Judging

- Prefer to leave your options open
- See rules and deadlines as flexible
- Like to improvise and make things up as you go
- Are spontaneous, enjoy surprises and new situations

then you prefer

P
Perceiving

Figure 10: MBTI Personality Types /14/

Descriptor	User Description
Age	Between 30 to 40 years old.
Nationality/Ethnicity	European, Caucasian – English is not their first language.
Background/Education	Background in the STEM or Business Fields.
Previous Qualifications	Bachelors or master's in science in Engineering or Business.
Hobbies/Interests	Sports, Cooking, Outdoor Activities, Travelling, Global Issues such as Politics and Legislations.
Technological Capabilities	Good understanding of software: understands how a system is designed to work, and is able to adapt quickly to new tools and programs.
Goals and Motivations	Likes to set targets, aims for career progression, financial stability, seeks positive work-life balance, values job security and stability, dislikes inefficiencies and stressful situations, values positive work culture and environment.
Personality	ISTJ like personality: Introverted, Sensors, Thinkers and Judgers – Based on their background of scientific of

	quantitative fields. Logical, Neutral in terms of emotions, rule abiding and expect consistent behavior.
Overall Conclusion in Respect to Software Design	• TAS System should be easy and logical to use. • System should be designed based on priorities and targets, meaning that the most important objectives of the system should be the easiest to locate (i.e. Time logging, etc.). • System should work through browsers – web-based application(s). • System needs to be designed in a way that is least distracting – easy to see text (clear contrast), minimal use of colors and variations in font(s).

Figure 11: User Persona of a Merinova Employee – The end user of the TAS System.

2.1.4 User Cases – Constraints, Goals, and Functionalities

The next step in the design process, from a user's perspective, is to understand the clear needs and goals of the user from the software program in question. Currently, and as mentioned earlier, the TAS System in use at Merinova today had a very limited scope and requirements. As such, the main requirements from the current system in place can be narrowed down to four main aspects:

- Ability to log and track hours worked by a Merinova Employee on certain project(s).
- Ability to extract/export (download) user data into different formats, i.e. Microsoft Excel.
- Ability to track the number of projects undertaken and corresponding details.
- Ability to add/remove users, and have different classes of users (i.e. administrators).

Moreover, there are also some changes that have been requested by Merinova. These changes, which do not necessarily affect the functionality of the system itself, are more changes to fix certain bugs and errors that are occurring with the current system. The changes or modifications which have been requested by Merinova are, as follows:

- Have the TAS System operate with a more secure protocol – HTTP Secure (HTTPS).

- Fix issues occurring in the database in regard to projects that are more than 2 to 3 years old – where projects simply fail to show up on the website itself.

- Enable the ability to export employee hour data into a Microsoft Excel Spreadsheet or other equivalent file formats.

- Fix issues occurring with Scandinavian letters (å, ä, ö) which come up as garbage text on the website currently.

- Qualitative/Visual Improvements to TAS System → Improve User Friendliness

It can be seen that the changes requested from Merinova are purely based on stabilizing the current system, and not necessarily changes which request further functionality from the TAS System itself. These changes, while designed to improve user experience, will not necessarily bring additional use cases, or 'options' for the user. However, Merinova, as the client, has not limited the changes to be solely to stabilizing the current system. Consequently, the TAS System can be expanded, and be designed to include more functionalities.

As mentioned earlier, the four main applications of modern day e-HRM systems can be classified as: Administrative and Workforce Management, Service Delivery, Strategic HR, and BI applications. The TAS System, as it currently stands, focuses primarily on the Administrative and Workforce Management applications. However; based on the nature of Merinova's business operations, which consists of primarily project-based assignments, further functionalities can be added to the current TAS System which can add BI applications and additional administrative applications to the existing system (**see Fig.12**).
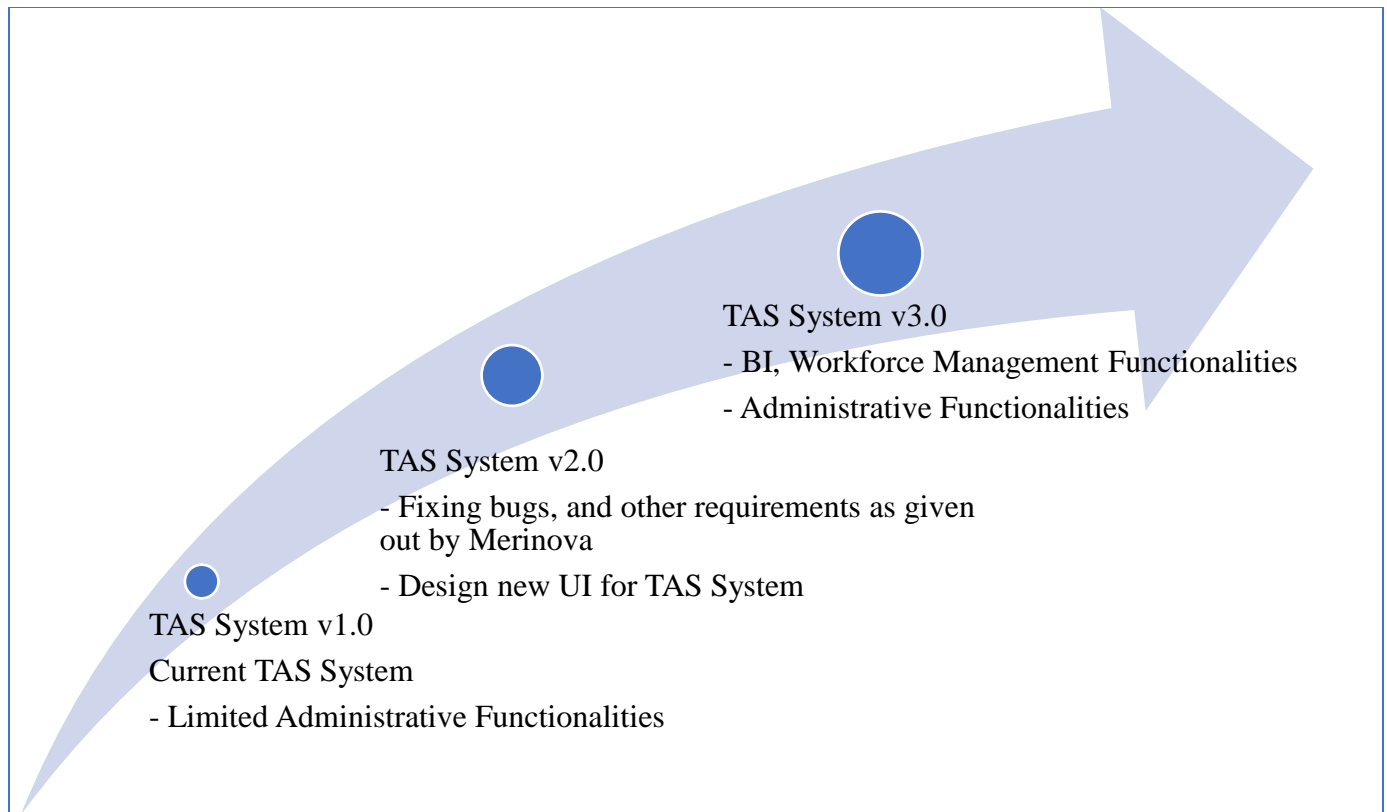
Figure 12: TAS System Development Process.

2.1.4.1 User Cases – Definition of Constraints and Evaluation Criterions

As the focus of this report is on the process of evaluation, it is imperative to define the context and constructs, particularly in regard to the words 'Improve' and 'Enhance,' both of which shall be used as the main guides to this report. Moreover, it is also important to apply these words to the right context, both in correlation to Merinova, and the field of HRM itself.

As a business, Merinova's primary revenue streams orient around the provision of services in the field of technological consultancy services and business development services. However, these functions are not to be improved or enhanced upon by the TAS System. Instead, the TAS System is focused on the internal HRM related tasks which could be either automated, or accelerated through the usage of e-HRM systems. Today, the TAS system is designed to focus primarily on the aspects of workforce management, administrative tasks, and can be designed to include BI applications. Thus, it is important to set the constraints, in regard to the definition of improvement and enhancement in the context of the aforementioned applications.

In the context of e-HRM systems, improvements can be defined as functionalities, which when provided by a system like TAS, shall aim to accelerate and improved the user experience of previously conducted processes. For example, the current TAS System has improved upon Merinova's earlier time-logging system, allowing users to log hours and allocate project hours faster than before. This has occurred due to changes in both, the back-end of the system in terms of the system, and the front-end in terms of the overall design of the system which is more user friendly than the previous one.

Enhancements, on the other hand, can be classified as functionalities or changes to functionalities which have consolidated earlier functionalities, provided more use cases to the user(s), removed redundancies, improved upon security-related issues, and redesigned the system to become more efficient from a technological perspective (i.e. faster response time of server, changes in programming languages and libraries utilized, and more efficient code writing).

To conclude, it can be said that while the definitions of improvements and enhancements somewhat overlap, they are not one and the same. Improvement, to summarize, can be used to judge the qualitative aspects of the e-HRM System, while Enhancement can be used to judge the quantitative aspects of the e-HRM System (**see Fig.13**).
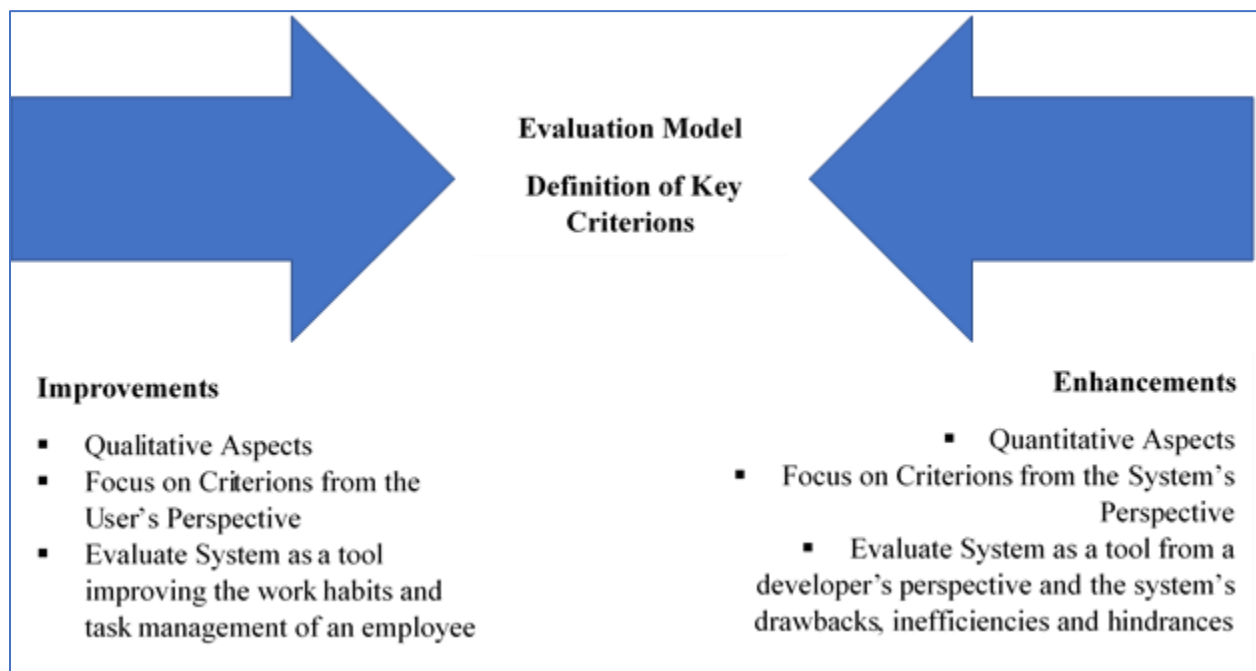
Figure 13: Definition of Key Criterions based on Enhancements and Improvements.

The current version of the TAS System is designed with a limited set of functionalities, all of which fall within the Workforce Management and Administrative applications (**see Fig.14**).

Functionality Provided by current TAS System	Description/Details
Employee Database	Basic employee information like name, role, and other descriptors are stored in the database.
Employee Hour Logging	Logging of hours worked per week, and on particular projects is done through the TAS System itself.
Project Database	Basic information about projects undertaken (both, completed and in progress) is provided by the TAS System.
Exporting of Employee/Project Data	It is possible with the current system to export data relating to the employees and projects into different formats (such as .txt files).
User Profile Settings	It is possible in the current system to alter basic user rights such as passwords.
Reporting/Logging of Project Work	Similar to hour logging of the employees, it is also possible to log the nature of the work conducted on the project (i.e. consulting, reporting, documentation)

Figure 14: Functionalities provided by the current TAS System in use at Merinova.

2.1.4.2   User Case Diagram of current TAS System

Once the list of current functionalities provided by the TAS System has been compiled, it is logical to provide the creation of user case diagrams to understand better what is required from a system level (**see Fig.15**).
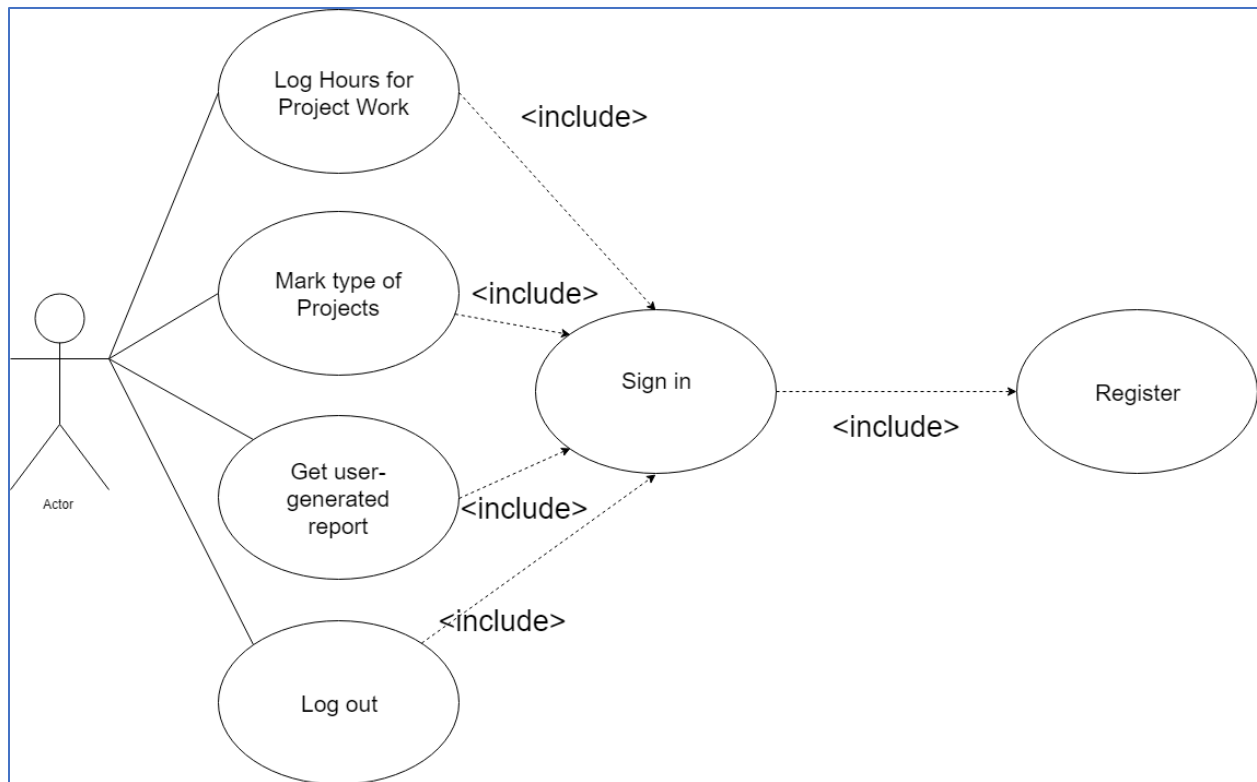
Figure 15: User Case Diagram of the current TAS System (v1.0).

Before developing further user case diagrams, for the further development of the TAS platform, it is important to understand what functionalities will firstly, fall in line with the requirements of e-HRM Systems such as TAS which focus on Workforce Management, Administrative applications, and potentially BI capabilities, and secondly, will result in the improvement and enhancement of business practices at Merinova itself.

2.1.5 Workforce Management, Administrative, and BI Applications with e-HRM Systems

Firstly, it is important to define and understand what each of the three potential applications consist of and mean in the case of TAS and other e-HRM systems. Workforce management, a broad aspect of HRM operations globally today, is the process to ensure that the right kind of customer service is provided to one's customer. In the context of Merinova, this can be applied in the sense that the right employee(s) are put in contact with, through various methods, with the customers of Merinova in regard to the needs and wants of the customer. For example, if a company needs help in terms of project management, they are put into contact with one of Merinova's many qualified project managers, as opposed to the business developers. To conduct

efficient workforce management, regardless of industry, there are few key defined processes which need to be followed. The processes which apply most to the case of Merinova, and the TAS System, are scheduling and forecasting. Scheduling ensures that the taskforce of the organization is used in a way that is the most efficient to handle customer requests, and forecasting is the ability to anticipate customer requests while preventing the chances of overloading employees or other workforces.

Secondly, administrative applications in the case of e-HRM systems and the TAS system in particular, can be tasks such as core HR oriented ones like pay-roll, time and leave management systems, and record/transaction keeping platforms. It should be mentioned that the current TAS system has some of these features in place as time and hour-logging features are a crucial component of the TAS System today for Merinova. However, features such as leave/absence tracking is something that could be added in, with minimal effort, to enhance the TAS system in relation to improving business practices at Merinova. Other administrative features that the TAS system could be designed to handle are methods to increase corporate communication, providing assistance to employees, and the ability for employees to voice their concerns or provide feedback to the organization itself. In essence, the goal of the administrative applications, if added to the existing TAS platform, to should aim to provide a two-way communicational link between the organization (HR) and the employees, as well as to better inform the staff regarding the organization, its values, and rules and regulations. /15/

Thirdly, BI applications in the field of HR are any tools that are used to help organizations better practice the management and assessment of their employees through the usage of metrics-based management. BI today encompasses various tools, processes, infrastructure and methods that are all designed to optimize decision making and performance evaluation at an organizational level /16/. It can be said that BI applications provide the widest scope in terms of changes that can be made to the existing TAS system to enhance and improve upon it. According to certain sources, BI tools today encompass functionalities such as: dashboards, executive scorecards, Online Analytical Processing (OLAP) analysis, ad hoc and operational reporting, forecasting, data mining, and customer intelligence capabilities /17/. It must also be stated that, while all of these features may be included in BI tools of today, not all of them are compatible with a company of Merinova's stature. For example, data mining, OLAP analysis, and ad hoc reporting

functionalities can be considered as tools which are not necessary for a company like Merinova, who have less than 15 full-time employees and do not have a lot of data to be processed, collated, and analyzed. In contrast, dashboards, forecasting, operational reporting and customer intelligence are all features which, when built on top of the existing TAS system, could, in turn, enhance and improve upon existing business practices.

Fourthly, it is now important to understand what workforce management related, administrative, and BI focused applications/functionalities could be developed and added to the existing TAS System as a method to improve and enhance business practices at Merinova. According to Martin Reddington, successful e-HRM platforms are often ones that link back to, and are driven by, the overall HR strategy of the company itself /12/. As such, the e-HRM principles which shall drive the developmental changes to the TAS platform must be derived, in one way or another, through the overall HR strategy of the company, Merinova, itself. Therebefore, before consolidating the list of additional functionalities for the TAS system, it is important to garner a better understanding of the overall strategy of Merinova as a business, and the overall HR strategy of the company.

Lastly, according to their website, Merinova consider themselves to be in the center of the Energy Cluster here in the Vaasa Region. Moreover, they see themselves as the experts in both, energy technology, and business development. Merinova is considered to be taking an industrial, and business-driven approach in their day to day running of the business. All of these qualitative attributes can be linked back to the original strategy of Merinova itself. As a technology center, Merinova understands the needs of the customers, many of whom operate in the Energy Cluster, better than their competitors. This also means that Merinova, in order to succeed, needs a small, yet a dedicated group of highly qualified, experienced, experts in the fields of project management, the energy sector, and business development. All of these, once again, are mentioned as they can be used to outline the overall and HR strategy of the business itself (**see Fig.16**).
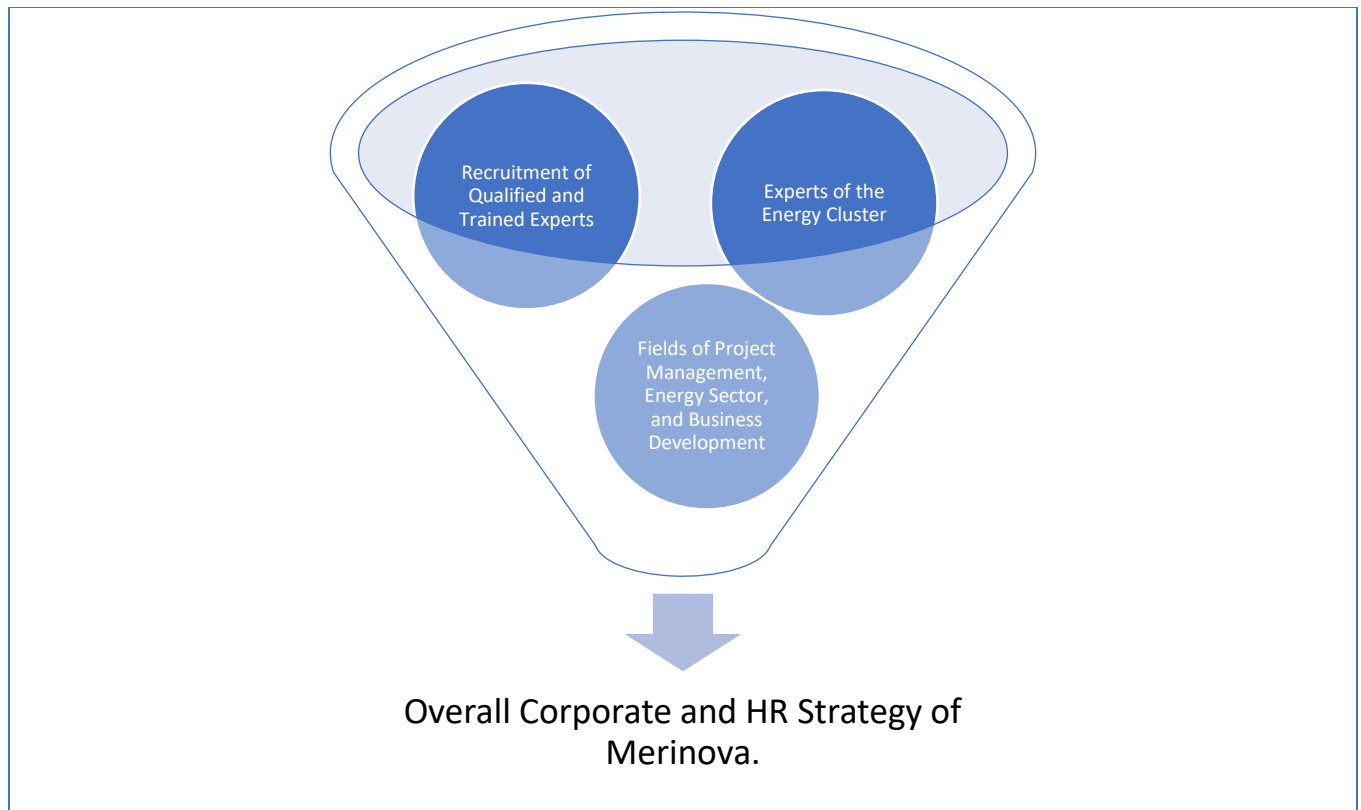
Figure 16: Factors in the development of Corporate and HR Strategy of Merinova.

2.1.6 Additional Functionalities for TAS System

Without distracting the user with additional functionalities which provide little/no benefits, it is important to come up with a list of potential additions that can be made to the current system which shall benefit both, the employees, and the organization (Merinova) itself. Based on the research conducted in the previous section, it is possible to now provide clear suggestions for additional functionalities for the development of the TAS system (**see Fig.17**).

As the organization views itself as a fore-runner in the local Energy Cluster, and a key cooperative player to the larger organizations present here in the Vaasa Region, the overall Corporate and HR strategy of Merinova can be considered to be encapsulating of the following principles:

- Merinova should be seen as an organization with experts in the fields of project management and business development – relating to the Energy Industry in one way or another.

- Merinova is a key cooperative player – meaning that the organization is well informed about the needs and wants of its customers, and is up-to-date with the latest trends in the industry.

- Employees of Merinova should be highly motivated, driven, and dedicated experts who can help make a difference in the local Energy Cluster.

- Employees of Merinova are cooperative team players who are individually experts of their respective fields.

- Employees of Merinova, to a large extent, should be intrinsically motivated, and from an HR perspective, should not be managed too closely, but should rather be left to manage themselves with minimal supervision by the organization.

e-HRM Systems Application(s)	Functionalities that can be added to enhance business practices at Merinova.
Workforce Management and Administrative Applications in e-HRM Systems	Repository of Company Documentations, Reports, and Files for Employees to easily refer to. The goal of this provision to reduce time wasted in locating certain documents, as well as having employees that are more informed about the organization itself.
	FAQ Section or a similar implementation allowing users to get answers to any questions they may have about both, the TAS System, or the company itself. Like the previous suggestion, the goal of this functionality would be to reduce lag-times and allow employees to get answers to simple questions faster, and potentially better, than before.
	News/Information Page that is regularly updated with relevant updates about the

	company, the environment in which Merinova operates, and other relevant factors. The goal of this functionality would be to create a centralized platform from where employees at Merinova are informed about various topics. For example, it could be a good idea to import relevant news data from reputed and trusted sources to be shown through the new TAS System.
	Main Homepage/Dashboard to the TAS System that is similar to a Profile or User Dashboard page. The goal would be to allow employees some freedom, and creativity in creating a page that allows them to customize the TAS System for their own needs.
	An implementation similar to an agile board for project updates should they be needed. This way it will be possible for Project Managers to keep track on what tasks are done, yet to be done, or are in progress. The goal of this system would be to help Project Managers or the Directors of Merinova keep a tab on the progress being made on various projects.
	Setting up a communication channel/gateway between the employees at Merinova that is informal and can promote collaboration between employees. The goal would be to

	increase the company culture and employee satisfaction within Merinova.
BI Applications in e-HRM Systems	Dashboard platform that can allow for metrics-based management. Create a simple system that allows for the graphing of variables along the X, Y (, and potentially Z) axes. The goal would be to allow, in the future, for more accurate performance evaluations.
	Create a platform that allows for employees to list or rate their skills, creating a shared database of employee's skillsets and other expertise. The goal of this platform would to be export employee information which could be used for marketing, but also for understand the skills, or potentially the lack of skills, that are available at Merinova. The goal would be to have a more informed HR team within the organization.
	Provision of a platform where employees can store information about certain projects, or clients. The goal would to be to create a certain framework under which the data is stored and collated. Then, once enough data has been stored about various aspects of Merinova's day to day running, this information could be mined for additional intelligence.

Figure 17: List of suggested additional functionalities to be added to the existing TAS System.

2.2   Evaluation of Software Tools as a Developer

To create a comprehensive evaluation model, it is now important to complement the principles outline from the user and design perspective, with some of the most important and decisive software development principles. As such, in this section, it is important to research and outline the fundamentals of good software development with the end goal of creating a consolidated evaluation model that encompasses the major principles of software development. For this part of the report, the evaluation model is created from the perspective of the developer, or the creator of the software program and tools itself.

For the purposes of this report, the evaluation model shall consist of principles that can be applied to software development in the fields of software creation, general programming, software prototyping and testing, and software project management techniques.

2.2.1   Evaluation of Software Tools: Software Creation

According to an article published by the user, Perezpriego, a User Experience (UX) Engineer, there are 10 principles that one should follow for effective software development. First, Perezpriego argues that the simplest option is often, also, the best option. The author argues that sometimes, by over-engineering our code or solutions, the solution that is provided can often end up being over complicated. Second, the author argues that one should try to reduce the number of moving parts. By this, the author believes that by reducing additional parts, we reduce the total number of dependencies; thus, decreasing the number of error-prone conditions and potential bugs within the code. Third, good software development means understanding the business for whom the program is being written. Perezpriego believes that understanding the value of one's creation to the client can only lead to better solutions. However, it should also be mentioned, that in his context, Perezpriego, when referring to business, also refers to the business for which a developer may be working for. Fourth, Perezpriego argues that one should care less, but rather more importantly, care appropriately. This is in regard to both, caring as an individual working on a team project, as well as caring about the overall success of a project. Fifth, he argues that pragmatism trumps perfection. Sixth, he also believes that an important principle is to think of

the features on a product level. He further iterates that it is also important to make one's self involved in the overall process, to help contribute to the success of a project. Seventh, Perezpriego states that systems should not be designed around edge-cases or other such scenarios. While one should be mindful of them, he states that one should not focus too much on those scenarios either. Eighth, Perezpriego argues that decisions, in aspect to software design and development, should not be made based on anecdotal evidence. Instead, thorough research should be conducted to verify earlier remarks and hypotheses. Ninth, he argues that one should not build anything until explicitly asked to do so. However, it is important to note once more that some of these principles, including the ninth one, are designed to be applied to individuals working as a part of a project team for a said client, and not as general principles. Lastly, Perezpriego argues that change management, or the ability to expect and accommodate change is an important principle. He further reiterates the importance of flexibility in one's solutions, ensuring that changes can be taken care of. Moreover, good developers often account for changes in their original plans itself. /22/

2.2.2 Evaluation of Software Tools: Software Engineering and Project Management

Barry Boehm, a distinguished software engineer, and a former employee of the now defunct TRW Defense Systems Group, through his professional working experience, consolidated his findings and research into what he called the Seven Basic Principles of Software Engineering. Written from his experience, and findings of approximately 30 million man-hours of software development at TRW, Boehm condensed his vast research into these seven principles which he believes were key to the success of any software engineering effort. The principles were: manage using a phased life-cycle plan, perform continuous validation, maintain disciplined product control, use modern programming practices, maintain clear accountability for results, use better and fewer people, and maintain a commitment to improving the process. According to Boehm, in his findings, roughly 50% of the failures in projects occurred due to poor planning processes. Without the provision of a good overview, a milestones plan, a project and product control plans, some validation plans, and lastly, operations and maintenance plans, a project will lack the necessary framework in the planning process to be executed successfully later on. Furthermore, Boehm states that in his findings, he found that by performing continuous validation, problems, bugs, and other errors or hindrances can be removed faster and often with less complications. The need for product control, according to Boehm, eliminates confusion and differing views

between the vision and the end results of the software project(s). Principle four, relating to the usage of modern programming practices, is one that Boehm believes can lead to many positive aspects in the field of software development. Better efficiency and productivity, less errors and bugs, and easier integration and testing are all byproducts of varying degrees, according to Boehm, of modern programming practices. It should; however, also be noted, that this research paper was released in 1983, and as such, may not be fully applicable in the meaning of the word "modern" in 2018. Principle five, which relates to the accountability, while an important principle, does not fully relate to the topic at hand which is to do with the evaluation models of software tools. Principle six, like five, is also one that will not fully relate to the topic of this report, and as such will not be discussed or clarified further. Principle seven, which states that there should be a commitment to improving the process, is an idea that was shared by Perezpriego too. Continuous development, and focus on the future is important, according to Boehm, from both, an organizational perspective, as well as its application to the project at hand itself. /23/

2.2.3 Evaluation of Software Tools: Software Prototyping and Testing

The Government Digital Service (GDS) of the UK, has consolidated its own list of principles that it follows when prototyping for IT solutions. Firstly, all their projects begin with a discovery phase, which consists of research and understanding the needs of the user(s) and exploring the various forms of technology that may be used. Following this, the GDS states that it is important to build working models to showcase to their clients. Rather than simply explaining the functionalities, they believe it is more important to show a working model; hence their saying, "show, don't tell." The GDS then highlights the importance of prioritizing and time-allocation. The GDS argues that for prototyping, focus on the aspects which are considered "complex" by the team and potentially, the client. They then emphasize the ideals of making use of open source tools, software and services. According to them, one should not focus on "reinventing the wheel," but rather build on top of already existing good solutions. Lastly, the GDS believe prototypes should be made with the future in mind, but without ignoring the needs of the customer. As prototyping is involved in the process of developing concepts, the GDS stresses the important of designing with the latest trends, as well as demonstrate the possibilities with the latest developments. /24/

In terms of testing, there are various principles that one may choose to follow when testing as a developer a particular software, tool, or program. According to Vineeta Gakhare, an ISTQB Foundation Level Qualified Tester, there are seven fundamental principles that one should keep in mind during software testing. These principles, which have been observed by various experts over the last four decades or so, are made to make one test more efficiently. The first principle is that testing should be used to show presence of defects. Moreover, it is important to note that the purpose of testing is to show defects, but not to prove or explain them. Likewise, when testing, it is important to never assume that there are zero bugs or errors. The second principle is that exhaustive testing is impossible. Due to the complexity of certain software tools and programs, it is impossible to conduct testing of every single parameter. Instead, to be more efficient, it is important to prioritize which aspects should be tested. The third principle is that testing should start as early as possible. Like mentioned in previous sections, testing early can result in better error detection as well as potentially provide more insight in terms of testing itself. The fourth principle is that one should try to defect clustering. The 80:20 principle, whereby 80% of the issues may result from 20% of the code, can be applied to better manage one's efforts in terms of testing and error detection. The fifth principle, which is labelled as the "Pesticide Paradox," argues that eventually, if one continues to repeat the same tests over and over again, new bugs may not be found. As such, it is important to develop not just the code, but also the testing parameters. The sixth principle argues that testing is dependent on the context and, as such, the focus of a tester should be based on the nature of the software program or tool and its relevant crucial factors and aspects. The seventh and last principle believes that no testing can be useful if the product or program itself is unusable or does not fulfil the needs of its client(s) and user(s). Therefore, it can be inferred that testing can and should only be applied when its clear that the software tool or program does, in fact, fulfil those needs. /25/
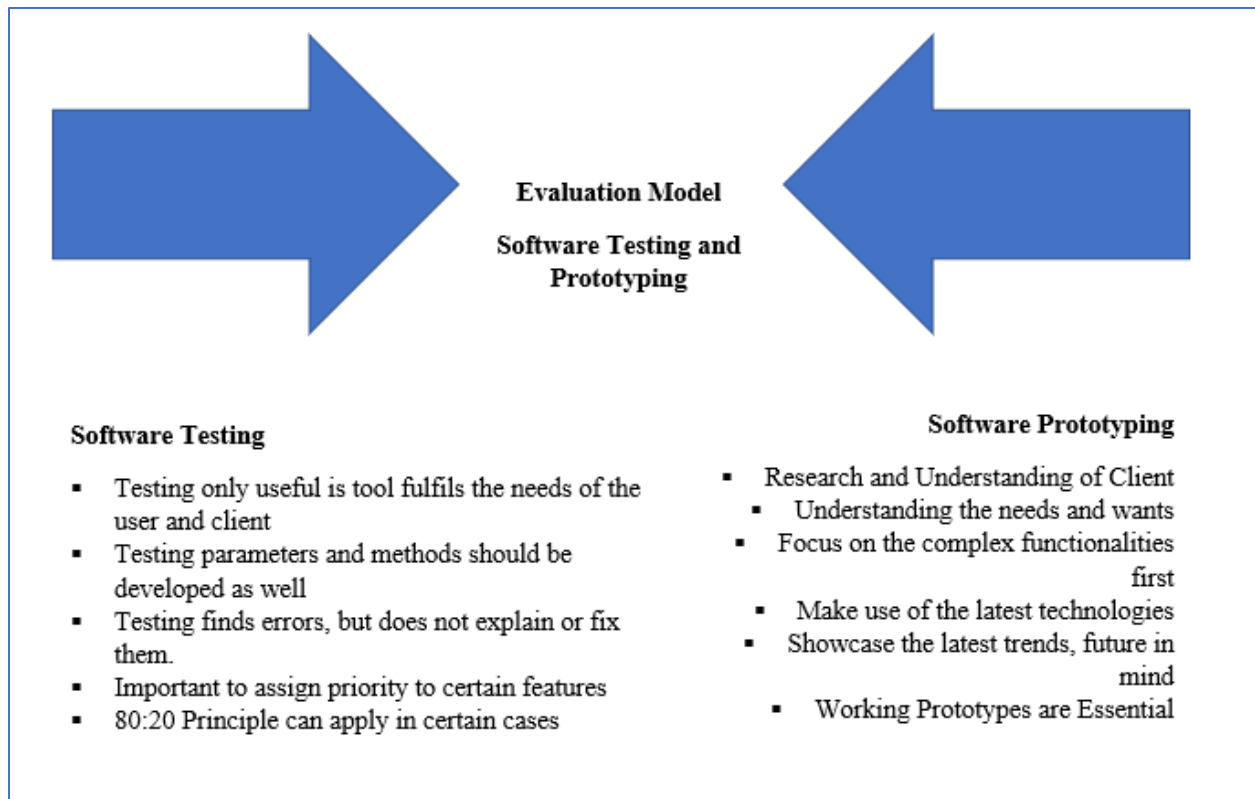
Figure 18: Consolidated List of Principles for Software Testing and Prototyping

As such, it is now important to consolidate and condense the main principles outlined in terms of the software prototyping and testing phases (**see Fig.18**). It can be seen that context, or rather the understanding of the context, is an important aspect for both, the prototyping, and testing phases of the software development.

2.2.4 Evaluation of Software Tools: Consolidated List of Development Principles

Now, with all of the principles outlined for the various phases and stages in the cycle of software development, it is imperative to consolidate them to be used in the final evaluation model. To conclude the most important aspects to keep in mind as a developer when evaluating software tools are: prioritizing the essentials, understanding the needs and wants of the client(s) and user(s), testing thoroughly and progressively, making use of the latest technologies and tools, and keep the complexity of the software in check (**see Fig.19**). To conclude, it can be said that the key aspects of software evaluation as a developer, in theory and principle, are similar to the principles that are seen from the user's or designer's perspective. The focus on the essentials,

prioritizing, and understanding the context and the needs of the users are all features shared with the design fundamentals too.
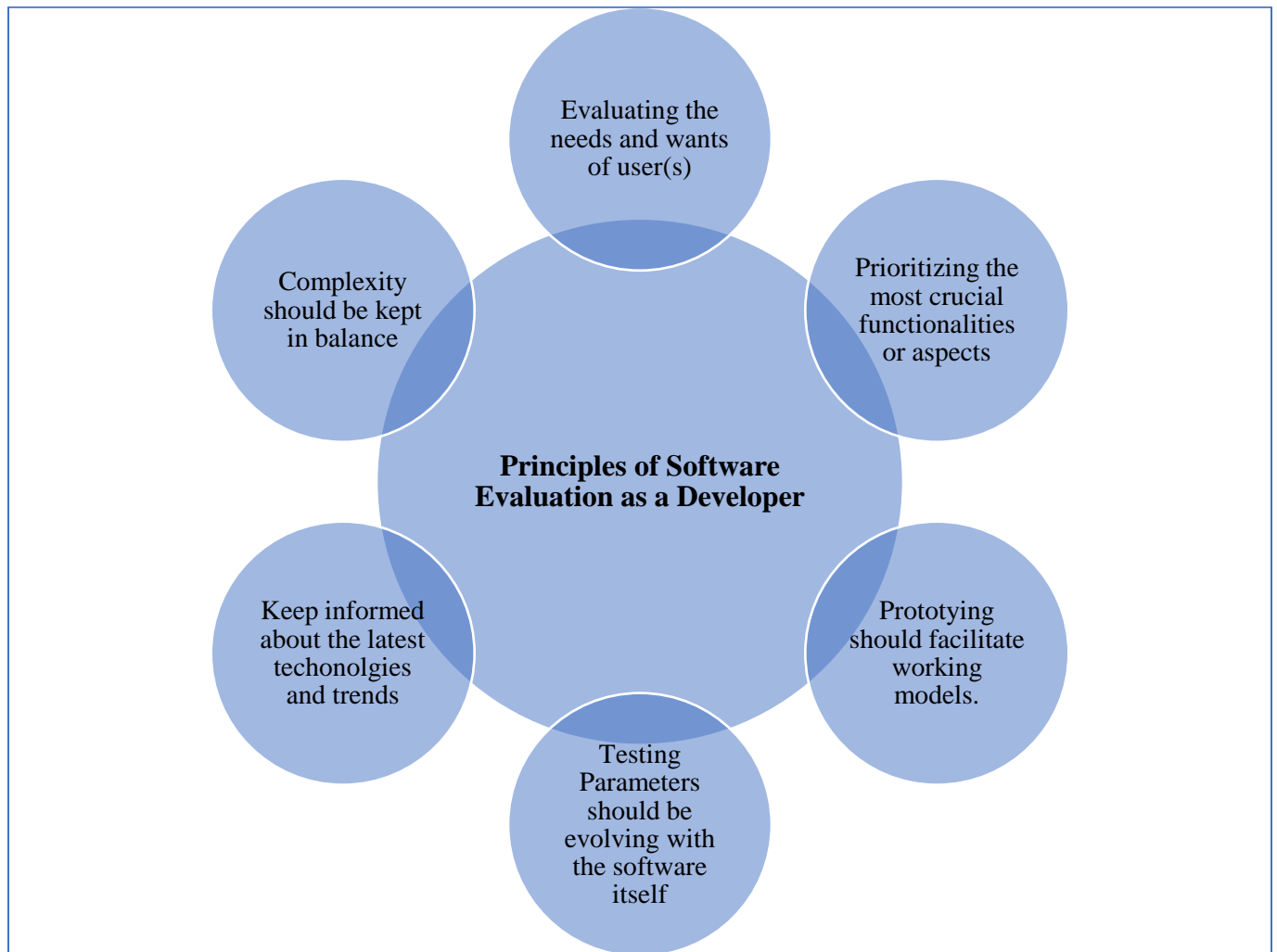
Figure 19: Key Principles of Software Evaluation as a Developer

2.3   Evaluation of Software Tools: Finalized List of Principles

To finalize this section, and the majority of the report itself, it is important to now consolidate the list of principles for the evaluation of software tools, applied to the case of e-HRM Systems, and create one finalized system that is both, conclusive, and easy to understand.

Figure 20: Finalized Evaluation Model for Software Tools

As such, when condensing and combining the many principles outlined previously, it is apparent that many of the principles, in abstract terms, share many commonalities. The finalized evaluation model should be designed in a way that is scalable, applicable to various systems, situations, and contexts, and comprehensive in its evaluation of a software from both, the user's perspective, and the creator's perspective (**see Fig.20**). It can be said that the most important evaluation principles/parameters to consider when applied to the case of software tools are: the core functionalities, simplicity of the execution, the overall conciseness and clarity of thought in the execution, its application to the needs and wants of the user, and is accommodating of future changes and further developments.

3. TAS System: Evaluation based on Evaluation Model/System

Based on the finalized evaluation model from the previous section, it is now possible to evaluate and give a concise judgement of the existing TAS System and the positive and negative aspects of it, as a software tool currently. As such, shown below are a few screenshots of the existing TAS system (**see Fig.21, 22, 23, 24**).

Figure 21: Screenshots of the existing TAS System.

Figure 22: Screenshots of the existing TAS System.

Figure 23: Screenshots of the existing TAS System.

Figure 24: Screenshots of the existing TAS System.

When evaluating the existing TAS System using the model developed in this report, it is easy to identify the advantages and the drawbacks of the current version of the TAS System (**see Fig.20, 21, 22, 23, 24**). It is easy to see that the existing TAS system is a direct result of the needs of the client and user, Merinova. As such, the current system will score highly on the principle that it takes into account, very clearly, the needs and wants of the user. Another aspect of the software tool, on which it will score positively, is the ease of using the tool and the understanding of the core functionalities. However, it is important to also note that the existing system, despite scoring highly on the aspect of fulfilling the needs of the user, is a limited software tool. As such, it is difficult to fully evaluate this principle. In terms of its less but better principle, it can also be argued that the existing system is fairly limited; however, it fulfils the current needs of the user to a large extent.

In terms of its drawbacks, it can be argued that the existing system is not the best in terms of its ease of use, good UI design, and humanized and honest in its design and execution. As such, it can be said that while the tool has a good understanding of the key functionalities, it does not necessarily make them the easiest to use from an average user's perspective. Moreover, as identified by the bugs and errors found by the current employees at Merinova, it can be stated that the testing and prototyping phase of the TAS System was not the best that it could have

been. As such, it could have scored higher in the aforementioned phases, had a more thorough testing and prototyping phase been conducted. Likewise, the existing system does not have a fully detailed execution and life cycle plan in place currently. Finally, it can also be stated that as identified by some security issues with the current system, that the system perhaps has not made use of the latest and most relevant technologies and technological trends to ensure that the system is up to date with the requirements of today.

To conclude, it can be said that the TAS System in place today at Merinova has certain positives, and certain drawbacks attached to its current system. It can also be said that while the fundamentals are currently in place, due to the limited scope and nature of the existing system, it is difficult to fully evaluate or understand the existing system as a whole.

3.1   TAS System: Suggested Developments based on Evaluation Model

As such, the final section of this report shall consist of providing clear, and well defined, suggested developments that should be made to the existing TAS System based on the Evaluation Model devised as part of this report. The idea is to provide suggestions that are both, fulfilling the criteria devised in the evaluation model, as well as enhancing and improving business practices as defined by fundamental HRM Principles. These changes, which are provided as mockups designed using Canva, an online graphic design tool, shall aim to make changes that are beneficial to the user, which in this case is Merinova, and has taken into consideration the perspectives of a designer as well as a developer.

The first change that was devised was the creation of a vertical tab set up, that allows for the user's screen to be maximized for the main purposes of the system (**see Fig.25**). The goal of this tab set up is to remove additional distractions to be put in front of the user when they are working with the TAS System. Furthermore, the changes shall be made to the tabs themselves and, as such, the new sections could be titled as the following: dashboard, messages, projects, news and information, repository, and Frequently Asked Questions (FAQ). The goal of these changes is to add more functionalities, which were devised in the earlier section of this report, and present them in a way that is both, appealing to the end user, and unobtrusive in its nature: meaning that it does not deter or distract the user from the work they are doing.
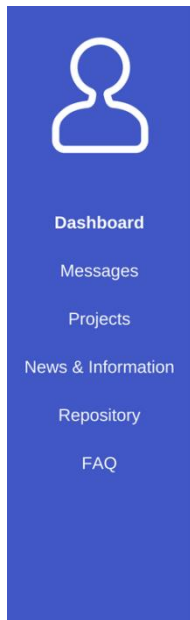
Figure 25: Suggested Changes to existing TAS System

The second change is the provision of a "Dashboard" page (**see Fig.26, 27, 28, 29**). The goal of this provision to create a platform that facilitates the inclusion of BI Applications and other aspects that can help Merinova move towards a more metrics-based management system. This change also helps create a platform that is accommodating of future developments and changes as it will be easy to add more functionalities into this new tab, rather than the creation of a new system entirely.
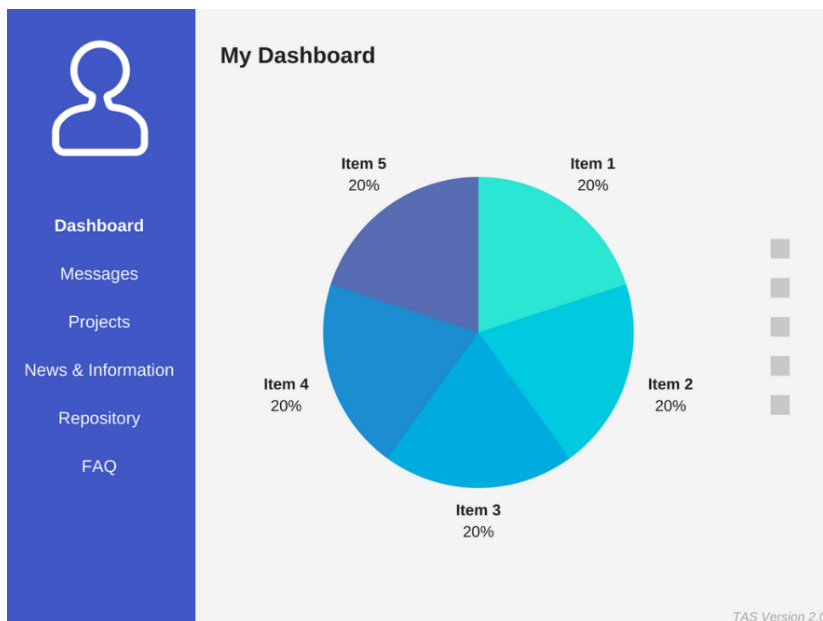
Figure 26: Suggested Changes to existing TAS System
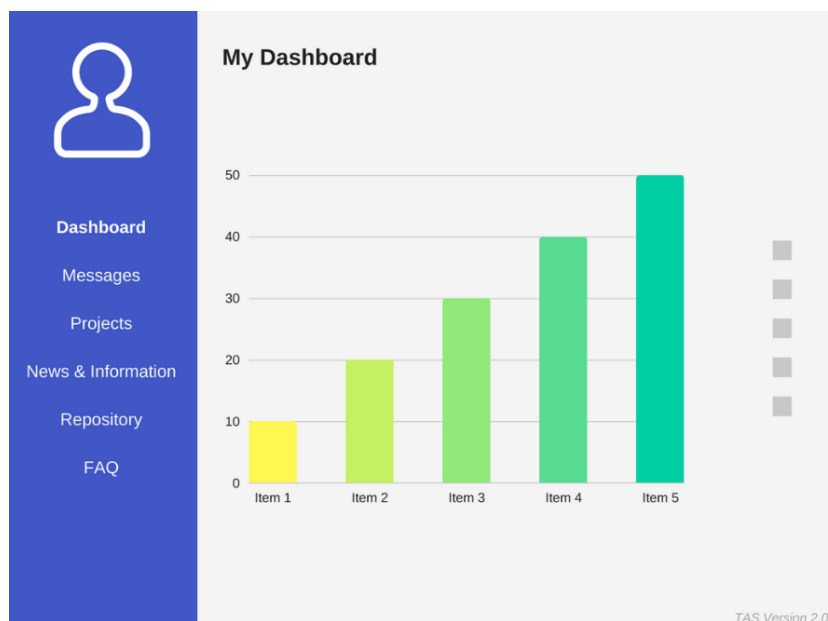
Figure 27: Suggested Changes to existing TAS System
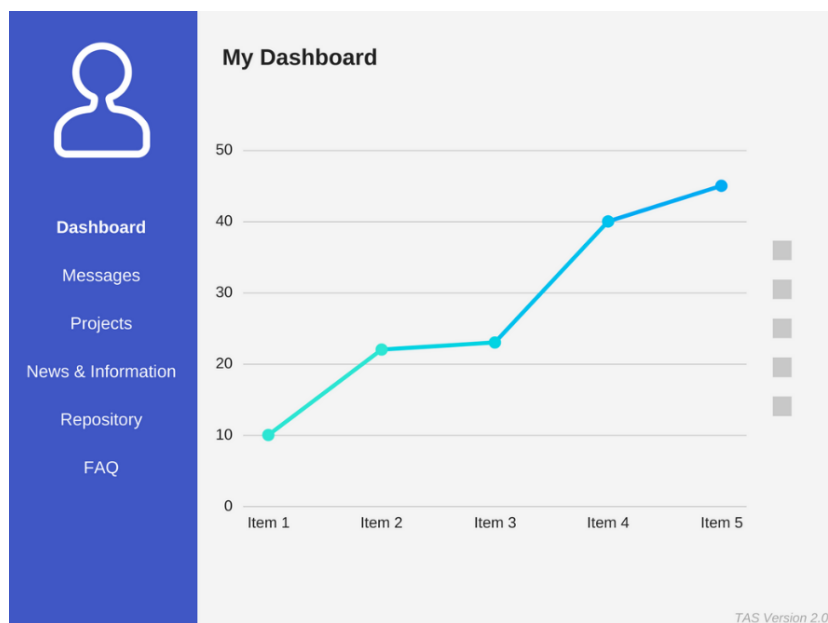
Figure 28: Suggested Changes to existing TAS System
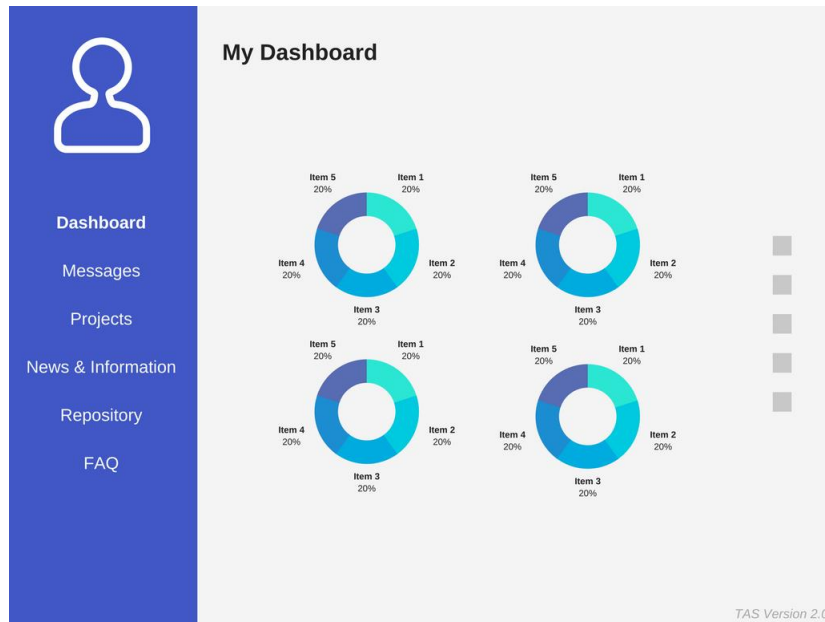
Figure 29: Suggested Changes to existing TAS System

The Messages tab is an abstract concept that can be created in two or more formats (**see Fig.30**). One option would be to simply use an Application Programming Interface (API) of the existing e-mailing tools and integrate it into the new TAS System. The second option would be to design a new provision to allow for cross-communicational links between and within employees at Merinova and perhaps in between project team members. While differing in formats, the goals of both the implementations are fairly similar. Both implementations seek to reduce time wasted in opening new browsers, establishing communication with other employees, and other similar inefficiencies.
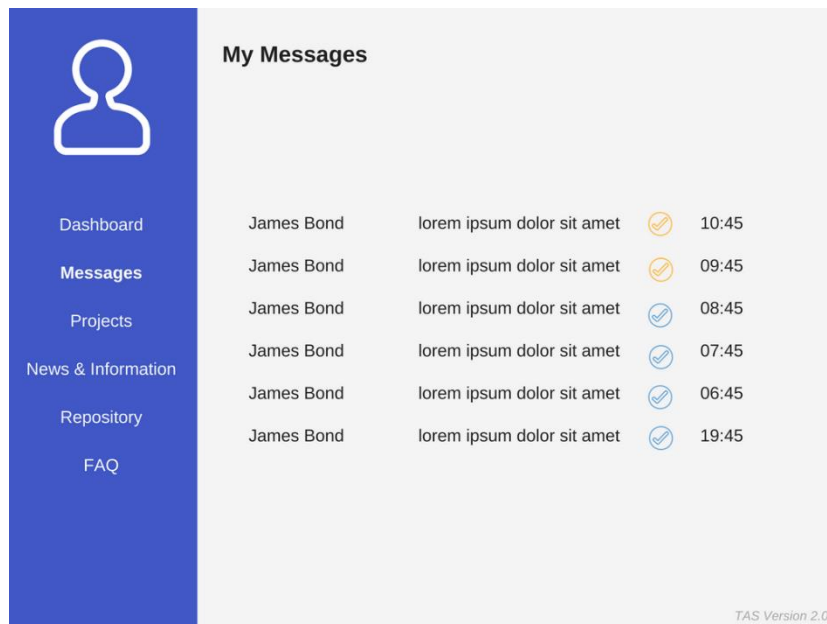
Figure 30: Suggested Changes to existing TAS System

The third tab, which shall relate to projects, is based of the primary functions of the existing TAS System (**see Fig.31**). The goal of this tab would be to create a simple UI where the user is able to oversee their various projects, log their hours for the said projects in an easy and effective manner, and, potentially, if the system provides them an Agile board, could be able to conduct some project management-oriented tasks on the system itself (**see Fig.32**).
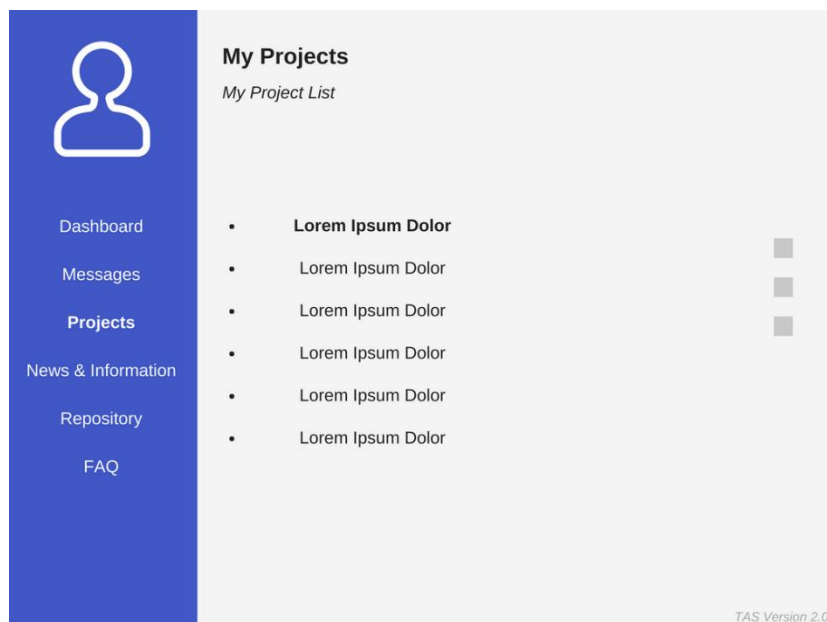
Figure 31: Suggested Changes to existing TAS System
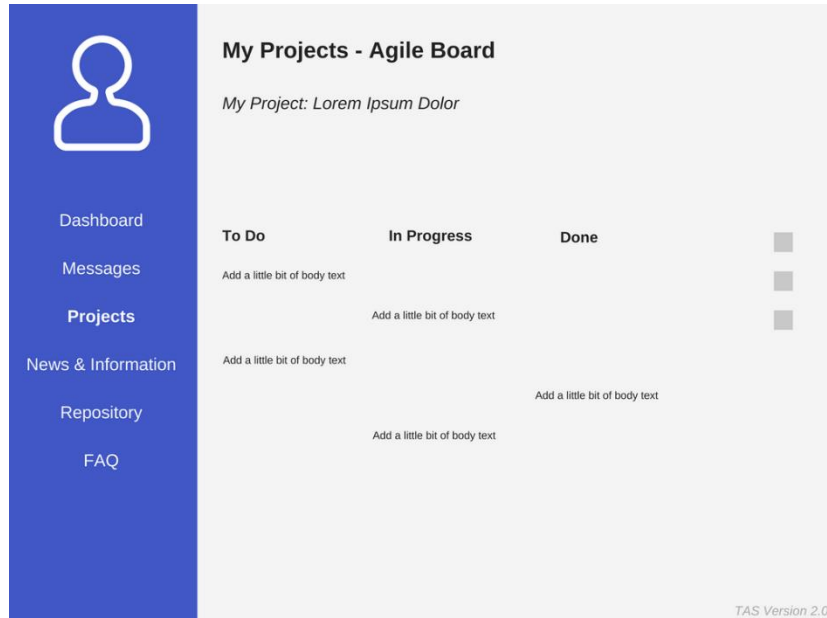
Figure 32: Suggested Changes to existing TAS System

The end goal of the provision of these changes to the Projects tab would once again, like the previous tab, would be to reduce inefficiencies and time wasted, as well as enable the possibility of data mining in the future with the collection of various project related information facilitated on the TAS system itself.
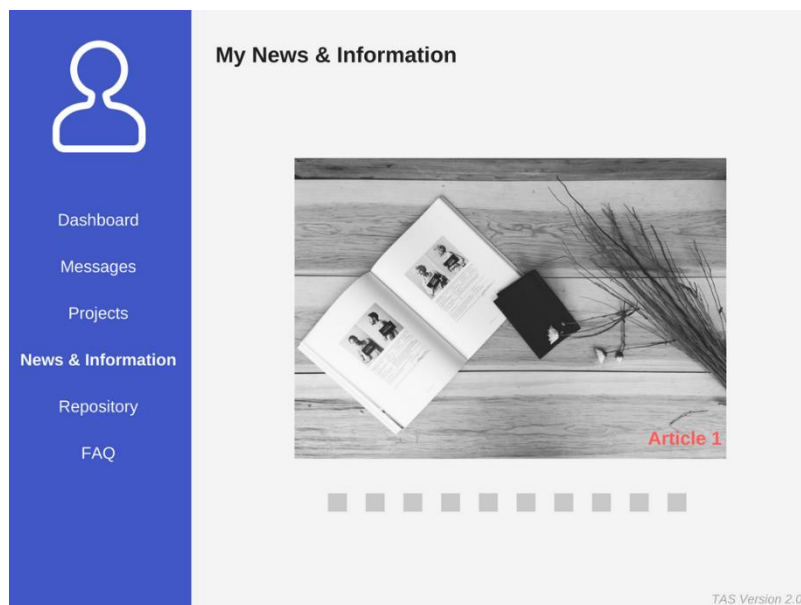
Figure 33: Suggested Changes to existing TAS System

The goal of the News and Information tab would be to firstly, better educate and have a more informed staff at Merinova, and secondly, improve work efficiencies and help provide a clear communicational link between the organization and the staff (**see Fig.33**). The goal of this tab would be to potentially use APIs of existing news platforms that can then be catered to the organization's core needs, as well as the development of a news board where the corporate staff is able to notify the other employees about certain news and developments in regard to the company itself. As such, the News and Information page could be divided into two sections: an internal page, focusing on the company's news, and an external page, focusing on other Political, Economic, Social, and Technological factors through the provision of verifiable and reputable news sources.
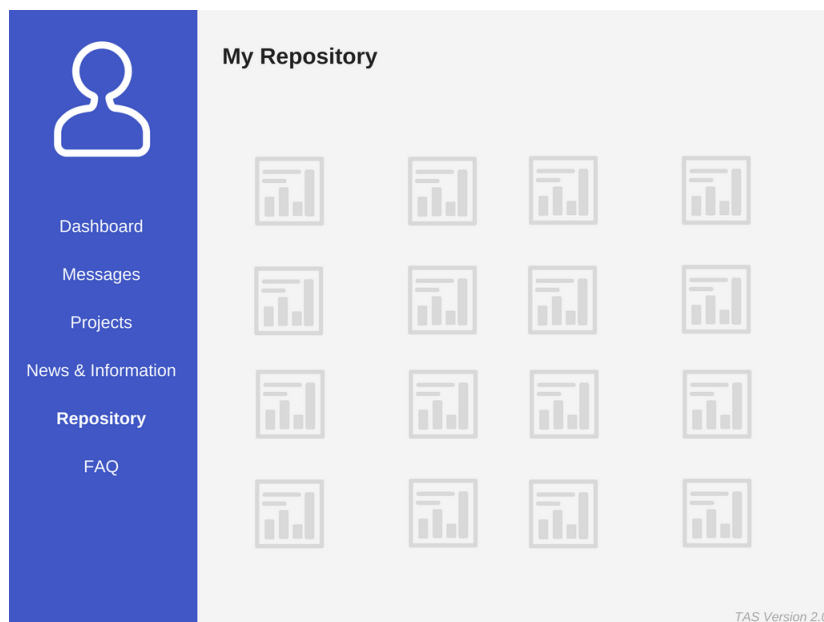
Figure 34: Suggested Changes to existing TAS System

The second to last tab, the Repository page, is designed with the end goal of providing users with a database to obtain and store information into (**see Fig.34**). By creating a platform where Merinova could store important corporate and employee documents, such as the Code of Ethics, or the company's Memorandum, Merinova can eliminate unnecessary time wasted in the locating and provision of these documents to their workforce. Moreover, by providing employees a system where they can store project related documents, Merinova can have the possibility to

implementing data-mining techniques and better understand the workforce and their working habits.
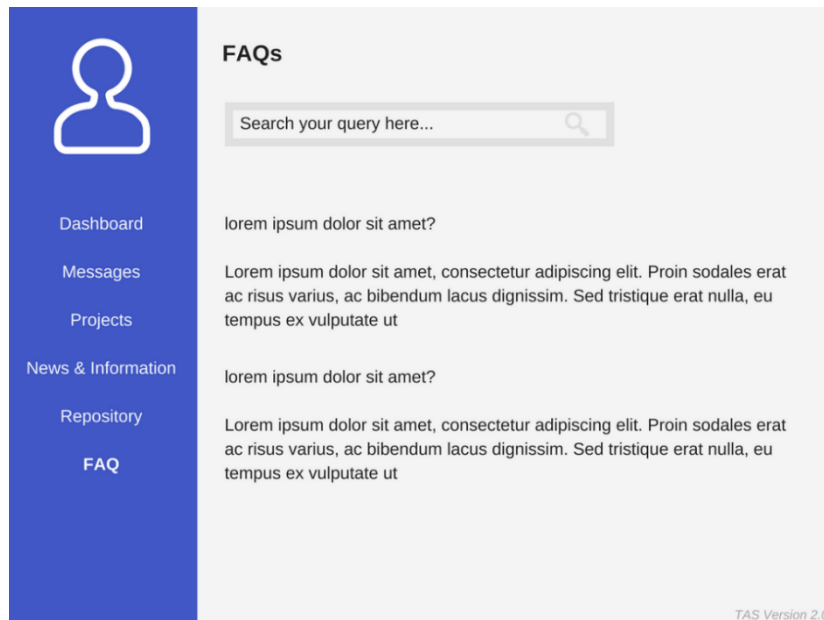
Figure 35: Suggested Changes to existing TAS System

The goal of the last tab, the FAQ section, is to help employees find answers to general and in certain cases, trivial, questions quickly and efficiently (**see Fig.35**). The provision of such a system can also be further developed by the provision of a chatbot-like platform that allows for user(s) to quickly get answers to questions that may perhaps not be listed in the current FAQ section.

4. Implementations

As such, based on these suggestions and mockups provided in the previous chapter, it was important now to conduct some basic implementations of these suggestions. A simple prototype of the new, TAS 2.0, based on these suggestions was then created. The prototype, which is not fully integrated, is more designed to test the model discussed in the report itself, as well as provide scope for future discussions with the client, Merinova.
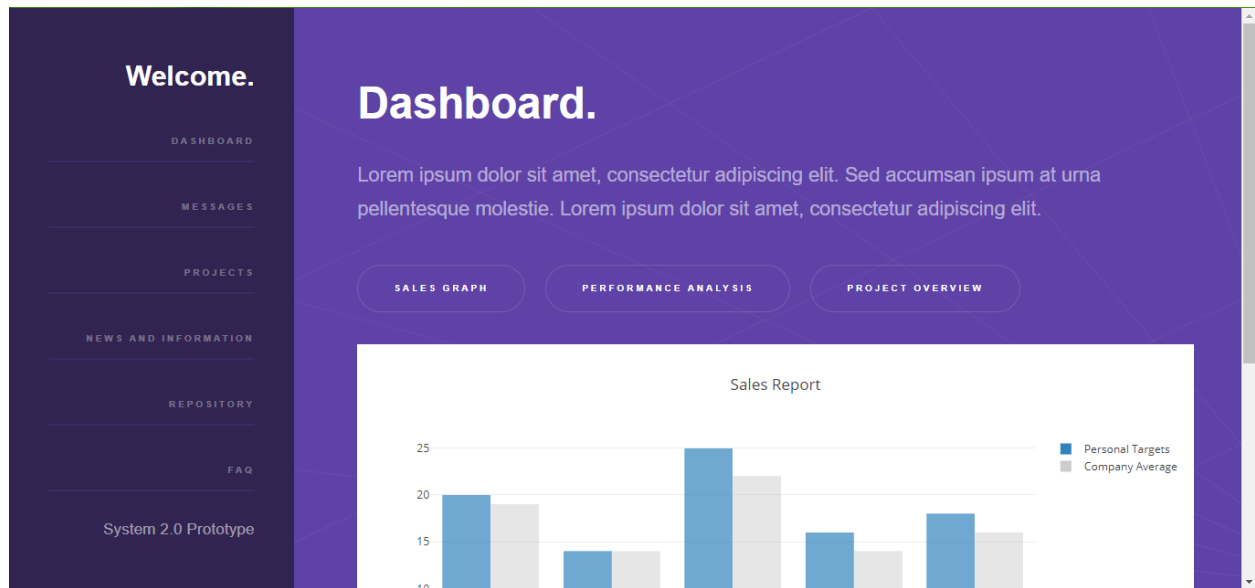
Figure 36: Prototype of the new TAS 2.0 System. This image showcases the first tab, the Dashboard for the new system.

As it can be seen in the figure above, the new dashboard is a new feature which should be added to the existing Tas System designed to give a user a more personalized system (**see fig.36**). For example, the dashboard could be used to implement certain BI focused applications, which can be implemented in the Performance Analysis section (**see fig.36**). The graphs, which are based on the Plotly.js library can easily be altered and integrated with the real data provided from the databases within Merinova itself. An excerpt of the source code, in regard to the graphs can be seen below (**see fig.37**). For the actual deployment of the code, the data to be plotted can be extracted from the relevant database and then converted to an appropriate data format, for example JSON, which can then be fed into the existing code itself (**see fig.37**).

```
55      var trace1 = {
56        x: ['Jan', 'Feb', 'Mar', 'Apr', 'May'],
57        y: [20, 14, 25, 16, 18, 22],
58        type: 'bar',
59        name: 'Personal Targets',
60        marker: {
61          color: 'rgb(49,130,189)',
62          opacity: 0.7
63        }
64      };
65
66      var trace2 = {
67        x: ['Jan', 'Feb', 'Mar', 'Apr', 'May'],
68        y: [19, 14, 22, 14, 16, 19],
69        type: 'bar',
70        name: 'Company Average',
71        marker: {
72          color: 'rgb(204,204,204)',
73          opacity: 0.5
74        }
75      };
76
77      var data = [trace1, trace2];
78
79      var layout = {
80        title: 'Sales Report',
81        xaxis: {
82          tickangle: -45
83        },
84        barmode: 'group'
85      };
86
87      Plotly.newPlot('myDiv', data, layout);
88                    </script>
89                  </section>
```

Figure 37: Script for implementing the chart which can be seen on the dashboard.

Figure 38: Suggested changes to the Dashboard for TAS 2.0

The second image of the dashboard is designed to showcase that the main tabs, situated on the left, will always be centered despite scrolling on the page itself (**see fig.38**). This is designed to help users quickly navigate through the TAS system (**see fig.38**).

The projects page, which was essentially the focus of the existing TAS System, has also been altered based on the principles and aspects outlined by the evaluation model itself. The projects page will now feature three different sub-pages which provide additional, useful functionality to the end users (**see fig.39**). The agile board is designed to help users better manage their workflow in an agile, and efficient manner (**see fig.39**). This board shall feature easy to use, drag and drop features to move their work packages between the 3 existing tables. The tables which are "To Do", "In Progress", and "Done" are all based on the existing Agile boards in use today.
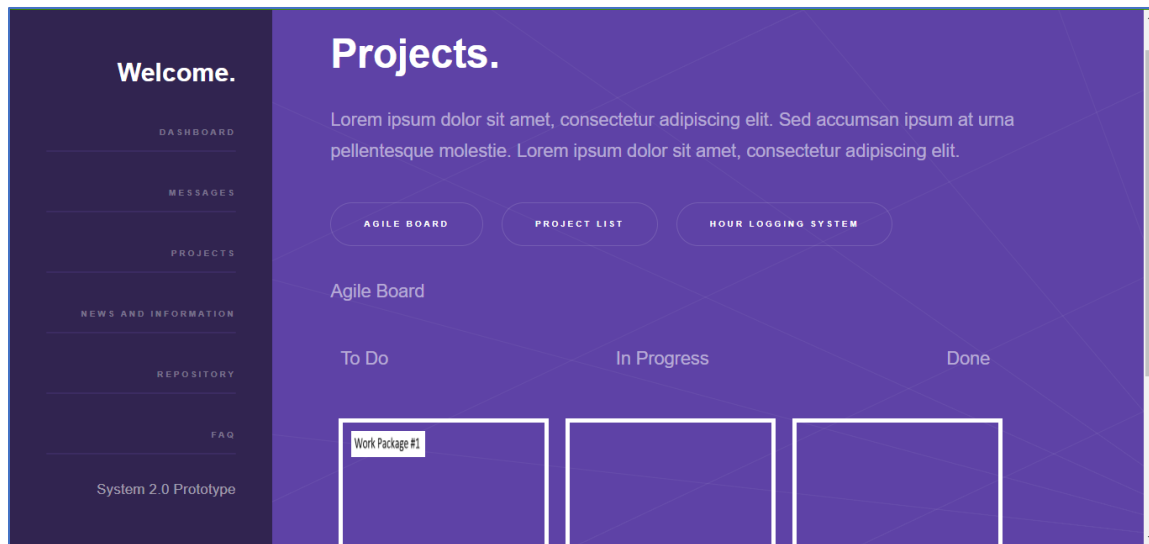
Figure 39: Projects page implementation for TAS 2.0.

The second tab of the projects page, the project list shall also be designed in a more minimalist, easy to use and simple manner. A condensed project list, which can be integrated from the existing database can then be indexed and searched through by the user to help identify and find the specific project the user may be looking for (**see fig.40 and fig.41**). It is almost important to mention that the project list, which currently only showcases the Name and the Project Manager of the said project can also be altered according to the needs of the end-user. For example, additional parameters that could be added are for example the year, the type or the status of the projects. The script for the search/indexing function can be found below (**see fig.42**).
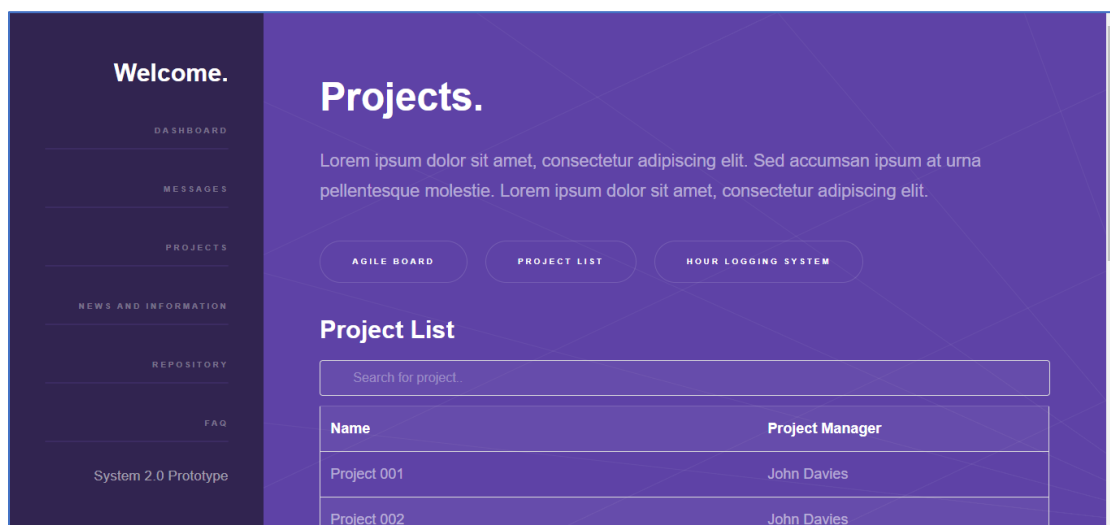
Figure 40: Projects page implementation for TAS 2.0.

Figure 41: Searching for Projects in TAS 2.0.

```
<script>
function myFunction() {
  var input, filter, table, tr, td, i;
  input = document.getElementById("myInput");
  filter = input.value.toUpperCase();
  table = document.getElementById("myTable");
  tr = table.getElementsByTagName("tr");
  for (i = 0; i < tr.length; i++) {
    td = tr[i].getElementsByTagName("td")[0];
    if (td) {
      if (td.innerHTML.toUpperCase().indexOf(filter) > -1) {
        tr[i].style.display = "";
      } else {
        tr[i].style.display = "none";
      }
    }
  }
}
</script>
```

Figure 42: Script for running the search/indexing function on the project list.

The repository page of the new TAS system shall be designed to allow users to find relevant corporate and project related documents easily and quickly. The idea would be to have these documents stored in a secure location but accessible to the employees/users via the TAS system itself. The repository could also be divided into relevant categories such as corporate documents, personal documents, and project related documents for example (**see fig.43**). Moreover, to accelerate the process even further, the possibility to search for relevant documents could also be implemented. An excerpt of the source code for the repository can be seen below (**see fig.44**).
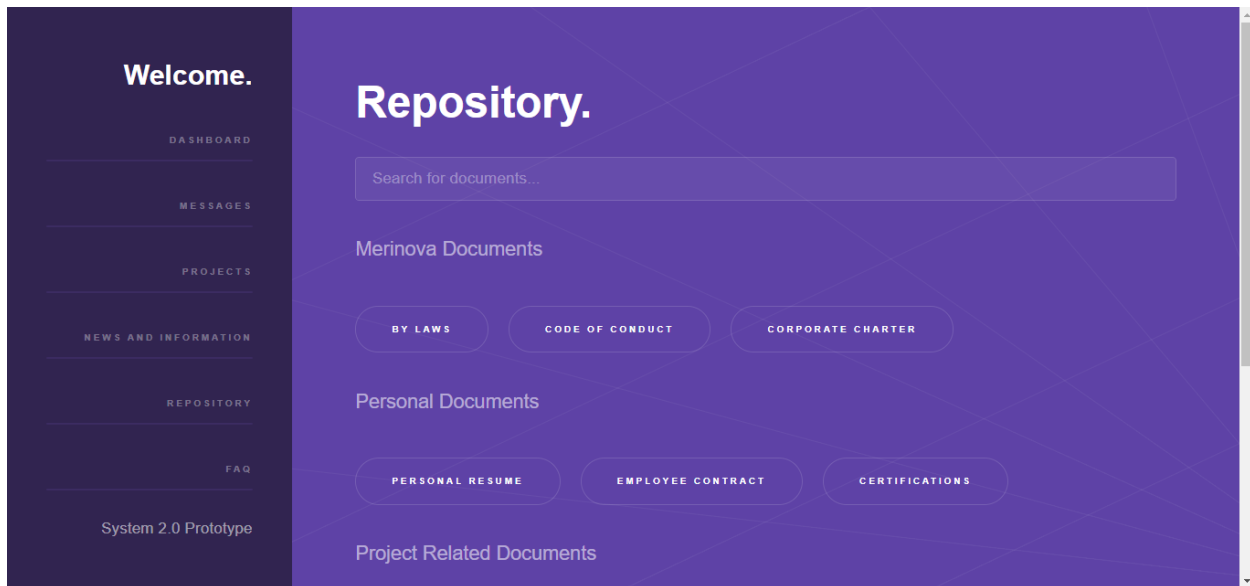
Figure 43: The suggested implementation for the Repository Page on the new TAS System.

Figure 44: Script for the Repository page of the new TAS System.

It should also be mentioned that while in the script the files are simply stored in the same directory as the webpage itself, for the full-scale implementation, these files shall be stored in a more secure, and remote location to prevent the misuse of these confidential documents (**see fig.44**).

The Frequently Asked Questions (FAQ) section was another development that was derived as a result of the models created in the previous sections. The FAQ section, as the name suggests, would simply be a place where the directors of Merinova could provide answers to some of the most common queries asked by the staff as well as provide additional instructions in relations to the TAS system itself (**see fig.45**). Moreover, it should also allow users to submit questions which, when answered, can then be added onto the FAQ section itself (**see fig.45**). A sample of the source code for the FAQ page can be seen below (**see fig.46**). As seen from the source code, the submission of a question on the FAQ page should trigger a submission of a form to the relevant party (**see fig.46**). This can for example be configured to send an email to the relevant director of Merinova, who can then answer the question.
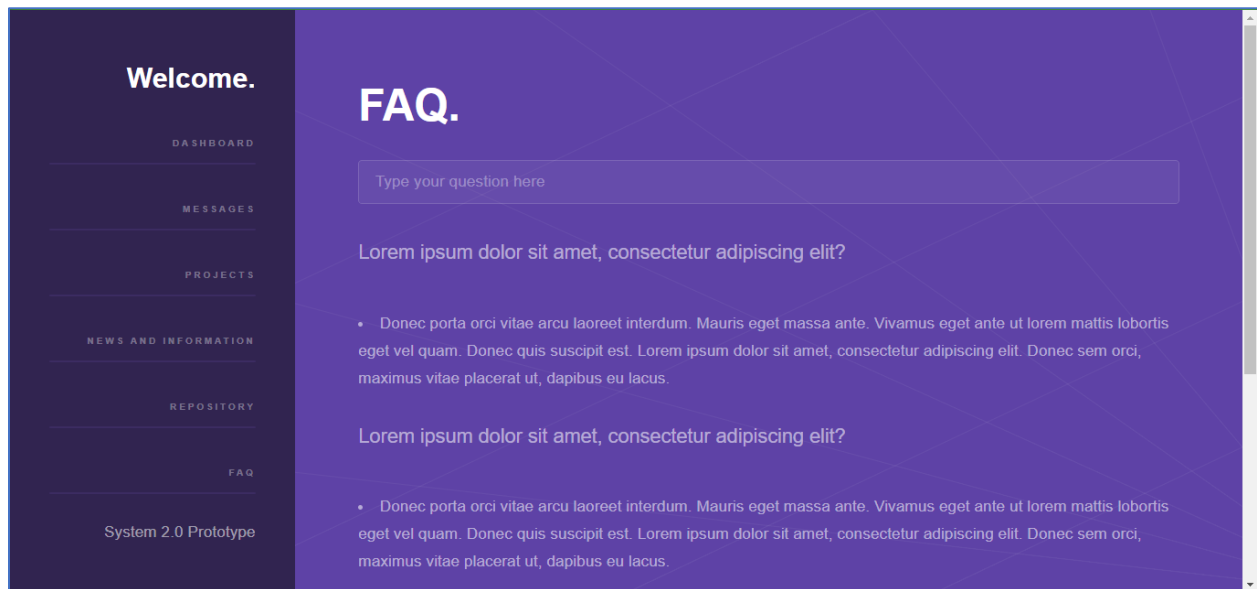
Figure 45: The suggested implementation for the FAQ on the new TAS System.

```
<!-- Intro -->
    <section id="intro" class="wrapper style1 fullscreen fade-up">
        <div class="inner">
            <h1>FAQ.</h1>
            <form action="/action_page.php">
                <input type="text" placeholder="Type your question here" name="etc" size ="2">
            </form>

            <p>Lorem ipsum dolor sit amet, consectetur adipiscing elit?</p>
            <li> Donec porta orci vitae arcu laoreet interdum. Mauris eget massa ante.
            Vivamus eget ante ut lorem mattis lobortis eget vel quam. Donec quis suscipit est.
            Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec sem orci, maximus
            vitae placerat ut, dapibus eu lacus.  </li>
            <br>

                                <p>Lorem ipsum dolor sit amet, consectetur adipiscing elit?</p>
            <li> Donec porta orci vitae arcu laoreet interdum. Mauris eget massa ante.
            Vivamus eget ante ut lorem mattis lobortis eget vel quam. Donec quis suscipit est.
            Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec sem orci, maximus
            vitae placerat ut, dapibus eu lacus.  </li>
            <br>

                                <p>Lorem ipsum dolor sit amet, consectetur adipiscing elit?</p>
            <li> Donec porta orci vitae arcu laoreet interdum. Mauris eget massa ante.
            Vivamus eget ante ut lorem mattis lobortis eget vel quam. Donec quis suscipit est.
            Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec sem orci, maximus
            vitae placerat ut, dapibus eu lacus.  </li>
        </div>
    </section>
```

Figure 46: Source code for the FAQ Page on the new TAS system.

The hour submission tab, which belongs to the Projects page, can also be redesigned to be more efficient, simple and easy to use (**see fig.47**). A simple form can be designed to help users log their hours according to the type of the work as well as the project itself. It would also be useful to have some of the said parameters, for example the name of the project, or the type of work, to be derived from a list (**see fig.47**). The current suggestion; however, only has it has a form submission where the user can input the text itself, which can be seen from the code (**see fig.48**) and, if deployed, should definitely be altered.

Figure 47: Hour Logging System on the new TAS System.

```html
<div class="inner">
    <h1>Projects.</h1>
    <p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed accumsan ipsum at urna pellentesque molestie.
    Lorem ipsum dolor sit amet, consectetur adipiscing elit.</p>
    <ul class="actions">
        <li><a href="http://www.cc.puv.fi/~e1400458/TAS/3.html" class="button scrolly">Agile Board</a></li>
        <li><a href="http://www.cc.puv.fi/~e1400458/TAS/3-2.html" class="button scrolly">Project List</a></li>
        <li><a href="http://www.cc.puv.fi/~e1400458/TAS/3-3.html" class="button scrolly">Hour Logging System</a></li>
    </ul>
        <form action="/action_page.php">
            Project Name:<br>
            <input type="text" name="hour" value="Enter a number">
            <br>
            Type of Work Conducted:<br>
            <input type="text" name="project" value="Work Type">
            <br>
            Number of hours worked :<br>
            <input type="text" name="project" value="Work Type">
            <br><br>
            <input type="submit" value="Submit">
        </form>
</div>
```

Figure 48: Source code of the Hour Logging System on the new TAS System.

5. Conclusion and Final Remarks

In conclusion, the report was created with the goal of, firstly, to create an effective and consolidated evaluation model for understanding software tools, and secondly, to use the model itself, to undertake a real-life case study using Merinova and their TAS System as the guiding points of the case study.

The evaluation model which was designed, while simple in its execution and final outlook, consisted of many hours of primary and secondary research to fully understand the key components and principles when evaluation software tools from three primary perspectives. The perspectives that this model takes into account are, as such, the ones that can be closely associated with those of a user, the designer, and the developer.

The second part of this report was designed to then apply this evaluation model to the TAS System which is under use currently at Merinova and then provide them with clearly defined and well thought out suggestions that have been illustrated through the use of mockups.

6. Appendix: References, List of Figures, and Abbreviations

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6.2   List of Figures

6.3   List of Abbreviations

HR   Human Resources

HRM   Human Resources Management

E-HRM   Electronic HRM

UI   User Interface

UX   User Experience

GDS   Government Digital Service

UK   United Kingdom

API   Application Programming Interface

BI   Business Intelligence

MBTI   Myers Briggs Type Indicator

OLAP   Online Analytical Processing

FAQ   Frequently Asked Questions

6.4   List of Technologies Utilized

Canva – Canva is an online, free to use, graphic design tool that was used for the purposes of designing the mockups which shall serve as the suggested changes to the TAS System. Canva makes use of drag-and-drop functions and provides access to various free fonts, graphics, and photographs.

HTML5UP – HTML5UP provides free to use, under the Creative Commons license, fully responsive HTML5 based templates for both, commercial, and noncommercial use. As such, the new suggested implementation of TAS was derived by using a template from HTML5UP to be used as the base. The template itself was then customized for the needs of the TAS System specifically.

Plotly.js – Plotly.js is a free, open source JavaScript library that is designed to help create sophisticated and interactive graphs, plots, and charts. This library was utilized in the creation of the charts which can be seen in the Main dashboard of the TAS 2.0 system.