

Lappeenranta University of Technology
School of Engineering Science
Degree Program in Computer Science

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**User-centered design approach applied to redesign
an in-use software**

Examiner: Associate professor Uolevi Nikula
Professor Ajantha Dahanayake

Supervisors: Associate professor Uolevi Nikula

ABSTRACT

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Approaching any development phase and product, with the idea of user's needs and requirements first, means leading a whole project with it as a priority. In order to reach this situation, is good if a user-centered process is followed and, is part of the development team mindset. This thesis explores the refactoring of a proprietary tool at King Digital Entertainment, used for an analytic purpose. The process followed for the refactoring process is the User Centered Design process. The challenges in following this process, lie on the knowledge of the UCD process of the teams responsible for the development and maintenance of such tools; the cost, the time and, the resources to adopt a user-centered design process; and then the focus on usability rather than perceived functionalities, which usually are higher, when compared to multiple competing business requests. The work presents the approach taken in making the team adapts its way of working towards this process, some of the challenges faced, and the results observed at the end of the process.

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LIST OF SYMBOLS AND ABBREVIATIONS

TDL	Tracking Definition Language
UI	User Interaction
UCD	User-Centered Design
QA	Quality Assurance
DS	Data Scientist
BPU	Business Performance Unit
CIT	Critical incident technique
HCI	Human-computer interaction

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1 INTRODUCTION

1.1 Background

Companies are continually dealing with significant amounts of data -the era of big data-. They need to deal with gathering, store and analyze data. This fact enhances a broader focus on developing internal products or software, for data gathering and analysis, which support the whole business in a smoother and more customized way. Despite this increment focus on this matter, teams involved in the development of those internal tools have hard times to get the right focus toward the usability. It can be because it requires time to adopt the right method to conduct the process, or even because the interest, and the budget, and is considered to be an internal product, can be fixed to a meager amount (time, money and resources in general). Indeed, the focus goes more on the usage of the product, also because especially in large organizations, many other seemingly unrelated issues come up [1], which can be disruptive regarding the plan.

It happens pretty often that products which were developed with no user-centered approach have remained unused after a while [2]. Approaching any development phase and product, with the idea of user's needs and requirements first, means addressing the whole project with it as a priority, to reach so this need to be part of the development team mindset.

The importance of the usability can be proved and seen when the product, the software, is continually being used even after has been released the first time, and moreover, it needs maintenance and development also. It can be seen, as well, when has helped to improve the overall performance of a team, and therefore helped to reach the organization's goals.

There are many studies and research regarding usability, indeed, with the enhancement of technology the scope becomes wide and the studies related need to split into sub-studies. Indeed, when talking about usability, we do not refer anymore only to the User interface, but there is the involvement of User Interaction, Customer Interaction, Human-Computer Interaction or even Human Device Interactions [3]. Researches have enough shown the importance of an established plan to follow, and the functional consequences that this can give, and the companies can benefit from it [1].

In this thesis, we are going through the journey that leads to the better user experience of a software data-analysis tool. The journey highlights the possible hassle that in a big company, a professional user experience/usability can encounter. The structured development plan, where the user is centrally considered, will be followed and, we will see the results worth the effort.

Development approaches, where users are an essential part of it, if not leading the process' phases, have been well documented. Therefore, is useful to see how a process is being used in a real case study and see the results of the approach in most of its aspects.

1.2 Objectives and plan

The thesis aims to state the effort to present an improved version, from the usability point of view, of a company's internal tool, used to gather data for the BPU and QA teams. To reach the final result, we will follow a structured approach, where the end users are involved and centered in the process. The importance of the UI and UCD is remarkable and get the interest across the whole team and company members, especially if the examined software product is in a growth phase.

The tools developed for internal use, usually are meant for expert users. Therefore, people interacting with the tool are familiar with the overall idea behind a software program, business program, or similar. Therefore, the effort put into building the software is more related to functionalities rather than the actual UI. The effort in one rather than in the UI can be a downside, no matter how expert is the users, because when the interaction with the interface is error-prompt or either not very intuitive, then not only makes the tasks longer but also does not get the interest in using it further longer. What would happen in that case, the expert users, try to find a better solution in order to accomplish the same task, and the tool will be substitute with a self-developed way which would accomplish the same work, in a smaller and oriented version. A retrospective study indeed, into the development process, would show that an actual non-used tool has consumed resources for some time, which they could be used differently, or in a more productive way and, with a better future vision. Therefore, the idea behind this work is to remark the importance of having a plan

where, following a UCD process, the solution would give a better result in the usage of the internal tool.

1.3 Goals and Delimitations

To accomplish the work, the questions to be answered are:

- How to address the Usability and the User Interface problems in a company's internal tools?
- Is the effort, time and money to get the end-user involved continuously in the development process worth the final result?

The work though, lack of high performance in the interaction design field, due to the lack of in-depth knowledge and resources. The interaction design field would involve a more accurate understanding of psychological aspects, which would make the design flows accordingly. Therefore, the tool considered in this work has improved not considering the interaction design aspects but concentrating on the usability issues.

1.4 Research methods

The primary path which will be followed to accomplish this work is to put into practice a Design Science Research methodology together with a User-Centered Design methodology. This project be identified as an exploratory research method will help to underline the importance of having a higher consideration of end users from the first phase development of a product.

1.4.1 Design-Science research

The seven steps defined for the Design-Science Research [4] are:

1. *Design as an Artefact*: in this first step the problem is under discussion, and throughout a series of iterations will be restated and presented in the form of a construct, a model, a method or an instantiation.
2. *Problem relevance*: the result of this type of research is to find a technology-based solution to the problem which has been identified in the previous step and is highly related to the business.
3. *Design evaluation*: The design artifact will be carefully evaluated through a series of high standard evaluation methods, to produce a valuable efficient and essential end product.
4. *Research contribution*: To have a rigorous research method, in the areas of the design artifact, design foundations, and design methodologies, we need a continuous and adequate literature search.
5. *Research Rigor*: The research, to be consistent and efficient relies on rigorous methods applied during the implementation phase and testing and evaluation.
6. *Design as a Search Process*: throughout the research process is essential to use accessible ways to reach the results, meanwhile not losing the focus on the artifact environment problem, to have a successful result.
7. *Communication of Research*: The result produced during the research process needs to be presented to different audiences whether they are keen on technology or business.

1.4.2 User-Centered Design

The User-Centered Design process outlines a more practical design and development life-cycle, in which the user is involved in the whole cycle. The general phases of the UCD process are [5] :

1. *Specify the context of use*: Recognize the people who will use the product, for what, and in which environment.
2. *Specify requirements*: Distinguish any business prerequisites or client objectives that would determine the success of the product.

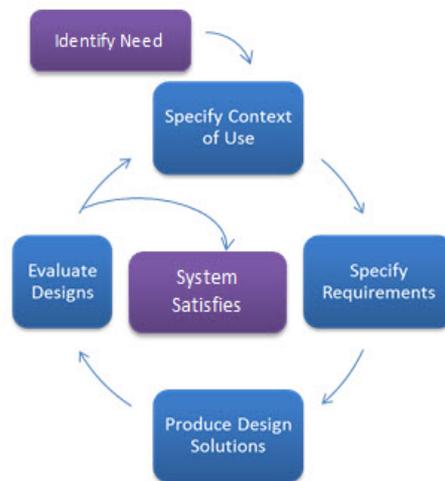


Figure 1 Phases of the UCD process

3. *Create design solutions*: This part of the process goes from a beginning phase of an idea to the complete structure of the plan.
4. *Evaluate designs*: the evaluation is done ideally with specialized methods which involve the end user, for a more accurate result.

There are key principles, other than the phases, added to these phases. Those have been stated, when considered many factors, following a development process and then throughout the system life cycle. Those principles are [6]:

- *User Focus* – The researcher should care, since the first step in the research field, about the user's goals, tasks, and needs. It needs attention to the function that the system has toward the user and vice versa.

- *Active User Involvement* – The different users are continually involved from the first stages of the research, such as analysis and design, throughout the development and evaluation phases.
- *Simple Design Representations* – In order to get the attention of the end users which are also the stakeholders, the final product design need engage at its best, which feature of course the easiness of it.
- *Prototyping* – To transform the brainstorming ideas, prototyping is the method to get it finalized, which means visualized.
- *Evaluate Use in Context* – This is a constant iteration of the solution used. The design evaluation is done with the users' support and in mind the goals and the criteria.
- *Explicit and Conscious Design Activities* – The design activities should not be underestimated, they are significant throughout the phase of developing.
- *A Professional Attitude* – To have a high-performance regarding cooperation and efficiency, is best practice to have a multidisciplinary team and excellent tools and environments. Usability experts are highly recommended during the whole process.
- *Holistic Design* – The different aspect, such as, the system, the organization and all those which are considered to interact in a further use should be developed in parallel.
- *A User-Centered Attitude should always be established.*

The listed principles have been proved, within previous and related researches, that they make the way to reach a suitable and well design interactive systems a more accessible and well-thought path. Nevertheless, many benefits can be associated when applying those principles, and they help not to lose the focus on the user while going through the whole development process.

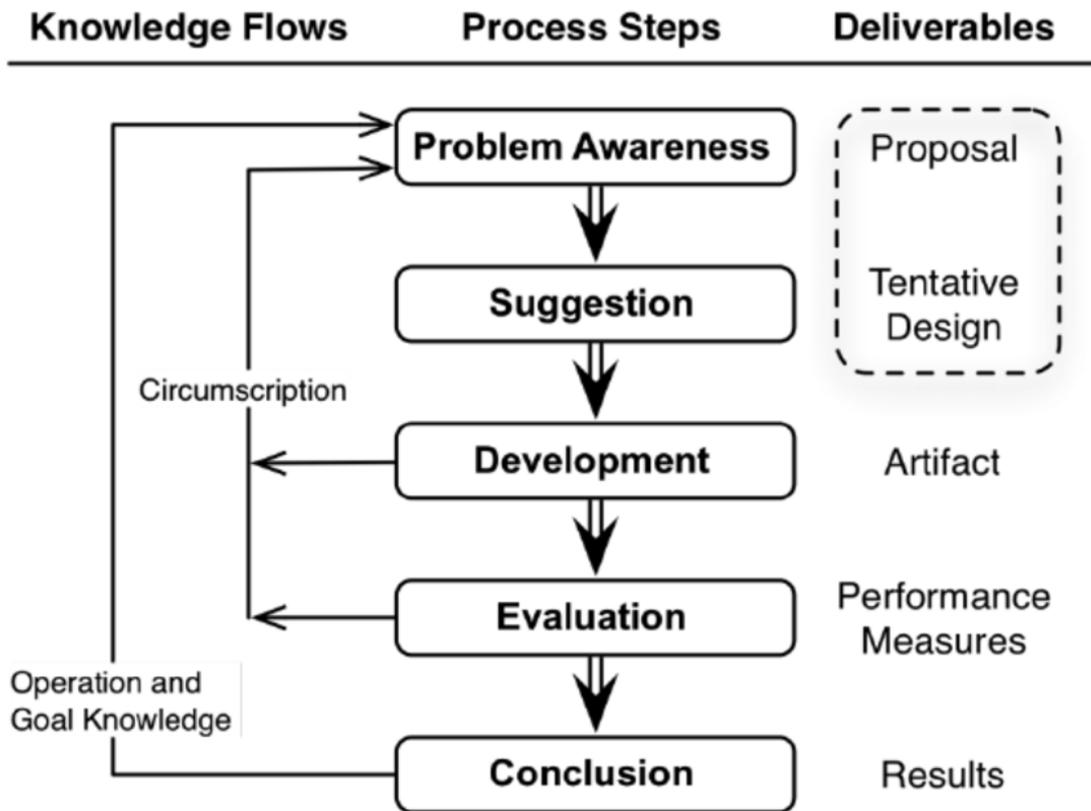


Figure 2. Design science research process model [33]

The first figure in this paragraph shows the UCD process, the figure just above this text shows the research process model. Furthermore, the steps suggested in the UCD process follow the ones suggested to accomplish a design science research. Therefore, following the UCD process for the practical part of this work, will take us toward the desired research founding.

1.5 Structure of the thesis

The thesis is structured around four different chapters. The first one presents the goals and the boundaries of the research, together with the research methods used to conduct the whole study.

The second chapter details the concepts and terminologies used in the thesis such as Usability, User Experience, others application domains, where these concepts come from and what are the latest literature describing them. In the same chapter, there is a presentation and an explanation of the tool which is under study for this thesis. How it is used, what are the purpose of it and an explanation of the problem's users have found while using it?

In the third chapter the primary research method used in the study, the User-centered design, is explained in detail, considering all the fundamental steps and tools. The different methods chosen for the just mentioned method are also illustrated.

The last chapter explains what the outcome of the whole implementation is, describing the changes and how we reached those changes.

The conclusion discuss and summarizes the work presented and the perspectives of extensions.

2 USABILITY AND ITS PERCEPTION

Data analysis is an essential and main point nowadays, to improve the business of any company and also to increase revenue, adjusting the products and services to the markets. The involvements of tools and software services that make the process smoother and, of easy access, has increased and of course, the need for more usability related to this software has increased and gained focus.

In this chapter, we will go through the meaning of usability and more specifically web usability, and of course jump in the meaning of user experience, to get the relation which is between them. At last, we present an overall picture of data analysis and HCI.

2.1 Usability

The term Usability has been in use since the 1900s when was used to replace the term User-friendly; though accordingly to Bevan et al., there has not been an accepted definition until they come up with one [7][8]. The perspective given to Usability since some years, gets its origin from the literature of human factor engineering and human-machine system engineering [9][10], the term then, has been evaluated for more specific approaches.

In the cited papers and books above, three definitions have been pointed out more than any others when talking about usability:

1) *Product-oriented view*

- a. Usability can be assessed considering the attributes related to the ergonomics of a product

2) *User-oriented view*

- a. Usability assessed considering the achievements and the mental outlook of the user

3) *User performance view*

- a. Usability assessed considering the interaction of the user with the product, measuring especially the
 - i. Ease-of-use (Is the product approachable by the user?)
 - ii. Acceptability (Is the product going to be used in reality?)

Ease of use is the most associated concept of usability.

One of the definitions of usability is very related to ease of usefulness, which is “the degree to which users can use the system with the skills, knowledge, stereotypes, and experience they can bring to bear” [11]. The ease-of-use oriented definition of usability, though, has been criticized because does not consider other relevant aspects of usage. Indeed, the quality of experience has been proposed instead of the quality of use [12].

The definition which has been given to usability by the International Standard Organization ISO 9241-11 [13] is:

"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."

The term usability has become popular since the intended computers' users, were not only expert users or to say better, people who were fully committed to that world. Interaction with computers and screens soon was performed for a large part of people's work and fun. To make the experience enjoyable, to reduce awkward situations and, to make the overall interaction smoother, researchers started to put a significant focus on how to reach this goal. Therefore, there has been evolvments of terms related to this fields, due to the wide range of researches involved in this area. Indeed, one of the first terms was "user-friendly" switched to different others, like Computer-Human Interaction, and the Human-Computer Interaction and more; usability though, is widely used to assemble all the concepts behind this idea.

2.1.1 The five dimensions of usability

The leading figure, in the field of usability, is considered to be Jakob Nielsen: he defined usability, not as a one-dimensional property of a user interface, instead he takes into account five main dimensions on which to build its definition [14].

- *Learnability* - Users, can, in a simple way, learn to perform a primary task on the first visit.
- *Efficiency* – The time the user spends too perform the task, need to be the right one.
- *Memorability* – the user needs to be able to remember how to manage and do a task after some time without using and performing that task.

- *Errors* – Mistakes and errors need to be reduced to none, and in case of any the recovery time need to be possible and fast
- *Satisfaction* – The user needs to enjoy the experience

The just stated dimensions, thus the attributes which come from that, have to be weighted differently, accordingly to the product and of course on the actual impact to give to the end-user. In the tool developed for this work, the composition of the audience is expert (in the field) users, and moreover, they are fully involved with the issues which are part of the tool. Therefore, we have not focused our attention on error tolerance and learnability, since it is a tool meant to be used for a long time and from users whom they get an introduction to that, from experts, means they get support. This has been specified because, for example, if we would consider an ATM or a snack vendor machine or whatever requires a fast (or only once) interaction, then, of course, learnability and error tolerance must be the focus, due the fact that the user satisfaction really matter in order to get it further back. So, the focus has been on efficiency, memorability, and prevention, mostly.

The aim of developers and of the whole team developing a product is to generate a very usable product, which means, that the interface should be intuitive so that the user would be fascinated to discover more; therefore, the interface should be easy to use and consistent. The goal of a page is to make the user comfortable with the information shown; the user must not be confused and not have the desire to leave before he finishes the task; the user does neither want to think much, so give fewer options is better for the engagement and also to have a faster result. To check whether the just mentioned options and others are performing in the right way, high engagement with users, need to be assured. The usability testing, conducting in a software development phase, serves the purpose just mentioned.

At this point we can say that to measure usability as such, is not possible if not considering the measurable parameters related to it. The two categories to consider as measurable usability parameters are: subjective user preferences and objective performance [15].

Subjective user preferences: This category assesses and measures the user's preference regarding the system, it answers to the question of how much the user likes the system?

Objective performance: This category is referring to how capable the users are at using the system.

This two categories, in most of the cases, correlated to each other, are both considering when designing [15].

2.1.2 User experience

Differently than usability, user experience refers to the aspect of the interaction between a user and the software product. Indeed, while Usability would answer to the question: “What is the user’s goal to wish to be accomplished with the product?”; in the user experience the focus is more about the real users and how they would engage with the system. User experience cares about the user’s feelings before after and while using the product. While using the system and technology, there are certain feelings and experiences which have very focus importance, such as that Human-Computer



Figure 3 The Honeycomb[18]

Interaction (HCI) is studying how to adapt technologies to human nature [16].

The interaction which we are referring to can be both physical and psychological, and it considers the behaviors or responses from the end-users even before interacting with the system; indeed, these experiences and user expectation affect the way the user will approach the system. In the same way, the experience can change the previous user's expectations and let the user gain a new experience [17]. The Honeycomb was developed to give a better idea of what would matter in the user experience other than usability [18]. Indeed, HCI becomes more and more popular to satisfy the need of this facets for a new development phase.

2.1.3 Human-Computer Interaction

In HCI, the focus is on the interaction between humans and devices/computer. The need of having a significant focus and attention on the users and the perceptions of human, other than the machine itself, evolved since when the society has been driven by technology, through the engagement in everyday life with devices and networks. Indeed, what the HCI field is involved with, is understanding and even more, evaluating how people and the so-called end users, are interacting with and through technologies [19].

HCI as Dix said, “is recognized as an interdisciplinary subject” [20]. Indeed, different disciplines meet under this term, and those disciplines are computer science, psychology, sociology and anthropology, and industrial design. Indeed, Hewett said that computer interaction has “science, engineering, and design aspects” [21]. Another interesting fact about HCI is about having experts in the field into the companies; they were especially in the past consulted later in the design process, but most of the research found that this was a mistake. Indeed, again as Dix in his research stated, “The Interface is not something that can be plugged in at the last minute; its design should be developed integrally with the rest of the system. It should not just present a “pretty face”, but should support the tasks that people want to do and forgive the careless mistakes”[20]. The picture in the figure below, from the book sustainable design, shows how the whole process of HCI fit into the process of designing a website.

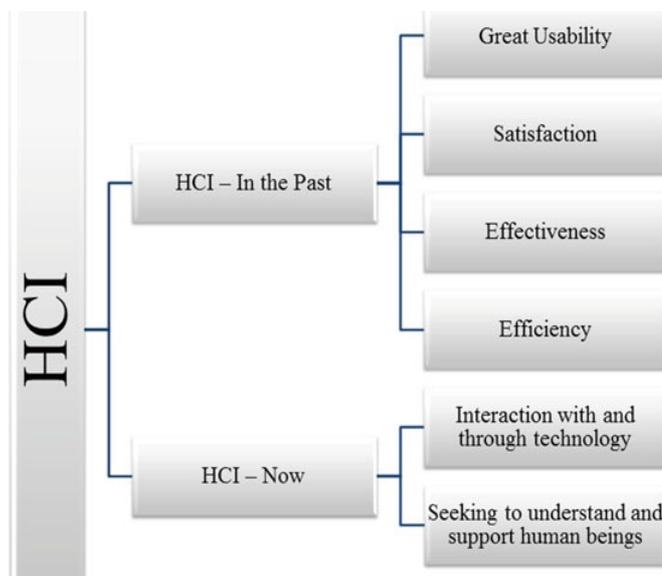


Figure 4 HCI for web development [8]

The largely used concept of Big Data brought in a new term in the field, which is Human-Data Interaction (HDI)[22]. We can consider this term as the evolution of the Human-Computer Interaction (HCI). The importance of the humans in the whole amount of data and to understand where the figure of humans stand into the picture is what it wants to be stated with the term HDI. Users are always more involved with the data, which are produced by us and regarding us, in an always more Data-Driven society [23], therefore the more explicitly the data are displayed and used, the more is, the understanding of this new ecosystem, becoming more explicit, and usable, and more accessible [24]. The systems that interact with data vary from our smartphone to the ATM or POS at the grocery, which is the most obvious ones. We need to think broadly and embrace the other meaning of interacting with data. In the current case study, the meaning refers to the background of how and who have been used the data we integrate into our systems, or even see the whole picture not only as the one that interacts with our data but also the one that enables the interaction with the system that processes our data (which is most likely the case of Tratt -explained in the next chapter).

2.1.4 Data as part of the subdomain of the application

Here we talk about subdomain, such as data, of this thesis which is still part of the tool under study. Collecting and analyzing data has become a crucial activity within the Internet business models, especially when advertising and marketing are involved. The reason is that for many of the activities we have in our everyday life we are sending some data which will then influence other things related or not in our life.

To clarify the concept, we can have a general idea of what are the big data and how they are managed lately.

The term big data refers to a dataset which has a much larger capacity of a standard database and has a stronger ability to store, manage and analyze the data captured [25]. Society nowadays is surrounded by digital data; indeed, we are sending data continuously through the technologies we use every day, and we are in contact with. Therefore industries, in most of the sector, are adapting and increasing their ability to capture and analyze the data in order to have a more comprehensive picture of the customers and end users, to optimize the use of resources and adjust their business accordingly [27]. As we already said, we are living in a data-driven society and all kind of industries, in our specific case study, game industries, data are flowing very quickly and to be able to keep them up and accordingly to the properties it needs a standardization or a precise procedure. The tool considered in this work has been built to add value to the business managing the significant amount of data in a considerable way, rather than trying to keep up manually, which is hard, indeed, more error-prone.

Visualization and user interaction play an important role with the increasing of captured and processed data. Indeed, it is stressed out how important is to have a good presentation of the data and results, and this would, for example, make the navigation through the data, more manageable and smoother [28]. To assist in the assessment and the adjustment of the data has been analyzed that an iterative process would be helpful, having multiple checkpoints, for example, it highlights and helps the iteration drive smoother.

2.2 The tool used for the case study

The tool considered in this thesis has been developed internally at King and has been used for more than a couple of years by now and is facing a very spread use across the company. King needs to have this kind of tool, for tracking, because of the significant volumes of game data, due to the high speed of some high in demand games. In total around 45 billion events entered the systems every day (internal data), this number can let the reader think of the need and use of the tools in use to serve the purpose.

2.2.1 Tratt: a web tool to define sequences of tracking events

The Tratt Definition Tool is used to define sequences of tracking events and analyze the occurrence of these sequences in event live data streams. It can be used to construct so-called event funnels or to detect the occurrence of any linear sequence of events. The tracking system is the infrastructure that records that an event has happened and makes sure it is stored on the server so that it can be transferred and used in the internal analytic systems. To capture a new event, a developer registers the event in the metadata, gives it a name, and describes what fields it should contain. To fire the event has to be inserted at the right place in the code and all fields have to be filled in so that the live event would be captured and recorded. Firing the event means calling the API on the servers where it is written to an event-log and then to the message transport system used internally. Kafka, which is a distributed streaming platform[29] feeds the real-time analytics systems, whereas the logs are regularly transferred to the data warehouse to be pushed through the data pipeline.

Before the development of the tracking tool, users tested the events manually. Usually, games were released without any tracking testing at all. The few tests made were very rudimentary, and those performing the tests had no tech support and minimal knowledge about what the purpose of the tracking was. The main problem, however, was that the tests were very much a manual task. It comprised a written description of how to trigger the event, following which the tester had to use a very simple web-interface or tail the server logs to make sure that the event ended up in the log. The content of the event was never checked, not to mention the sequences of events.

Since the game clients were updated at least every two weeks and had several backend releases every day (total say 20-25 releases spread out every two weeks), the chance of a tracking bug slipping through was quite high. So, tracking bugs did slip through.

There were many of those, and they also were serious bugs too, such as not knowing how having a track of the monetization of a week. For a while it was almost all the releases would have had a broken tracking. Analysts were frustrated because they could not focus on analysis but instead had to spend hours on cleaning and repairing data, figuring out ways to patch and compensate broken data so that any conclusions at all could be made on the performance of the games. Game producers and business managers shook their heads because it took a long time to see if the time invested in new features had paid off or if players did not like them and they, therefore, should be closed down. The frustration spreads across the company.

The influence of a QA specialist got together developers and data science team to build a funnel-analysis tool. The reason was not primarily to get a tracking test-tool but a tool that could decouple funnel analysis from the game code. The idea behind the tool was to give the data scientists an easy way and a more user-friendly way to do analysis and get away from keeping funnel-states on the game-clients and backend that bloated the code. This tool had a simple way to define the event sequence and relations between the fields in the event and could be run on data streamed from the framework used to process the big datasets. This tool turned out to be very much use that it becomes the core of today's Tratt system (in Swedish "tratt" means funnel).

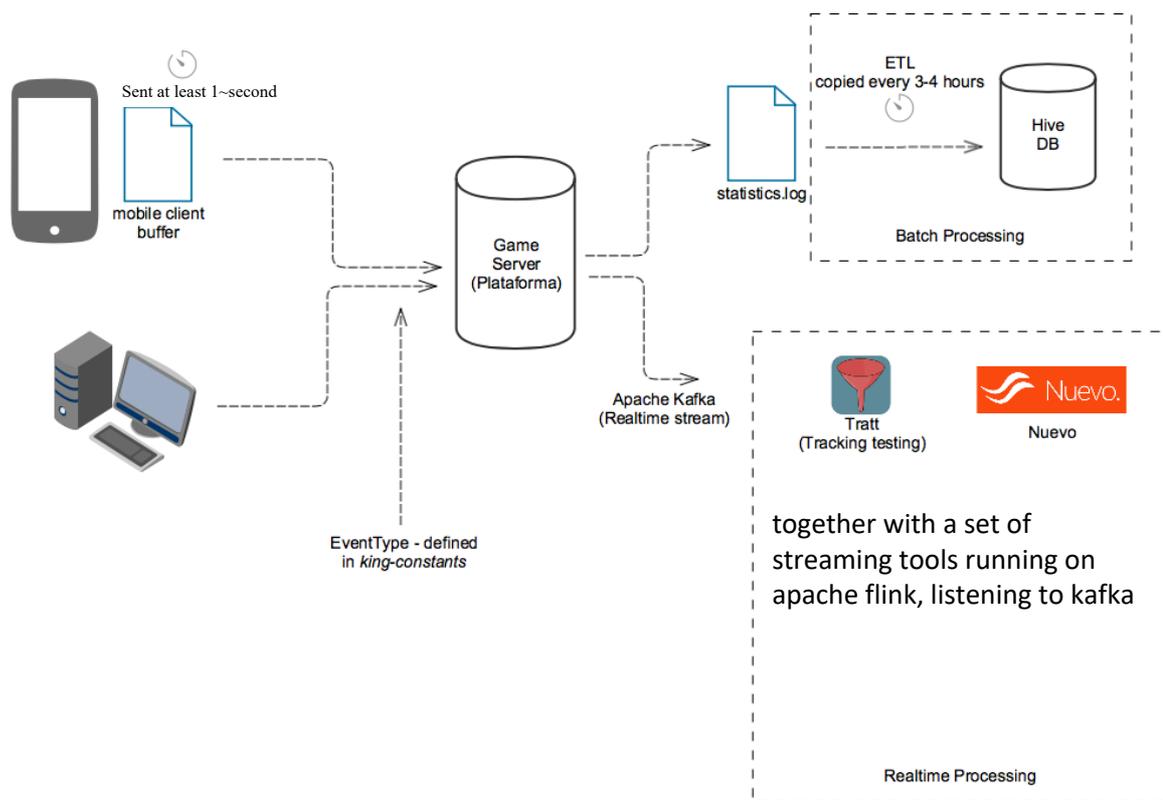


Figure 5 Tracking and analytic system

Therefore, looking at Figure 4 in the previous chapter and the Figure 5 [30], we can see that the tool considered here, have data flowing from the different sources such as PC and mobile devices, which they are captured and stored in the server in a specific way. Indeed, the tool is used across the first and second block (in the picture) of the workflow. The data scientists and the business teams will be using the data collected through the tool, to produce the result wanted or considering new results.

The tool has since its release, been facing some significant issues, raised from the users, and have been adjusted accordingly; a bug log file is available for the users, and they need to be considered to satisfy the requirements. The log file keeps track of the problem's users are facing using the tool. Most of them are functionality and usability problem; furthermore, they also require support to understand the interaction with the system. The importance and the power of the tool for the analysis of the data and therefore, for the whole business, brought it to very exponential growth. Therefore, the usability, which was not the priority at first, became a focus to let the growing number of users interact more smoothly.

2.2.2 The importance of the tool

The tool, explained in the previous chapter, is the center of the case study on how to approach a development project where the ultimate goal is to improve an existing tool. The tool issued is an internal tool, as we already mentioned, used for tracking live event streams in the service (a game in this case) which is the product developed by the company.

In a company such as King, with a fast development pace - has become one of the biggest companies in its sector - casual gaming -, the importance of having an up-to-date and good performing tool, from the base platform to the final product is of vital importance. Furthermore, King has tried and is trying to develop most of the tools internally, from the data science ones and performance analysis to another kind of. Therefore, a significant focus on usability in order to make the internal users' experiences better has become important. The critical aspect of the importance of usability is that, as it was explained in the Usable Usability book [31], there are three stages of implementing usability, the first one is that nobody talks about usability, such as some companies are ignoring usability at all. The second stage is that everybody talks about usability since the argument it has been brought up within a workshop or similar talks. The third and last phase is tricky as he said because it can either be that nobody talks because everyone is aware of the importance of the matter, so has become the company mindset. The other way is that nobody talks for a different reason, which is that the issue will be left aside once the job finishes for a single project.

Improving internal tools and, prove the best performance could lead to a possibility of letting other companies outsource the services, that is what a company that grows fast in size and performance would look forward to accomplishing.

3 THE USER-CENTRED DESIGN APPROACH

The process followed as mentioned in the earlier paragraph has its guideline in the design research method combined with the UCD design process. The users, the tasks, and the environments will have a more accurate understanding when following the phases of the process mentioned. Since the methodology followed for the research is design science, in order to enter into the first phase of the process we need to be aware of what is the problem and allocate it into the broader context. After this phase, we have been analyzing the context, then specify the requirements which make the process going toward the design and implementation, and in the end, there is the evaluation phase.

3.1 Awareness of the problem

This phase was accomplished together with the developers and the product owner, who have first proposed (because of the need) to work on the tool, due to the lack of satisfaction from end user's point of view, and of course to boost the usefulness. The reason behind the dissatisfaction, after few early discussions, appears to be that during the previous development phase, there was no or very little involvement of the end users, due different aspects which went from limited time to develop the tool, to the absence of user interface designers. Awareness of the problem, such as recognition and articulation of the problems, as researchers have discussed it can come from [32]:

- Reading and researching the literature
- Find relevant and adequate problems in another discipline
- State down what are the research needs
- Being on site for a closer into the research issue
- Advance in technology developing it further

In the case of our applied to industry case, we reach the awareness of the problem by expressing the need for something. The proposal for the project has been written down firstly by the project manager who is highly aware of the needs of the users, who were demanding a new version in order to keep using the tool. Field research and the development of new technology have also been factors that led to the draft of a complete proposal. Indeed, the field research was conducted by collecting ideas and

feedback and, moreover general knowledge within the company. After the collection of this information, the research moved to the specific field of the user interface. Especially for the user interfaces and the issues related to that, researches have been developing quite fast lately, so it always demands new updates and development. New technologies in this specific case refer much likely to the frameworks related to the programming language in use, such as JavaScript, which is abundant and always moving toward a further direction. In fact, regarding the tool analyzed in here, some of the frameworks or templates used were out of date or even not used anymore. Therefore, when it comes to software development, maintenance is, and it may also be sometimes a hard work [33] when that is not continuously made it may come to a point where refactoring is needed.

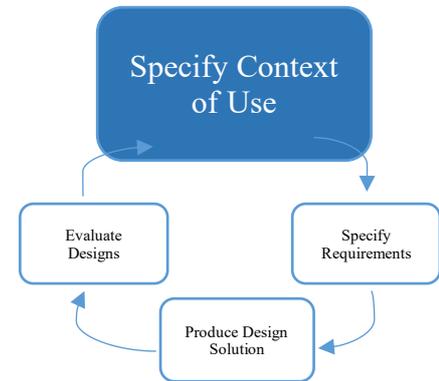
3.2 Analyze the context of use

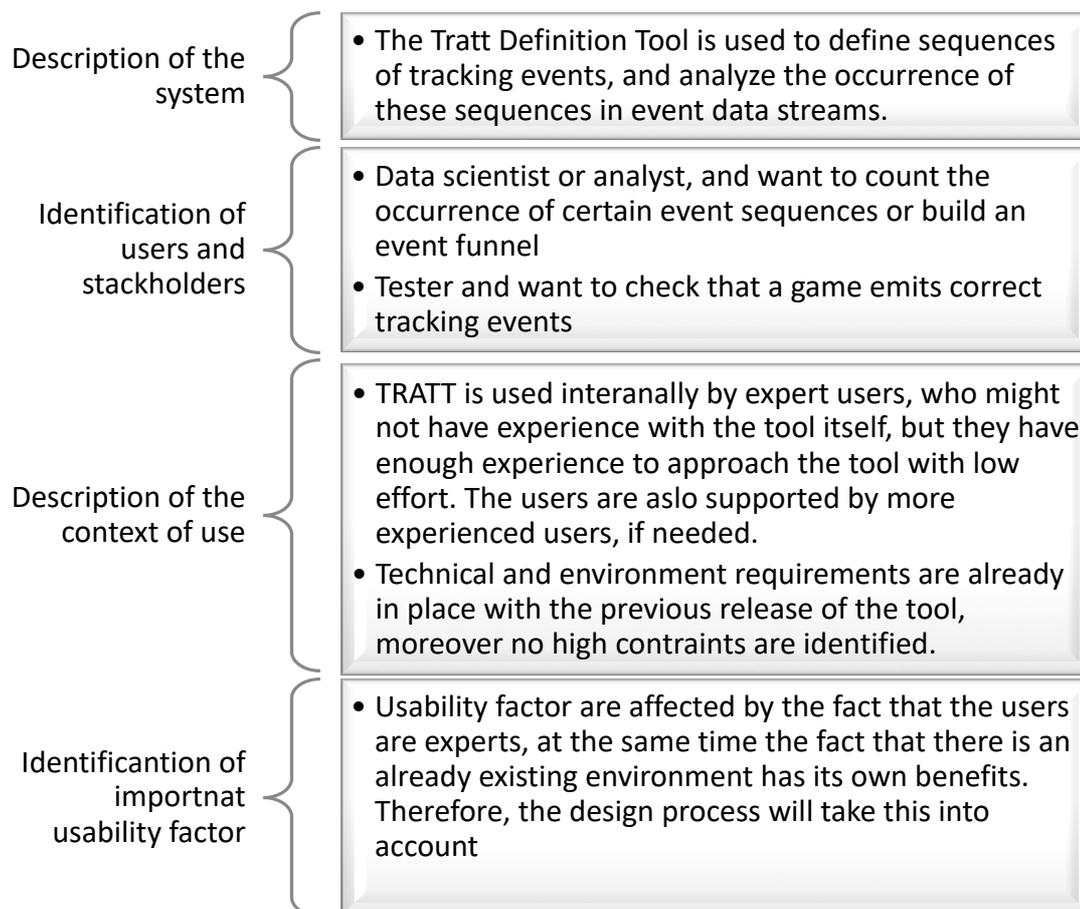
The Tratt tool is used internally to the company. The intent users are people who are for some reasons involved in the business.

To understand the need, and what, and how the users would use the tool, interviews, and one-to-one meetings were taken. The people involved in this part were specialists and developers, involved in the first and previous release, and into the business, and end-users.

To get the best from this phase, a review of the existing contents, such as documentation of the tool or the code itself was helpful. Furthermore, an in-depth analysis of it made the issues clearer when having the one-to-one meeting with the people mentioned before. In this first phase, an understanding of the company issues, such as business, technologies, and resources was needed, because of the understanding of the context.

The first meeting, called according to the Usability Body of Knowledge, Context Meeting [34], took place with a QA specialist, which launched the idea for the tool, and a senior developer, which is deeply involved in the development, and a user. The information collected during this first meeting lead the way to understand the resources available either to develop the tool and to work with the tool from the end-user point of view. No significant constraints were found to be in place, both regarding the resources and the environment in which the tool is running and the people that are using it. The only constraint that could be raised in this phase was the lack of time and a shortage of people involved in the process. The just mentioned constraints were managed by making a roadmap of the critical issues to be solved within the time limit and with the forces available for the specified time of period. To summarize the outcome of this phase, we can state and highlight the following steps [34]:

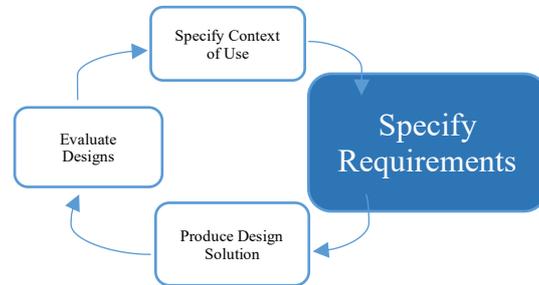




There has been a continuous relation with the users and with the people involved in the previous release of the tool. The process took some time since people have a tight schedule and are focused on the ongoing and own project. Another reason is also that, the tool improvement is not on a priority list because it is already up and running, not in the best usable way though. The preparation of the meetings, in advance, was necessary in order to have a checklist of what to discuss. Even though, the participant, especially in this first stage of the process, was aware and comfortable with what was to be discussed and needed to achieve.

3.3 Needs and requirements

The identification of needs and requirements is an essential part of the User Centered design process. There are different methods to acquire and process the right information. Among the different methods, we have had some unstructured interview with



people interested in the development of the tool. We also used some known methods to understand the needs and the requirements, such as cognitive walkthrough with the help of task model, of the current version in use, and Personas, to state the different user's needs, experiences, behaviors, and goals.

Before going into how we used the methods in this project, a definition and clarification of them make the further process description easier.

The unstructured interviews are conducted to gather rich information from users and stakeholders, in our case developers as well. The idea is to have conversations without any restrictions and limitations, and it means there is not a defined topic and agenda [35]. Indeed, not having an agenda, helps a lot to get into the project and gather the overall information.

The fact that the work is based on an improvement of an existing tool, and the final result must give better performance from the usability aspect, conducting a usability test at this stage, before the implementation of the new product starts, makes it easier to catch and prioritize requirements. For this purpose, a method to check whether a user could carry out some specific tasks, the so-called Cognitive Walkthrough and the Task model method were performed. This Cognitive Walkthrough focuses on how the user feels about using the tool for specified tasks which are predefined beforehand [36]. To get the best information out of the cognitive walkthrough method, the assessor should use the following four questions as they are stated in related research [37]:

- Will the user try and achieve the right outcome?
- Will the user observes that the correct action is available to them?

- Will the user correlate the correct action with the outcome they expect to achieve?
- If the correct action is performed will the user see the progress made towards their intended outcome?

The other method used here is the definition of Personas. Persona is a fictional person who represents the typical attributes and behaviors of a group of users [38]. Personas tell stories about users so that the interviewer or researchers have an in-depth understanding of the needs and necessity to focus on. To better represent a user a persona is defined and act as an ideal one. Indeed, will act as a guide to make decisions such as functionalities or interface and interactions would help. It is a handy tool that allows to set a specific group of user and focus on their needs goals and behavior, which helps not to lose the path to follow [39]. Other than these methods, we conducted continuous researching and getting information about the company and the relevance of the tool conducted.

3.3.1 Unstructured Interviews

The literature review and the first introduction meetings lead the way to define some unstructured interviews and understand more the user's point of view.

The interviews were planned. The persons involved were being contacted well in advance when the preparation time was finished. The preparation time did not require that much time since the idea behind those interviews was to get more information from the users. So apart from a few prepared questions, there were, during the section, questions and answers, which were pretty useful for the prototype and implementation phase.

Invitation to the interviewer is sent out through the organization's mail so that the recipient would not be afraid of the answer; means would not consider that as spam. They would have accepted and moreover they would have found a time to fit their agenda. Once we fixed the meeting, we started the interview by presenting each other, a small presentation of the project and the tool that we were considering in the section, and the usefulness of the information that we would have got in the section.

The results of the interview were analyzed and discussed before the next phase started. The Personas developed later in the process, got an extensive contribution from this phase to fill in information.

The section started with questions such as:

- Do you like TRATT?
- How long have you been using the tool?
- How often do you need to interact with the tool?
- What kind of difficulties have you encountered while using it?

From this point on, there were no actual questions, and the discussion went smoothly deeper in the functionalities and design of the tool.

Indeed, that is what has happened in this phase, gathering information with a closer look at the work environment of the user. It was after this phase which we get a better feeling with the tool and got deeper into the actual problems. This process leads the way to make a list and prioritize the problems walking through the whole tool from the user perspective, and this is what will be shown later on with the task model after a walkthrough section.

3.3.2 Cognitive Walkthrough

The walkthrough was conducted with two of the users, and they create a TDL file as if they would do in their everyday environment. The two users chosen had a different background. One user was an expert on it, and the other has started to use it a not long time ago and still familiarizing with it. The ground questioned we mentioned earlier, have been used to have a major focus and manage the whole walkthrough. This method placed after the interview was quite a success because the –let's call - unclear points could just be explained here. Within this section with the user using the tool, the observer can see most of if not all, the touchpoints, and in the end come up with a list of tasks performed which are helpful to design a task model.

3.3.3 Personas

The phase of collecting requirements from the people involved in the project, such as product owner, QA specialists, and developers, has led the way to create personas. The process to create them took a long path, for the fact that, in the beginning, there was a broader implementation idea, involving more issues. Indeed, for this matter, got involved another kind of personas removed later, due to the time cutting in the development goals. The reason for the cutting was the lack of project development time.

Personas are the typical users of the tool we are considering. As we said earlier in the chapter keep them in the process has helped to be on track and also a more straightforward approach to the problems when explaining it to different users and stakeholders.

The main Persona is considered to be Arian, a user who is being hired for a short time and as such she started to use the tool recently and reported the main difficulties in working with it. The other two personas are the ones who are working with the tool for a long time, with different background and different motivation as well.

Arian

Age: 25

Department: QA analyst



Goals and motivations

Arian has been newly employed, and she has a background as a developer. She has high expectation in things she is involved with. She likes to perform tasks efficiently, and she pays attention to details. Her goal is to succeed in the job and moreover contribute to the high quality of the company.

Nature of work

The work Arian is involved with is related to assure quality. She helps business teams to gather the exact data for the analysis. She has a problem-solving personality.

Experience and training

Arian has joined the programming world after she got attracted by some friends talking about that. She got a six months intensive course on Java programming before she got into the quality area.

Environment

She works in the company's office, and it happens though that she continues to work from home with her laptop. The workplace is highly international, and the people with whom he works have different background and skills, but she has pretty good guides, and she gets good support.

How will this person use the website?

Arian is new to the use of the tool, and she pays attention to details. She needs to use the tool to create the TDL file, and she is enthusiastic about using the UI to get the job done, rather than using raw data.

Key tasks

As a QA analyst, she needs to test that the sequences in the games are working correctly. She is testing the events and get the right data to let the business analysis unit to work with the proper data.

Jim

Age: 24

Department: QA analyst



Goals and motivations

Jim is a young developer, and he has high expectations from his code. He is a motivated developer, and he thinks that as a QA analyst he can gain a broad experience both in programming and in software quality, and he can fix his bases to succeed to higher positions.

Nature of work

As a QA analyst, he is working closely with data. He helps business teams to gather the exact data for the analysis. He can get things done even if there are not that many guidelines.

Experience and training

Jim has finished his degree in software engineering. He participated in projects, and he has also developed some web application in its spare time. He has enough knowledge and worked closely with java but also PHP and he is very interested in databases.

Environment

He works with his PC when at the office, but he likes to work during the night and often he works from home with its laptop. The workplace is highly international, and the people with whom he works have different background and skills, he gets support from the QA analyst leaders when he runs into problems.

How will this person use the website?

Jim needs to create a TDL file, and since he either has a good work environment or he prefers to work with raw data. He is not very fond of details, and he is not very patient in not working tools properly.

Key tasks

As a QA analyst, he needs to test that the sequences in the games are working properly. He is testing the events and get the right data to let the business analysts work with the proper data.

Joseph

Age: 40

Department: Product
Owner (QA team)



Goals and motivations

Alex wants to get the QA analysis to an upper level. QA brings the business further and having a tool which makes the tasks more natural and smoother and faster is his vision.

Nature of work

Team-based and project-based worker, he likes to push things forward. Trying to find a better solution for its tools is what he is willing to do

Experience and training

He is a fully experienced QA analyst with experiences in leading corporates. He has been working with the quality of the software and products. Thus he can see the next step to take to add value to the company.

Environment

His work environment is the company's office, and he does not prefer to work from home. The ***workplace*** is highly international, and the people with whom he works have different background and skills.

How will this person use the website?

Alex needs TRATT to create a file which will be needed for tracking events in the game and used by the game team. He uses the tool on his desktop.

Key tasks

Alex ideates the tool. He now uses the tool first to create a TDL file. He is also the person responsible for the users who are involved with the tool. He is responsible for the issues raised regarding the tool. Optimize it is its primary duty.

The definition of personas was a reference point during the whole development process. Especially for the lack of time, have a limited scope with the changes to be addressed individually for the main users, was a useful point.

3.4 Task model to picturing the requirements

The task model designed below is used to describe how a user is supposed to create a tratt. The model shows part of the passages, the tasks that are required from the user to get the work done. It was a good method to interconnect the observer’s annotation with the tasks done by the user [40].

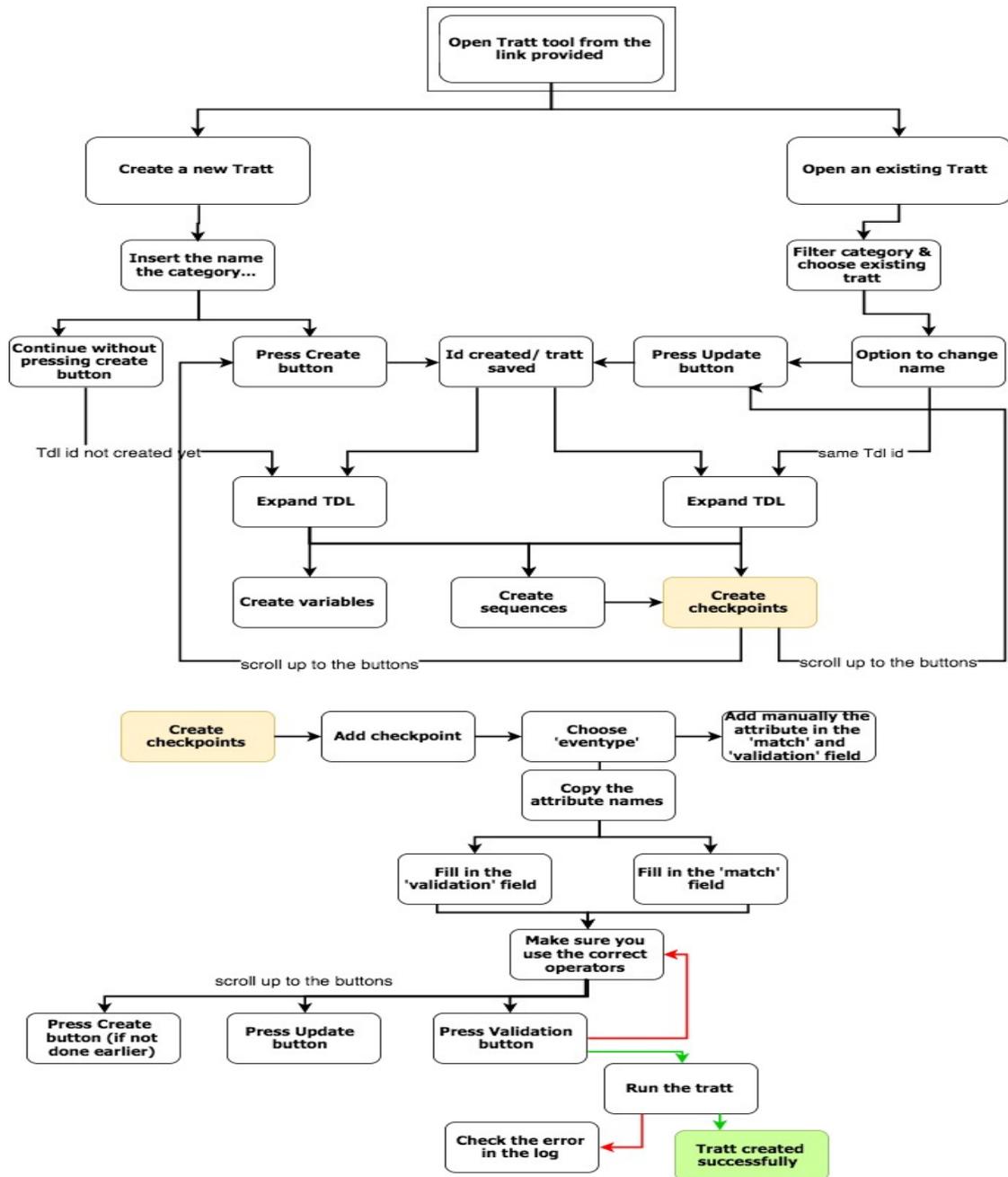


Figure 6 Task model to create a tratt

The graph designed covers just part of the tasks that the user is used to do to create a tratt. The first part of the graph is where the user loads up the page and can start work on a new tratt or an existing one. At this point apart from few UI (such as colors to highlight the button 'create' and some other such as give a more straightforward name to the button 'start a new tratt'), the user did not find big issues to find his way to the next step. After choosing between new or already existing tratt, another part of the page is opening with some details to either fill or filled in already. The user to go further needed to expand the next are pressing on the expand button, which was impressively frustrating (since for each section the expand button started from collapsed). This button, was one of the relevant tasks to change, how to give the user the feeling of reaching the goal with the minimum amount of work. The other big issue in this part was the buttons to create or copy or delete a TDL which were not very clear in most of the cases. The Update button also had a copy function which was useful in case of having a more graphic visualization. This task had to be improved, together with the position of them; indeed floating buttons would have worked great for the purpose.

Then the other graph required a bit more writing from the user and a bit more thinking from the development point of view. When the user performed the task 'Choose the eventype' he got usually confused on how to go further and write the adequate attributes in the 'Validate' and 'Match' area. Indeed, the user underlined the desire of this improvement since it is also the cause for errors occurring in the Validation part. The just explained task was the most valuable ones, and worth picturing within a Task model. The steps, as in the task model, are explicitly stated with the following bullet points (we cover the two parts as in the graph with the different annotation -numbers and bullets-): the first part of the graph, as underlined in the above graph, have the ends point where is given the possibility to create checkpoints. The second part goes from creating the checkpoint to having the run button for the just created tratt file.

- 1) Open the tool
 - a) Create a new Tratt (definition file)
 - i) Insert the name of the category
 - (1) Continue without press CREATE button
 - (a) Expand TDL
 - (i) Create Variables
 - (ii) Create Sequences
 1. Create Checkpoints
 - (iii) Create Checkpoints
 - (2) Press CREATE button

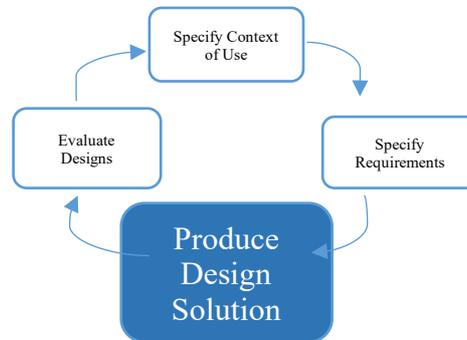
- (a) Id created/ tratt saved
 - (i) Expand TDL
 - 1. Create Variables
 - 2. Create Sequences
 - a. Create Checkpoints
 - 3. Create Checkpoints
- b) Open an existing Tratt (definition file)
 - i) Filter the category and choose an existing tratt
 - (1) Option to change/extend the name of the existing tratt
 - (a) Expand TDL
 - (i) Create Variables
 - (ii) Create Sequences
 - 1. Create Checkpoints
 - (iii) Create Checkpoints
 - (b)
 - (c) Press UPDATE button
 - (i) Id created/ tratt saved
 - 1. Expand TDL
 - a. Create Variables
 - b. Create Sequences
 - i. Create Checkpoints
 - c. Create Checkpoints

❖ Create Checkpoints

- Add Checkpoints
 - Choose eventype
 - Add the attribute manually in the match and validation field
 - Copy the attribute names
 - ◆ Fill in the validation field
 - Make sure you use the correct operators
 - Press CREATE button (if not done earlier)
 - Press UPDATE button
 - Press VALIDATION button
 - ◆ Check the error log
 - OR
 - ◆ Run the tratt
 - ◆ Tratt created successfully
 - ◆ Fill in the match field
 - Make sure you use the correct operators
 - Press CREATE button (if not done earlier)
 - Press UPDATE button
 - Press VALIDATION button
 - ◆ Check the error log
 - OR
 - ◆ Run the tratt
 - ◆ Tratt created successfully

3.5 Ideation and Prototype

At this stage, we identified the requirements and the needs. At this point, it was needed to generate ideas, based on requirements and information got from the user. The ideation would have been the base for prototyping. We schedule this time by generating ideas among ourselves first and then presenting it in a



presentation/brainstorming section. According to many researchers, the brainstorming was a good point to reach an excellent later design. The first ideation iteration involved the main persona, and in the second iteration, a couple of users were involved.

The ideation, referred to as brainstorming is usually used when [41]:

- There is a need to coming up with ideas or requirements.
- There is a need to find a solution to a problem.
- The old ideas need a new visualization, or an implied comparison to emphasize the conceptual design of the user interface architecture.
- A new design area is going to be researched.
- The product’s teams need a social bundle.

In our section, we can state to have used brainstorming to generating ideas to find a solution to a specific problem, defined in the previous sections. Furthermore, for one of the main functionalities (issue raised by the users), there was conceptual design support, to generate a new way to carry on the old process. The user's idea is important as much as the developer's ideas. Having a section with developers and users and stakeholders might have its profits but eventually its losses [42]. In our section, the result was pretty valuable, because the discussion went smooth and the ideas flowing in there, arrived actually to a common point were both developer and user were satisfied.

The first ideation phase was not very much structured, and it did not bring the desired results. This issue happened because the process of the ideation was not brought to a restricted point or to better say to a terminating point. This issue was in a way managed,

with a second meeting, though a loss of time and a short shifting in the timetable was involved.

The second meeting, which involved ideation as well, was conducted after a low fidelity sketching. Prototyping is an integral part of a design process, and especially when done in the early stage of the design process, it highlights the key problems and also enlarges the creative space to create new solutions taking care about the costs as well [43]. In a meeting, we introduced the paper prototype to the primary users and to the product owner who was both really involved in the process and was also involved in an early interview.

The meeting was organized by inviting the people, according to their schedule. The issues here were that the user is not very prompt in being involved in this kind of process. To better say, the user was at first not very interested in giving other feedback since it was not very clear the importance which we would have given to them. It started with a presentation again of the main problems and issues which they would be involved and, in the presentation, and moreover explaining which main issues discussed. The paper prototype started with the changes to the homepage of the tool, and then it went on with the various UI changes and then it touched the most critical issue, which was one of the functionalities which according to the product owner it needed most of the focus.

One consideration to do at this point is that the paper prototype was enough for this project, at this stage, because it brought up, the main features to change in the first design iteration. It created a clear picture in the short roadmap available, of the design process, for the main issues.

The meeting went on, especially involving the end user, telling how it would solve the problem, which solution would give, why the solution presented was not appreciated because not very user-friendly. Indeed, during this meeting, one beneficial opinion from the user was raised, the inconvenience (according to her opinion) to have a series of the drop-down menus.

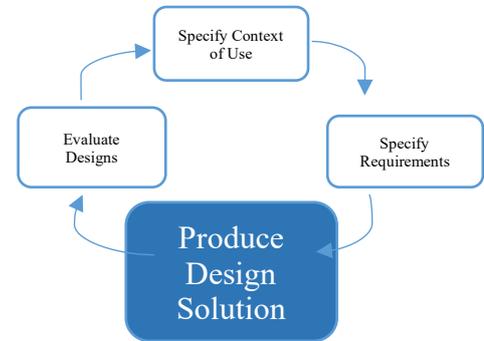
After this phase, according to the timetable and according to the process, the implementation phase started. The users are less involved during this implementation phase, compared to the previous already mentioned phases, but continuously available if needed. Indeed, if something like a page or a functionality a component can be tested out before being released, this might be the most useful case, users are involved.

4 IMPLEMENTATION & EVALUATION

The process at this point has reached the implementation phase. The outcome desired has been discussed during the previous phases.

Furthermore, extensive research on how it could be better implemented was also conducted. The research focus, at this point, on the frontend better solutions. The code needed to be cleaned and a refactor for better maintenance and future expansion of the tool. After

few meetings with some feedback from senior frontend developers, involved in the same kind of tools, that I was working with, we agreed on use the React framework, built by Facebook developers which is gaining pretty much popularity among the frameworks now in use, because of its way of thinking in reusable and components way [44].



4.1 The road to the outcome

The implementation phase has started with studying the code developed for the actual version. After some deep into tutorials and best practice, there was the understanding that the time was too limited to refactor. Indeed, for quick changes and a first working release the decision was to continue to work on the code the tool was built and using the jQuery library to work on. Implementation meant as we mentioned, working and changing the code of the first release of the tool. Indeed, there has been the need for small talks and discussions with the previous developers. The availability of the team who worked on the previous release made this work going smoother, there has been interaction, especially in the beginning with them. This interaction helped, in parallel with the users' needs, in understanding the problematic, of course under a different aspect than the users' ones [45].

In the following section, there is a brief explanation and a visual caption, based on the main changes made during this iteration.

4.1.1 The new look and feel

The new look and feel of the tool, starting from the functionalities and then with the UI changes. The figures show the new view of the webpage, and in the explanation, there is a reference to what it was in need of changes, the figures capture only the parts of the page where modifications occurred.

The home page of the tool starts with the menu closed on the left side of the screen. The toggle button comes in the picture in order to show the links in the menu. The decision has been made because from user's feedback the menu is not often used and then it would be better to see the TRATT tool home page fully, at first, rather than the menu. The user will open the menu if looking for something else than the definition of the TDL itself.

The colors have also been modified, because of consistency [46]. There was not a clear reason why the colors for the bars on top of the single components (Create new Tratt and Load Tratt) were on a lighter color than the one used on the top navigation bar. The color added to the "Create new Tratt" button, made it more intuitive, and essential to get the attention of the user it at even the first glance.

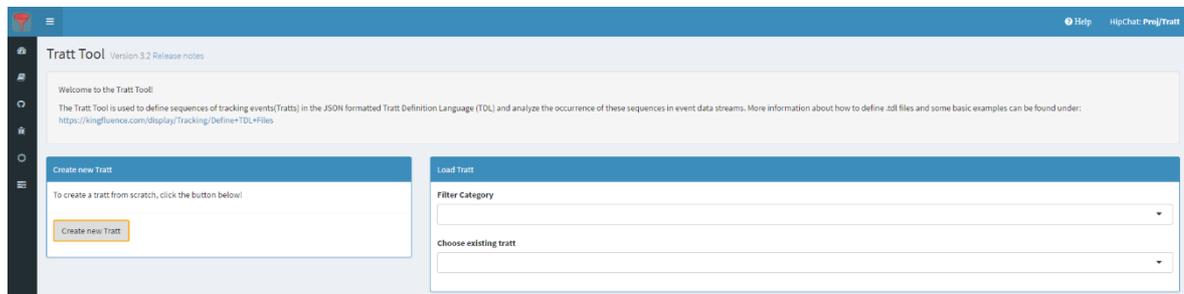


Figure 7 Create a new tratt button

In this screen, we can see that the buttons “Create” “Update” “Delete” and “Validate TDL” have been added on top because requested, are going to be shown on the navigation bar just after the user will scroll down. Those buttons were a very demanding feature. The reason is that the user wants to have easy access to the features which are often used and in this way, they are handier.

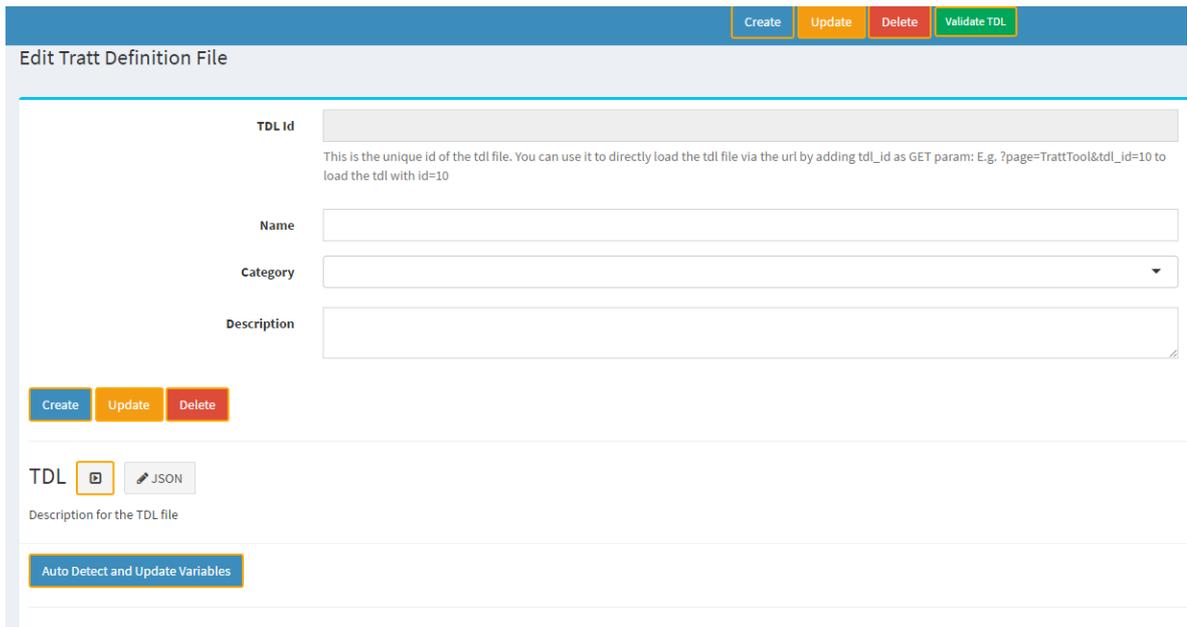


Figure 8 New Buttons floating

Stepping in the different blog on the web, regarding UI design, is interesting to see how much white spaces are essential for the visual part of web design. In this webpage, though the white area took an extended part. Indeed, in the new design, the look is much more compact and gives the user an overall visualization of the relevant parts in there.

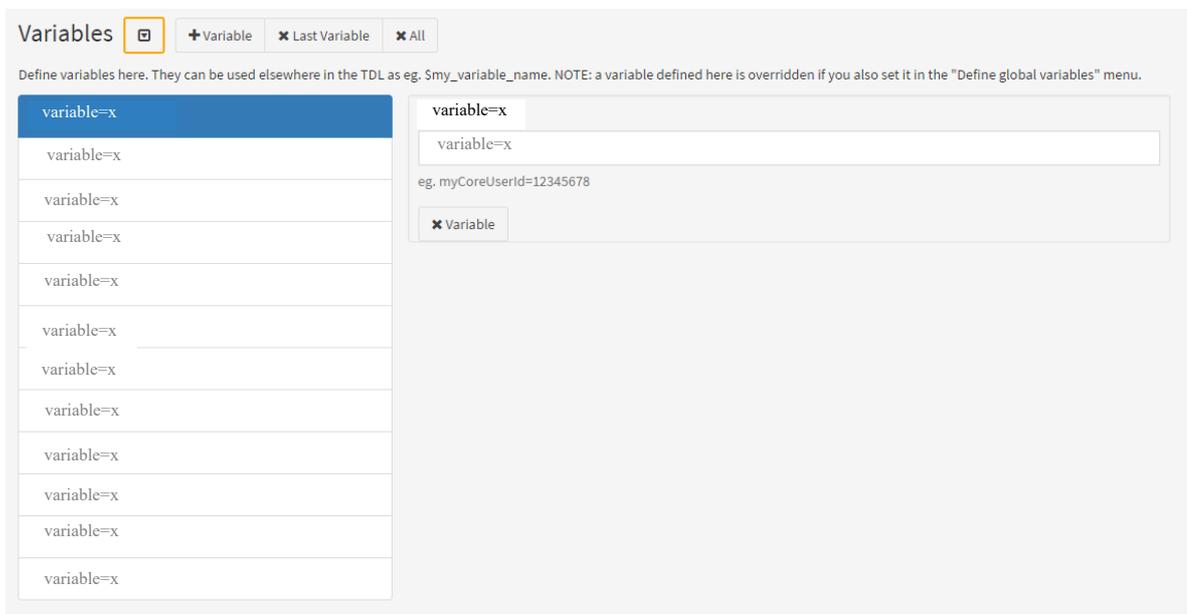


Figure 9 Variables list

The same as for the variables page happened with the checkpoints. This part of the editor is the one where the user is spending more work and time. Therefore, the

complaining and the requests for improvements was high. Indeed, with the new design, the visualization was very compact, and the user could have a better contest of the points was dealing with.

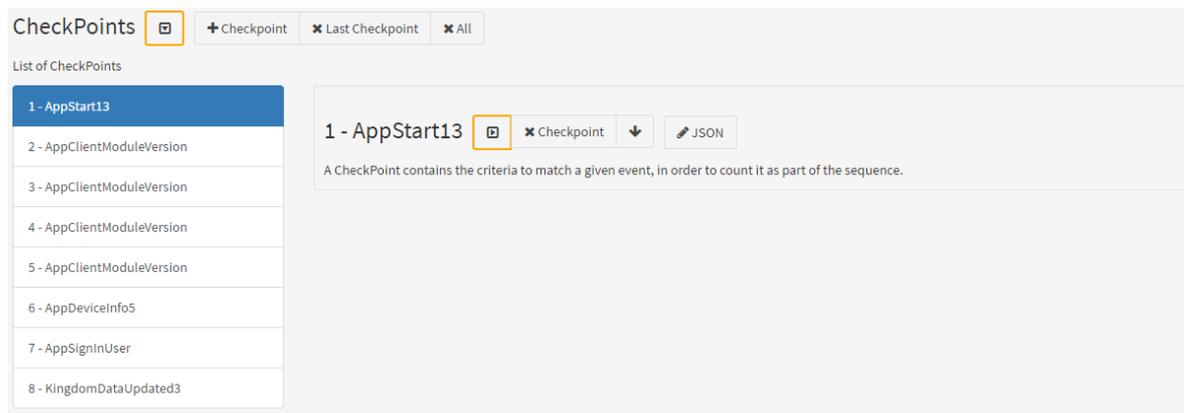
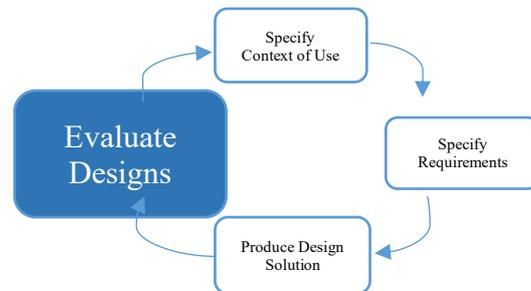


Figure 10 Checkpoints list

The following screens are yet again related to Checkpoints, as we said in the paragraph above this is the section which has requested most of the changes due to the high interaction. Therefore, the other changes related to these screens are related to functionalities, indeed the user needed to move the checkpoint easily up or down, because of a different way of checking the events in the funnel. The arrows allow this functionality. The other change was to remove the unnecessary button, the property one. The users were not even aware of the function of the Properties button. Another change and, the last one to be pointed here, is the change of the format of the input area, been changed as textarea so that there are no long lines issues and more comfortable to work with.

4.2 The evaluation of the new design

The evaluation of the new product has been conducted following the guidelines of some known evaluation methods. Those evaluation methods to which we refer are the questionnaire, known as Critical Incident Technique [47], which is a widely used technique



in the psychology field and, together with think-aloud protocol [48] within the usability testing. The satisfaction questionnaire is used to gather information from the user, with a pre-defined set of questions. With this technique, it can be easy to collect more data, than other kinds of more one on one techniques. The other techniques mentioned earlier are more invasive compared to the one used, closer contact and interaction with the user is required and, is for that reason, a more straightforward result-oriented.

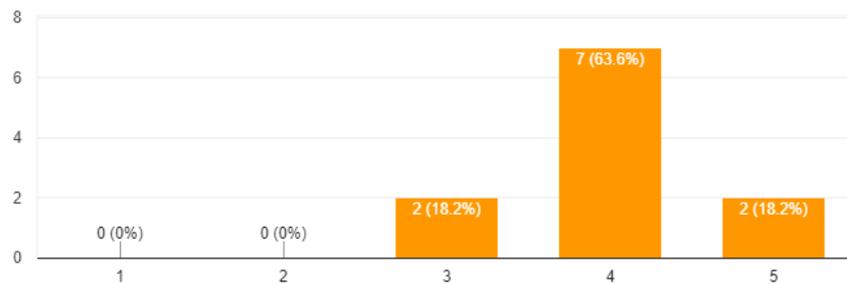
The questionnaire has been used to have an overall idea on the result of the new design. It contains nine fields/questions, among those, five are scaling questions, with which the idea is to assess the acceptance of the new look and feel of the tool. The other 4 are open-ended questions, in which the respondent can give either extra information related to the tool and extra comments.

The first step of this process was to send out the questionnaire, the number of people available to send it was small, and the overall answers were even less (11 in total). Nevertheless, to gather a particular type of information the number of responses was acceptable [49], especially since the people involved in the requirement gathering were involved in this phase as well, so we could have a comparison at the same time. Therefore, the answers were enough to get an overall idea; indeed, it came out that we reached a first step in which the user could notice the benefits of the differences, but it came up that there is a strong need to work on it in a further release. The percentage of non-satisfaction was still high as we can see from the graphs below which came out from the first two questions. The graphs shown in the picture below with the related questions are very much explanatory (in the first graph, one is extremely satisfied five

is not at all). The interpretation I gave to them is that the user was aware of the changes and has appreciated them, but it needs more work in order to be even more engaged with it as a whole.

How satisfied are you with the look and feel of the new version of TRATT?

11 responses



Compared to the previous version, is the tool quality better, worse, or about the same?

11 responses

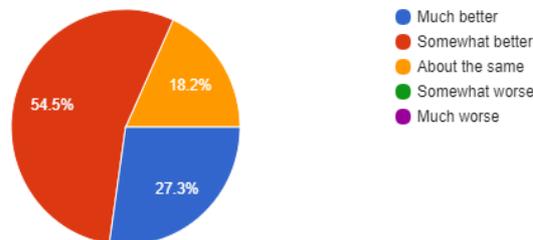


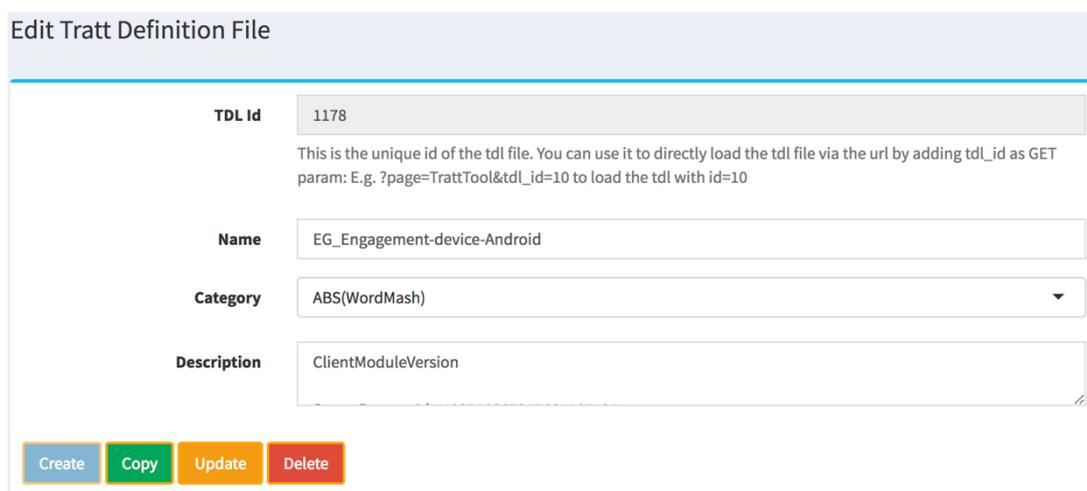
Figure 13 Questions and result from the questionnaire

The results from the questionnaire showed that it was pretty much necessary and needed to have some closer meeting with the user again to realize how engaged they were at this stage with the tool and what are the requirements to address in further work. Therefore, with the usability testing, with that CTI and think aloud technique, we gather precisely what were the low points of the new design and what were the easy fixes and the other ones, which require a longer iteration and still an engagement of the user in the process.

The technique used was pretty much prepared in the same way of the interview used at the beginning, the one to gather the requirements. This last one, it was prepared

according to the latest changes. Moreover, there was less friction between the interviewer and the user since worked for quite a long time by now. The all process was to walk through the tool, and use the functionalities as the user is used to and he would explain the steps as it goes further. This process is much easier when the interviewer and the user have worked already together; indeed the meeting resulted in being smoother. Collecting ideas and write down the critical areas, highlighting the low points, were done in parallel and with the help of a recording, we needed that especially for new functionalities which were not part of this iteration, the process went smooth overall.

The user requirements and the changes were applied according to the evaluation results and the user (testers), the few who started to use it at the second release were much more engaged. This engagement resulted from the feedback received and the many questions received while using it, for some clarification.



Edit Tratt Definition File

TDL id 1178
This is the unique id of the tdl file. You can use it to directly load the tdl file via the url by adding tdl_id as GET param: E.g. ?page=TrattTool&tdl_id=10 to load the tdl with id=10

Name EG_Engagement-device-Android

Category ABS(WordMash)

Description ClientModuleVersion

Create Copy Update Delete

Figure 14 New buttons label and style

The changes applied in the second iteration were announced and release to make more people aware of the new Tratt GUI. Indeed, some relevant changes compared to Figure 8, in the previous paragraph, is the now 4 buttons, which they all continue to float, which give a more precise idea now regarding the role of each of them.

One more relevant change regards the pre-filled 'Match' and 'Validate' area. The value that is now that textarea pre-filled could come out only working closely with the users. Indeed those are small changes which are useful for the end users in the constant engagement with the tool, as shown in the following figure.

EventType

AppAdClick

This event contains the following attributes: coreUserId / clientFlavourId / installId / timeSeconds / adSessionId / type / subType

Match

```
coreUserId != " == < <= >= > || &&
clientFlavourId != " == < <= >= > || &&
installId != " == < <= >= > || &&
timeSeconds != " == < <= >= > || &&
adSessionId != " == < <= >= > || &&
type != " == < <= >= > || &&
subType != " == < <= >= >
```

Define the criteria for accepting the event for this checkPoint. Eg. "coreUserId==1234567". If the matching fails, the sequence will continue looking for this checkPoint. For details, see <https://kingfluence.com/display/Tracking/Use+Matchers>

Validate

```
coreUserId != " &&
clientFlavourId != " &&
installId != " &&
timeSeconds != " &&
adSessionId != " &&
type != " &&
subType != "
```

Figure 15 New textarea pre-filled

The last but not the least which was the result of the combination of personas and the end usability test is the collapsed button in the home page. This feature is very useful for a particular type of user highly engaged with the tool as a whole, and they are interested only in the very first areas and the very last, the 'validate' and 'run' part.

5 CONCLUSION

The case study focused on the need of updating the user interface of a tool used internally to a company, in order to be user-friendly and have higher acceptability from the end user points of view.

In order to reach the desired goals and solution, passing through the steps we have been through in the study, is important that the organization and the people at the top (managers in our case) are committed to usability, they are aware of the importance and the need of it. The main points that we can underlying which have been seen in our study and are also available in similar studies, and they help in proceeding with usability improvements and make the process going further are:

- Have enough resources available to get the project going and to an end. Especially, having professionals in the field, such as UI or UX, makes the problems very clear and the plan to solve it also become more reliable and also acceptable
- Having a log where the user is able to report the issues faced while using it. It is a starting point from where the plan can take place digging in from those already stated issues.
- Address, visualize and discuss the problems and make a detailed plan with time management in mind, which would take into account all incidents along the way.

The development process followed, is the one where users are a central part of it; indeed, interesting results were reached and, highly rated user acceptance. The knowledge of, how to conduct the process and, plan it earlier, is a way of not losing easily focus and, prepare in advance for a specific type of processes. Moreover, integrating the user-centered with the whole lifecycle software process is a way to speed up the acceptance of the results.

The satisfying result that we perceived in our study has been stated in previous researches as well. Indeed, there has been a questionnaire (regarding adopting the user-centered design process in team projects) in which the use of User-centered design approach has led to significant impact on product development, both regarding results and in term of cost efficiency especially when looking at the long run picture.

The results obtained were engaging for the end user and as a whole for the interaction with the tool. They increased the popularity among even the more skeptical ones. Indeed, the focus for further work will be on considering and, applying user-centered design process whenever any major refactoring or a new project, would be put in place, and it would surely help even for minimal changes. This case study is only the beginning of what the tool needs for further better results.

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