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Guidelines for personalizing the trial experience.

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Cover:

[an example from the first prototype created to test the guidelines subject of this thesis work]

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Abstract

As a user, evaluating the personal utility of a service can be an overwhelming experience. With compex services, such as analytics software, this evaluation is especially daunting and time consuming. The aim of this thesis is to explore how personalization can be applied to make it easier for users to evaluate cloud-based analytics services during a free trial period. The project was carried out in collaboration with an industrial partner that develops a cloud-based analytics service, and this service was used as an example. Based on literature studies, a set of design guidelines for the application of personalization during a free trial. To evaluate the validity of the design guidelines, a prototype was designed and tested with A/B testing, heuristic evaluation and interviews. The results of the project indicate that personalization can be a promising concept to explore further for helping users be able to evaluate software products more effectively.

Keywords: Interaction Design, Personalization, Cloud service, Service trial, User Experience, Guidelines.

Table of contents

1 Introduction

As a user, evaluating the personal utility of a service can be an overwhelming experience. Especially experience goods, such as software products, are problematic for customers to assess before purchase, since best way to do so is usually through first hand experience. For this reason free trial versions have become common practice in the industry, allowing interested users to try a product themselves, within certain limitations of time or functionality (Cheng et al., 2015; Zhu & Chang, 2014). But even with this option, reaching an adequately informed decision can be difficult. A service could be complex and complicated to learn. Or the most relevant feature to a certain user might be hidden deep inside a labyrinth of menu navigation. Often there is even a hurdle to commit to put in the effort to sign up for the trial to make this evaluation (Wang et al., 2013).

Because all users are different, one uniform trial experience may not be equally suited for every user to make a well grounded assessment of a product, particularly if it is an intricate one. If the experience could be tailored personally for users during these initial steps of the user journey, could it help users more efficiently and accurately form a decision on whether the service is worth paying for? This could be done by applying personalization, the process of adapting a system according to the user's needs, either automatically or by allowing manual customization.

Using information about users to provide a personalized experience is a growing trend that users demand and developers pursue. It is used in browsers to filter information and in video streaming services to recommend movies. It is used to target advertisements for users on the web. And in products like video games the option of choosing difficulty according to the player's skill level has been common practice for decades.

Being able to tailor a product for each individual user's needs this way is becoming more and more plausible. Collecting information on users to make an estimation on their needs is no longer a costly process and with the use of algorithms, systems can adapt automatically according to the identified needs (Chung et al., 2015), which means that the cost per use of personalization can be cheap.

In this thesis, the potential for applying personalization in the trial journey of a software service is explored. This encompasses the entire process of a user assessing a service, from hearing about it to becoming a paying customer. During this journey the user is forming decisions on whether to engage with the service and try it and whether to continue using it as a paying customer (Wang et al., 2012). How can this process be facilitated with personalization?

To explore the topic, a cloud based analytics service was used as an example. The work was carried out in collaboration with an industrial partner (referred to as "the Company"), who is the developer and provider of this service.

The hypothesis is that personalization could reduce the effort and time required for a user to assess the personal utility of a service during the trial journey of a cloud based analytics service, helping to form a well grounded decision on whether to continue using the service. How can personalization facilitate this process, helping the user assess the utility of the service more smoothly?

1.1 Research question

How can personalization be used in the user trial of a cloud-based analytics service, to facilitate the evaluation of the system for the user?

1.2 Goals

The goal of this project was to produce a set of design guidelines for how to apply personalization for the purpose of facilitating the evaluation of cloud analytics software during the trial journey. The design guidelines were based on literature studies, and the guidelines were evaluated by realizing a prototype design based on the guidelines, which was tested with users.

In short, the project resulted in three primary deliverables (in order of relevance): (1) a set of design guidelines for applying personalization during the trial journey, (2) a prototype of a design that was developed based on the design guidelines, and (3) concept maps that visualize and condense the findings from the literature studies about free trials and personalization.

The six design guidelines that were included in the result were the ones that could be deemed relevant after user testing of the prototype. The guidelines were written in the form of a short descriptive title, followed by a more exhaustive description for how and why to apply the guideline.

The prototype, which was developed by applying the design guidelines to the trial journey of the Company's service, was a short scenario with low interactivity where elements of personalization had been added to the service. The prototype covered a first-use scenario, where user would go through the experience of creating her first analysis.

The concept maps, which were visual representations of the findings from the literature on the two main topics, were an output from the literature studies. This deliverable was more of a biproduct from the project, but the maps were deemed a very useful way to communicate how the findings from the literature studies could be understood.

1.3 Delimitations

Due to to the limited amount of time available to carry out our research and in order to realize a tangible output of the research, some delimitation were placed on the project domain.

- The main target user for the project is just one of the Personas that are used by the Company to identify interactions with their product.
- Due to the complexity of the products of the Company, only the cloud service will be considered.
- During the ideation phase just few areas of the user journey at the time will be taken in consideration for personalization concepts and just the most relevant result will be used for the prototyping phase.

1.4 Ethical issues

Working in collaboration with a company goes along with the responsibility of handling possibly sensitive information about different stakeholders involved in the Company's activities, getting material and contacts for interviews directly from the Company as an example.

During the thesis process it is important to communicate transparently how the data collected from interviews and other methods is going to be used for the project purpose.

2 Background

2.1 The Company

The Company is a Silicon Valley-based provider of integration, analytics and events processing software. Their solutions are geared mainly towards companies. Their products are available both as on-premises and cloud-environment solutions.

2.1.1 The Company's analytics service

The Company's cloud based analytics service, which was used as an example to conduct the research of this thesis, is part of a suite of products for analyzing datasets in a visual manner.

The project made use of a lighter version of the software that can be run in a web browser, without the need for any installation. The cloud based software also comes as a downloadable client that offers richer functionality. Further, there are desktop and company tailored on premises solutions available.

2.2 Target user

For the target user group, a persona developed by the Company was chosen. This persona is called Asad, who is described as an accidental analyst. He uses analytics in his profession, but it's not a main part of his job description. He's the self taught analyst and there is no support in the matter to turn to in his company, meaning he has to rely on information on the Internet and other sources.

Fig. 1: Asad, the accidental analyst.

Asad is a very suitable persona to gear this project towards, seeing as the topic of free trials instinctively brings one's thoughts to beginners. Since he is not using a company wide

solution for analytics, it can be assumed that he himself is making the choice of product and evaluating whether an analytics service fits his needs or not.

2.3 Research Areas

2.3.1 Personalization

Personalization is the process of adapting a product specifically for each individual user. This could either be a manual option or an automatic process, where the product or service is tailored to the user based on the data collected about her. This is a practice that more and more companies are applying in their services in order to tailor the experience to their users needs. The purposes of using it, however, are widespread.

One common application is marketing, where one of the most famous examples is Amazon. Amazon collects data on the user's searches, what items she has viewed or wishlisted and, of course, her purchase history. All the above data is used to make recommendations to the user when browsing the Amazon website and even to generate personalized emails with recommendations. Their algorithm also keeps track of the seller's stock and according to the amount of customers interested in an item, can make suggestions to the seller on how much to add to the inventory (Techcrunch, 2013). The value of this personalization is partially designated to the user, that gets recommended items of interest, but mostly it generates value for the sellers to increase profit.

On the other end of the spectrum, personalization can be used to add value to a product, as features that users desire. Today, personalization features are used as main selling points in some cases. The music streaming company Spotify, for example, highlights how their service will help users discover new music on the first page of their website (Spotify, 2016).

2.3.2 Free trials

A free trial version of a software is a version that is limited either in time of functionality. Its purpose is to allow users to get first hand experience with the product before deciding to purchase it, without giving too much away for free.

As a marketing strategy, giving potential customers a taste of what a product is like is nothing new; car vendors have always offered test drives and it is common to run into salespersons in supermarkets handing out taste samples of food. Video games have long since used some similar marketing techniques, with stations in-store where customers can just pick up the controller and play a quick session.

Short experiences such as the above examples, however, are seldom enough for digital services. For other softwares, considerably more first hand experience is required for the customer to make a thorough evaluation of the product. And to try it in the right context, the customer might need to be able to use it on her own hardware. This is what free trial versions allow for.

Today, free trial versions in different forms are available for most digital services. Video games are marketed through downloadable demos, that contain only a short portion of the game. Netflix, Amazon Prime and countless other providers let users try their services for a limited time free of charge. Other services will add elements that are unwanted to the experience of the free trial, such as commercials in the free version of the music streaming service Spotify.

2.3.3 Cloud services

Cloud computing refers to the use of IT products where the computing, at least in part, is taking place elsewhere than the hardware being used to access the material. This allows for services being accessed from anywhere where internet connection is available. It allows users to access on-demand data, softwares and services without the need to downloading those on each device they would be accessed from. Cloud computing already has a wide array of applications of which some common examples are; email providers, social networks, collaborative documents platforms, file storage and streaming of video and music. Users are commonly identified by registration information, which they then use to access their account, and these services are usually either free or paid for via a subscription fee.

2.3.4 Analytics

Business Dictionary (2016) defines analytics is the field of data analysis. It can be described as the use of data analysis tools for exploring and investigating data in order to gain insight, discover trends and drive decision making. These analysis can be used to make predictions. The aim of using analytics is to gain knowledge that can be used to make business decisions, changes or improvements (Business Dictionary, 2016).

3 Theory

3.1 Personalization

Tailoring a product to a consumer's specific requirements, even before the time of technological products, was a luxury that only few could afford. A few decades ago, online and offline service providers started offering customizable platforms or services, where the user could manually tweak the look and functionality of a system according to her needs. Nowadays it's possible for systems to adapt automatically to users - an estimation of the user's preferences is created based on for example her navigational patterns and knowledge of similar users, in order to tailor the experience. Already personalization has a wide area of application, such as filtering information according to the interests of the user, facilitation of navigation in browsers and recommending products of interest (Gauch et al., 2007; Ying Ho, 2014).

3.1.1 Adaptive and adaptable systems

In personalization, there are three distinct approaches regarding how the system is adapted to the user's needs; adaptive, adaptable and mixed initiative systems.

An **adaptive approach** means the system can adapt automatically depending on information about the user. It commonly makes use of information about the user's usage of a product and manually provided information, in order to identify interests and goals to give a personalized experience (Brusilovsky, 2007).
Pros:
● Simple to use
Cons:
● Lack of control for the user
● Can be difficult to create coherent models

An **adaptable approach** means that the user has option to adapt the interface herself to suit her preferences.
Pros:
● Gives power to the user
Cons:
● Add complexity that requires learning from the user
● The user has to do extra work customizing the interface

A **mixed initiative approach** has been proposed, among others, by Park and Han (2012), showing how the system helps motivating the user to carry out adapting actions that he might not use otherwise.

In Fig. 2 comparison of the two systems is shown.

	Adaptive	Adaptable
Definition	dynamic adaptation by the system itself to current task and current user	user changes (with substantial system support) the functionality of the system
Knowledge	contained in the system; projected in different ways	knowledge is extended
Strengths	little (or no) effort by the user; no special knowledge of the user is required	user is in control; user knows her/his task best; system knowledge will fit better; success model exists
Weaknesses	user has difficulty developing a coherent model of the system; loss of control; few (if any) success models exist (except humans)	systems become incompatible; user must do substantial work; complexity is increased (user needs to learn the adaptation component)
Mechanisms Required	models of users, tasks, and dialogs; knowledge base of goals and plans; powerful matching capabilities; incremental update of models	layered architecture; domain models and domain-orientation; "back-talk" from the system; design rationale
Application Domains	active help systems, critiquing systems, differential descriptions, user interface customization, information retrieval	information retrieval, end-user modifiability, tailorability, filtering, design in use

Fig. 2 - a comparison between adaptive and adaptable systems (Fischer, 2001).

3.1.2 Personalization and contextualization

Personalization is one of the names that adaptive systems take. In the research carried out by Zimmerman et al. (2005), four dimension of adaptive systems are analyzed and used as a framework to relate personalization with contextualization: "Personalization allows users to obtain information that is adapted to their need, goals, knowledge, interest or other characteristic" based on user models that deliver the main parameter for selecting and adapting information presented to the individual user. On the other hand contextualization is based on: "components personalization, so that environmental states or the context of use can also be taken into account".

Contextualization is just one of the factors of a personalized or adaptive system, in our research (5.2.1) we identified and mapped the other influentials factors that determine what makes personalization being optimal from both a system and an user points of view.

3.1.3 User modelling

In the context of personalization, user models are defined as the models that systems create of users inside a computational environment. These are not to be confused with the mental

models that users have of the systems and tasks that are in the heads of users when interacting with others and artifacts (Carberry et al., 2013).
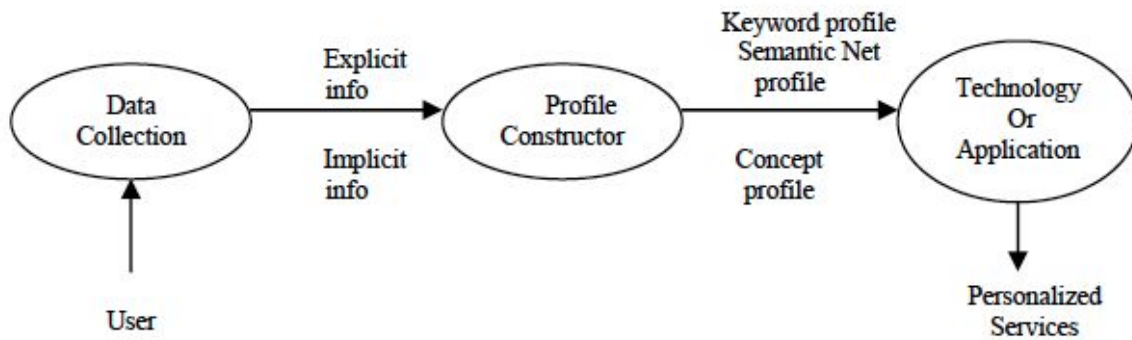
Fig. 3 - Overview of user profile based personalization

User modeling or user profiling consists usually of three phases as schematized in Fig. 3 (Carberry et al., 2013).
1. Information collection process is used to gather raw information about the user.
2. User profile construction is formed from the user data.
3. Technology or application exploits information in the user profile in order to provide personalized services.

 In the following chapters is defined what are the different types of user profile(3.1.3.1) generated from user modelling techniques and methods of data gathering (3.1.3.2).

3.1.3.1 User profile

Most personalization systems are based on some type of user profile, a data instance of a user model that is applied to adaptive interactive systems. User profiles may include demographic information, e.g., name, age, country, education level, etc, and may also represent the interests or preferences of either a group of users or a single person(Gauch et al.,2007).

The goal of user profiling is to collect information on the interest of the user and the length of time during which she has expressed such interest, this phase is important for the system so that it could improve the quality of the information accessed and foreseen user's intentions.

3.1.3.1.1 Static user profiles

Static user profiles are formed by gathering data that can't be changed over time, no automatic data collection and algorithms are used (Johnson et al., 2005).

3.1.3.1.2 Dynamic user profiles

Dynamic user profiles allow an up to date representation of users over time, the interaction with the system are noticed, they influence user models and can identify short-term and long-term interests. Short-term profiles represent the user's current interests whereas long-term profiles indicate interests that are not subject to frequent changes over time.

A visualization of the two different type of profiles is shown in Fig. 4.

Fig. 4 - SaD (Static and Dynamic) User Model (Hothi & Hall, 1998)

3.1.3.2 Data gathering

In order to construct an individual user's profile, information may be collected explicitly, through direct user intervention, or implicitly, through agents that monitor user activity (Gauch et al., 2007).

3.1.3.2.1 Explicit data gathering

Explicit data gathering means that the user herself enters information to be used by the system, such as interests and other personal information, before the personalization can take place (Bozdag, 2013).
Cons:
- burden of the user
- user might develop privacy concerns
- static information , the user might not update changes

3.1.3.2.2 Implicit data gathering

The system determines what the user is interested in through the use of: clickthroughs, browsing history, previous queries, time spend for session , IP etc. (Bozdag, 2013)
Pros:
- no user intervention
- automatically updated

Cons:
- implicit feedback might capture just positive feedback (a click is intended like interest, not as a possible mistake of the user)

3.1.4 Ethical discussion on personalization

3.1.4.1 Privacy

Benevolence refers to a customer's belief in the firm's intentions and motives to place customer interest ahead of company interest (Shen & Ball, 2009).

Shen & Ball (2009) raise some interesting points in analyzing three different styles of technology mediated personalization in service relationships. They question if the use of personalization always impacts a service positively. According to their studies, for example, the " intrapersonal adaptive behaviour" could on one side increase user's benevolence towards the service. But at the same time "for customers with high sensitivity towards privacy, personalized interaction might be interpreted as imposition".

The "*privacy halo*" is what happens when an initial personalized interaction is seen as a privacy invasion and leads any further personalized interaction to decrease perceived benevolence *(*Shen & Ball, 2009).

Privacy concerns seem to be the main obstacle in getting personalization working just right, if on one side collecting data explicitly allows the user to control what are the information she gives away to the system, she also becomes more aware of the personal data the system uses for the tailoring of her needs (Bozdag, 2013). However as Li & Unger (2012) discuss in their paper, customers do want personalized services and they come to a compromise with it, if one of the following case is to happen:
- The customer can make a privacy calculus, weighing the benefits of giving up the information against the costs. Is the perceived value of the personalization high enough?
- The customer might be offered financial incentive to give up their information
- The customer might be largely unaware of the privacy implications (for example facebook apps that gain access to your full profile)

3.1.4.2 The filter bubble

The "filter bubble" is a term coined by the Internet Activist Eli Pariser (Pariser, 2012) that refers to the intellectual isolation that can occur when websites make use of algorithms to selectively assume the information a user would want to see, and then give information to the user according to this assumption (Technopedia, 2013). As a result of this algorithms the "filter bubble" reduces the exposure of users to diverse content and viewpoints than their own and tends to reduces user creativity, learning and connection.

A study run by a research group from the University of Minnesota (Nguyen et al, 2014) try to find out if recommender systems actually expose users to a narrower content over time. To answer their research question they introduced a new set of methods, one of which is used to study the effect that recommender systems have on users. Those methods can be useful to evaluate the result of the guidelines and concept generated for the Company's service.

3.1.4.3. Transparent data gathering

Facebook released in February 2016 a new feature called "reactions" (Facebook, 2016), which could be seen as an example of implicit data gathering. In fact when the user express her "reaction", Facebook collects how that user is feeling towards certain content and uses that information as extra data to provide to marketing companies (Business Insider, 2016; CNN, 2016). This type of data collection is not obvious to the user, she sees just the benefits for her and not how the data she gives away is used.

3.2 Trial services

In a world where customers are increasingly more "try and buy" oriented, rather than "buy and try", offering free trial versions of products is a common measure for software providers of reducing customer uncertainty. Users want to try for themselves to be able to more accurately assess the potential usefulness of a product (Wang et al., 2013) and for technology based products where production costs are negligible offering free trial versions is a powerful and suitable tool for marketing (Zhu & Chang, 2014).

Zimmerman & Nerdinger (2012) argue that in addition to the negligible costs of distributing trial versions online, the fact that the copy downloaded is immaterial and has no value makes it possible to use the free trial more realistically than when, for example, test driving a car. The user is not borrowing the product, but she has her own copy with no constraints on how it is used.

In the following sections, the user's process of approaching and evaluating a software through free trial version offerings is described. Also, some important industry considerations are covered, regarding the effects of offering a free trial versions of products.

3.2.1 A journey from expectations to adoption

The trial journey is a process of assessing a service that starts upon first hearing about the product. Already at this point, expectations are being formed and these preconceptions will be highly important in forming the overall experience (Wang et al., 2013).

There are two stages of decision during the trial journey: firstly the decision to engage with the service for free to gain experience and secondly the decision on whether to pay for continuing to use the full service after having tried it (Wang et al., 2013). Both these decisions are heavily influenced by several factors; *perceived usefulness, perceived ease of use*, *social influence* and *perceived risk* (Wang et al., 2013; Zhu & Chang, 2014). Wang et al. (2013) suggests that for the user's intention to engage with the trial, these assumptions are based mainly on second hand information - things that the user has read or heard about the product. They found that these beliefs are then evaluated and modified based on first hand experience using the free trial version of the product, to form a decision on whether to purchase.

3.2.2 Trial strategies

Cheng et al. (2015) describes three distinct general approaches to free trial versions of software, all restricting the use of the software compared to the complete versions; the *limited version-*, *time-locked version-* and *hybrid version free trial*. In the -80s and -90s, demos of software with limited functionality was common practice. This is referred to as a limited version free trial. More common today is the time-locked free trial, where the user is offered to try the product with full functionality for a limited time. Hybrid version free trials combine these two approaches, offering full functionality for a limited time after which the user can continue using the product with certain functions locked off.

3.2.2 Onboarding

Samuel Hulick, defines onboarding as a process that increases the likelihood that a product is adopted successfully from new users (Hulick, 2011). A more precise view sees onboarding as: the process of helping new users into becoming loyal long-term customers during the first 90 days (Frisk, 2014). Being 90 days considered the average time cycle that takes new users into either leaving forever a subscription service or staying.

3.2.3 Positive network effects and cannibalization

Apart from a more inviting approach to customers, free trial versions can be effective in creating positive network effects for a product. A positive network effect, according to Cheng & Tang (2010), is the positive effects from having more consumers becoming users of a product. They explain how the number of users of a product is an important factors when consumers are considering whether or not to engage with a product, since an higher number of users means an higher compatibility with more users. For example a larger user base share troubleshooting experiences and get access to more relevant technical support and updates. A way to increase the user install base can be achieved by offering a free trial of the software.

Although positive network effects help make free trials a very effective marketing tool, there are risks involved when offering users free versions of a product. A situation can arise where the trial offer is good enough, so that users can continue using it without feeling inclined pay to upgrade for the full version. This is called *cannibalization* and refers to when the free trial version is eating up demand for the full version of a product (Cheng et al., 2015).

According to Cheng et al. (2015), the risk of cannibalization is greater for limited version trials, since they can be used indefinitely. This also holds true for hybrid version trials, since they incorporate elements of the limited version approach. If the functionality of such an offering is good enough, it can fulfill many users requirements without them needing to upgrade.

3.3 Cloud computing

The market is shifting increasingly from products to services (Stahel, 2000), which are experience goods suitable to market through trial offerings. Another social and technological revolution had been happening with the spreading application of cloud computing systems and Software as a Service (SaaS) has become a more strategic way to serve a product (Oracle, 2013).

The American National Institute of Standard and Technologies (NIST) has defined Cloud computing as "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction".
According to the type of resources offered, cloud services take different names.

3.3.1 Saas

A cloud software, a Saas, is defined as a software accessed by the user "on-demand", based on a cloud platform supplied by the service provider (CompuBase, 2015).

3.3.2 Paas

PaaS is for Platform as a Service, is what makes the creation of SaaS possible by providing tools available for efficient coding, deploying and maintaining of web applications (Cloud Space, 2013).

3.3.3 Iaas

Infrastructure as a Service is virtualized computing resources (hardware, software, servers etc..)needed to power other services like Paas and Saas(Tech Target. 2015.).
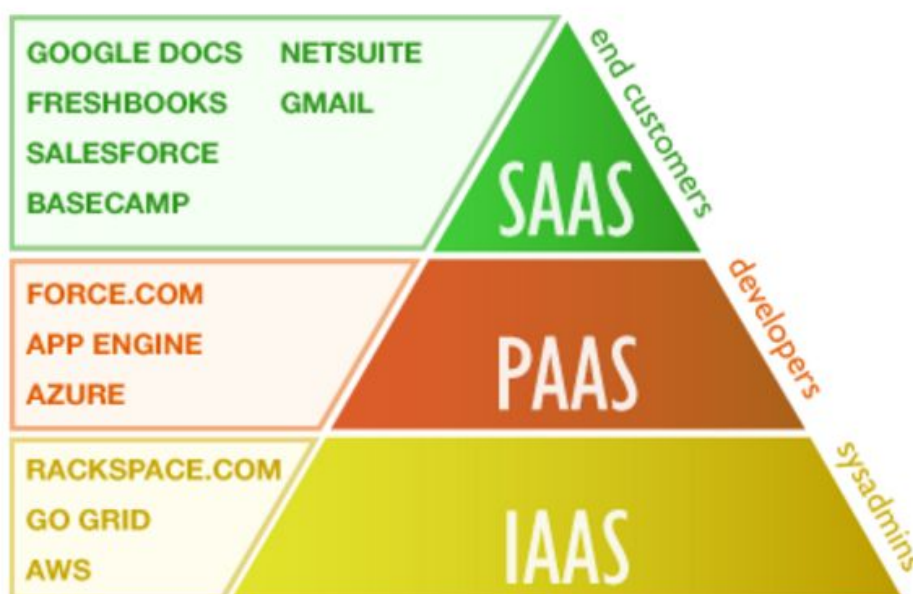
Fig.5 - Cloud Services Types and Examples (Global Dots, 2013)

4 Methodology & Methods

4.1 Methodology

Methodology is how the research is done, which principles guide it and why methods and tools are used in carrying it out (McGregor 2010). This project is situated primarily within interaction design and user-centered design, which will be guiding the process and choice of methods.

4.1.1 Human Computer Interaction

Human Computer Interaction researches the way humans interact with computers and technologies, it's a discipline that blends different research areas such as behavioural sciences, computer sciences, design and medias with a practical approach to it (Interaction Design, 2011).

4.1.2 Interaction design

Interaction design is a term that was used for the first time by Bill Moggridge (2007) in the middle 80s, it's a design field focused on designing for digital products, environment, services and systems (Cooper, 2007). Interaction design takes particularly in consideration what are the user's needs, desires and behaviours during the different phases of the design process.

4.1.3 User-centered design

Usability First (2016) defines user-centered design as the process of "tool, such as a website's or application's user interface, from the perspective of how it will be understood and used by a human user". They argue that, from this perspective, the system should be adapted to fit the user, rather than the other way around - a statement which, as a matter of fact, sounds very much in line with the purpose of personalization.

4.1.4 Design Thinking

Tim Brown (Brown and Katz, 2009) defines Design thinking as "the discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity."

Through the application of different design methods in different process phases, designers solve complex problems to benefit the user. Similar approaches are defined design thinking such the IDEO framework (Brown and Katz, 2009) , the UK design council (Naiman, 2016) , and the Stanford d.school (How does the d.school's framework for design thinking map onto IDEO's?, 2015) framework that is further explained in the following chapter.

4.1.4.1 Stanford D.School framework for Design Thinking

The D.School framework from Stanford (How does the d.school's framework for design thinking map onto IDEO's?, 2015) defines the design thinking process phases into five iterative steps (Fig. 6)
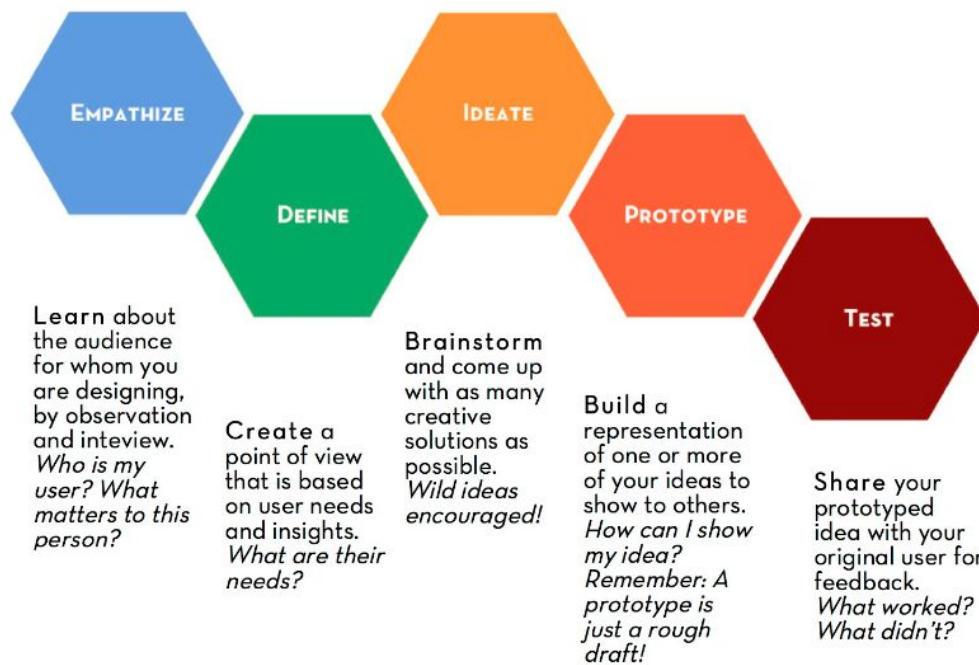
Fig. 6 - The five phases of the Stanford d.School framework design thinking process.

4.2 Methods

A large number of design and research methods were applied during the course of the project. In this section, the methods used are introduced and explained from a theoretical perspective.

4.2.1 Secondary research

Secondary research is conducted with the aim of understanding the broader context of a design challenge. This information can be gathered from different sources, through reading literature or researching online, but one common denominator is that Secondary research captures the kind of data that is found in existing sources, rather than generated from user studies (IDEO, 2015; Martin & Hannington, 2012).

4.2.1.1 Literature studies

Looking to existing literature in relevant fields and subjects is not only an integral component to conducting research - it is also useful in a design project to lay a foundation and put the design challenge in context. In design, it is a method for distilling information and extracting the essence of published sources that describe, for example, similar projects (Martin & Hannington, 2012).

4.2.1.2 Benchmarking

Exploring and investigating precedent products within the subject is a mean of secondary research for design (Martin & Hannington, 2012). This is a valuable source of inspiration and understanding of the state of the art and latest development of a specific sector. Looking to the business best practices is often referred to as benchmarking, which infers a comparative analysis of one's own product to its competitors on the basis of certain metrics (Wikipedia - Benchmarking, 2016).

4.2.2 Cognitive Walkthrough

A cognitive walkthrough is a method used to evaluate the first experience of users with no previous experience, it allows to observe the learnability of software interfaces during early design phases from a new user perspective (Spencer, 2000).

4.2.3 Observations

Observation are a good way to collect requirements in the early phases of a project through a direct involvement of the user. The researcher observes users in the context of use and capture their behaviour when engaging in a planned activity. During the observation is important to give a good amount of instruction for the user to be independent during the observation phase, the researcher should have minimum to no interaction with the user, to guarantee a genuine result (Laurel, 1990)(Gomoll, 1992)(UsabilityNet, 2006).

4.2.3.1 Controlled and naturalistic observations

Controlled observations are usually supervised and carried out by researcher in an impersonal environment. A standard procedure is applied with all participants, this guarantees a reliability and reproducibility of the observations with other users and allows to analyze in a more effective way the quantitative data produced. In certain cases a two-way mirror is used to observe participants behaviour, with or without mirror, the subjects awareness of a researcher presence might render the participants to act differently from usual and effect the observation results (McLeod, 2015).

Naturalistic observations involves researchers observing spontaneous behaviour of participants in their natural environment. Having observation subjects being in their natural surroundings makes possible to discover behaviour patterns that wouldn't be possible to observe in a laboratory, on the other hand those type of observation are more difficult to control and it's harder to collect a representative sample (McLeod, 2015).

4.2.3.2 Semistructured observations

When doing observations, researchers may have decided beforehand exactly what to observe (e.g. how many times does a class of students sneeze during an hour?) or they may go into it with open minds with the purpose to simply observe a situation. This is called structured and unstructured observations (Martin & Hannington, 2012).

In between the two, there is the semistructured approach. These observations are guided by a set of questions, but more room for divergence is allowed (Martin & Hannington, 2012).

4.2.4 Interviews

Talking, asking questions and listening to people - be it users, experts in a field or just people in general - is a fundamental research method for collecting personal views and experiences to base design work in (Martin & Hannington, 2012). The approaches and techniques for interviewing are numerous and interviews can adopt many different shapes.

4.2.4.1 Semi structured interviews

An interviewer and a respondent engage in a formal interview, where there is not strict guide to follow from the interviewer. The interviewer know the goal and focus of the interview and tries to have an open-ended discussion with the respondent allowing her to express herself in a free way.

A semi structured interview is optimal when the researcher has already gathered some knowledge in the field, it's a good way to test preliminary understandings and to further develop more structured interviews guides and surveys (Robert Wood Johnson Foundation, 2008).

4.2.4.2 Expert interviews

Interviews with experts, for example people developing a product, can act as a valuable complement to user studies. Talking to experts can provide a quick way to gather an understanding of a subject, as well as acquiring a different perspective than that of the user (IDEO, 2015).

4.2.4.3 Focus groups

When involving a number of participants in an interview situation, interesting conversations can occur that would not in a one-on-one interview. This method is called a focus group and is designed to syphon the dynamics of bringing carefully selected people together to discuss for example their reactions to a design. The discussion is moderated but a good moderator should try to nurture the natural dynamics to uncover valuable insights (Martin & Hannington, 2012).

4.2.4.4 Questionnaires

Questionnaires are questions that are posed and answered in writing, filled in by participants without interacting with the researcher. As proposed by van Velsen et al. (2011), questionnaires, work well in combination with interviews for evaluation of personalization. They found that questionnaires, while they generally only capture one comment per question from every participants, do get more honest answers (not as disproportionately positive).

4.2.5 Transcribing

Transcribing is a method to elaborate data collected through recordings of interviews and other research material. Transcripts can be used for coding recurrent themes and patterns to be further analyzed, in order to do so, rules regarding formatting styles of the transcript are recommended (Humble, 2012)(Research observatory @ UWE, 2007).

4.2.6 Synthesis

Large amounts of data and impressions are collected at various phases of the design process. In order to sort, share and make sense of overwhelming information, there are methods that supply a structured approach to the task.

4.2.6.1 Download your learnings

After conducting any kind of research, all team members generally have slightly different impressions and observations. The purpose of this method is to reach a common understanding within the team. It is done by having a session, for example after a study visit, where team members sharing their impressions and perspectives (IDEO, 2015).

4.2.6.2 Affinity clustering

To make sense of and order large amounts of information, mapping it out with the Affinity clustering (also called KJ) can be helpful. It constitutes collaborating on sorting and grouping

items that are perceived as connected. The clusters that emerged are then named, creating a map of the data (Luma, 2011).

4.2.6.3 Concept mapping

In order to reach a common understanding and clearly illustrate an overview of a topic, a concept map is a suitable format. It is a way of documenting one's current understanding and knowledge in a visual way, including the relations between different concept within the topic. This is a way of presenting a comprehensive view of a topic, making a large amount of information easier to communicate (Luma, 2011).

4.2.7 Personas

Personas are short descriptions of fictional persons that represent user behaviour patterns, goals, attitudes and skills in different profiles (Martin & Hannington, 2012). To create personas, real data is collected through user research and synthesized into different archetypes to work with within the project.

In a project personas can be used as a decision making tool, to focus on users and their needs, as a communication tool and to evaluate a product from different user's points of view (Soegaard and Dam, 2002).

4.2.8 Design principles

Design principles are used to create short, positive statements that will guide further ideation and iterations upon a design. They are extracted from previous solutions ideated and aim to collect the most important common themes in an easy to remember and understand format (IDEO, 2015).

4.2.9 Brainstorming

Brainstorming is an umbrella term for many methods aimed at generating a large number of ideas. Brainstorming methods can be applied either within the team or in other situations with other participants, such as workshops.

4.2.9.1 101 Ideas

In the "101 Ideas" a list of ideas, related to the design problem identified, is written.
The list has the scope to write down all ideas and thought without restrictions until reaching at least 101 ideas, not just in text form but also through sketches if a more visual result is needed. Those ideas are a starting point to work on the more valuable ones (Ideas for Ideas).

4.2.9.2 Design charette

This is an ideation method designed to be used in a team, especially well suited for a workshop environment. Participants come up with ideas that will then evolve during the activity, by collaboration in small groups that rotate at short intervals. The purpose is for

cross breeding and natural selection of ideas to occur, when participants bring the strongest ideas from their previous group discussion to the next group (Martin & Hannington, 2012).

4.2.10 Sketching

Sketching is a technique used by designer in many fields to generate, develop, discuss, choosing and iterate ideas in a quick manner (Greenberg et al., 2011).

4.2.11 Prototyping

Prototyping is the process of transforming an idea into a tangible artifact, for the purpose of communicating and testing. It is a wide term and a prototype can take many forms from simple paper sketches to working computer programs (Martin & Hannington, 2012).

4.2.11.1 Fidelity in prototyping

When speaking of prototypes, the term fidelity is central. It is common to speak about "low" and "high" fidelity prototypes. This refers to their level of refinement and interactivity. Prototypes generally have a lower fidelity at early stages of the design process, being built quickly and from simple materials. Higher fidelity prototypes are more like the final product (Martin & Hannington, 2012).

4.2.11.2 Parallel prototyping

By getting to work on rapid, low fidelity prototyping done independently by designers on a team, many different designs can be explored simultaneously. Prototyping in parallel serves the purpose of avoiding to focus in on one solution too early and to be able to test multiple prototypes with users (Martin & Hannington, 2012).

Working simultaneously and independently with design can also be done in earlier phases. For example, during ideation, sketching out different solutions can serve a similar explorative purpose but without the goal of testable results (Usability.gov, 2014).

4.2.11.3 Paper prototyping

Snyder et al (2003) defines paper prototyping as "a variation of usability testing where representative users perform realistic tasks by interacting with a paper version of the interface that is manipulated by a person "playing computer," who doesn't explain how the interface is intended to work".

A paper prototype is not just used for usability testing, but it's a method used also for brainstorming, designing, creating, testing and communicating user interfaces ideas within a design team (Snyder, 2003).

4.2.12 User testing

4.2.12.1 Think-aloud evaluation

Think-aloud testing is a method for identifying specific points of success and failure in a product, by having participants speak out their thought process while going through a test case. In contrast to other evaluation methods, e.g. interviews, the thoughts and reactions of the participants while using the system can be collected. In an effective session, the moderators can even pick up on the mindsets and intentions of the users (Luma, 2011).

Van Velsen et al. (2011), in a comparison of methods for evaluating personalization, found that thinking-aloud testing would generate a high amount of comments on usability issues in the intended context and that it would identify the most critical problems.

4.2.12.2 A/B testing

A/B testing, also called split testing, is a method used to compare two version of the same product. It's used to gather insights on the data collected in a comparative manner, based on an hypothesis (Visual Website Optimizer, 2016).

4.2.13 Expert evaluations

Expert evaluators, for example UX-designers, can help detect usability issues in a product. They are not a substitute, but rather a complement, to user testing and are often done before bringing in users.

4.2.13.1 Heuristic evaluation

Heuristic evaluations pose expert evaluators with the task of assessing a design according to a set of heuristics. There are many different heuristics and they are recommendations or "rules of thumb" for usability. This provides a structure for inspecting an interface and identifying usability issues for the different heuristics (Martin & Hannington, 2012).

4.2.14 Pitch presentation

Communicating a design and its benefits to stakeholders requires careful consideration of how the design is best presented. This communication commonly happens through a pitch presentation describing the project and its result. The process of creating the pitch is one of identifying how people outside the design team can best understand the design (IDEO, 2015).

4.2.15 Planning report

The Planning report is an early step of the research process applied in this project. It includes a syntheses of the theoretical background for the project and provides an extensive rationale for why and how it will be carried out. It also contains a plan of the process.

From a design perspective, one could look upon the planning report almost as a collection of methods. For one, since it includes a plan of the process, it is much like the method of Create a project plan (IDEO, 2015). This activity also carries a strong resemblance to the method Frame your design challenge (IDEO, 2015), which provides a way of reaching a concise statement of what the purpose and goal of a design project is. Just like the research question in the planning report, IDEO recommends that the design challenge is stated as a question. However, where the Frame your design challenge-method's focus lies on brevity, the Planning report includes a richer elaboration on the design challenge and purpose.

4.3 Tools

In this project, different softwares and tools were used. Certain tools that were central to the process will be introduced in this section.

4.3.1 Balsamiq Mockups

Balsamiq Mockups is a software for creating wireframes of graphical user interfaces. It allows for rapid sketching by giving users access a library of low fidelity UI elements that can be dragged and dropped. In the cloud based version of the service, myBalsamiq, it is possible for multiple users to collaborate simultaneously on project (Balsamiq Studios, 2016).

4.3.2 InVision

InVision is a prototyping tool for adding interactivity to visual sketches or prototypes of interfaces, for example a file created in Adobe Photoshop or SketchApp. It allows for quickly adding a higher fidelity to a prototype, through simple interactions, and then testing it directly in an Internet browser (InVision, 2016).

4.3.3 UserTesting

The website UserTesting.com is a service where customers can test their products with users, remotely and quickly. Customers create think aloud test scenarios and UserTesting automates the process of finding the right participants, through screening questions, and carrying out the tests. Participants go through the scenario, speaking out their thoughts and motivations for actions. During the process, they have their screens and voices recorded. Afterwards a few questions are also answered in writing. The test materials, recordings and answer sheets, are supplied to the customer as soon as a test is completed (UserTesting Inc, 2016).

5 Process

In this chapter, the execution of the project is covered. In chronological order, it describes in detail what was done to achieve the result of the project.

5.1 Initiation

Before starting the actual project, some preparation was done in narrowing down the scope of the work. A general subject matter, being personalization of the trial journey, had been selected by the Company, and some initial research was required in order to understand and specify why and how this should be explored.

Roughly one week in total was spent scouting the field, getting familiar with some general research and articles on the web. This would build an initial grasp of personalization; what it is, how it is currently used and what benefits it can bring. The findings were summarized in a report, known as a "project proposal". This included a reasoning for the project with a first draft of the research question.

The rationale provided in the proposal maintained a broader view on the problem. An "enhanced user experience" and "shortened time-to-value" was envisioned as the possible gains of applying personalization to the trial of a cloud based analytics service.

5.2 Domain research

Initiating the project, the first four weeks were dedicated to gaining a deepened understanding of relevant topics. In particular, the subjects of personalization and free software trials were explored. Other topics that were touched upon to varying degrees were; cloud based services, SAAS, analytics, software evaluation and UX.

5.2.1 Literature studies

The first couple of weeks of the project were spent finding and reading relevant research material on the subjects of: personalization, trials and cloud based services. Articles were sourced through the university library access to research material and digging further into the references of relevant papers on the three subjects mentioned above.

In order to process and synthesize the large amount of information that was worked through, each source regarded as relevant was systematically re-read and summarized in a separate document. This would allow for sharing informations within the team and for later reference. At this stage, a total of 28 articles were included in this background research and they were divided in papers on personalization, software trials and cloud services.

28 summary sheets is still an overwhelming amount of data and further synthesis was required to acquire an overview of the knowledge that had been gathered. The two main categories of papers - personalization and software trials - were boiled down by sorting in

separate affinity diagrams. The summaries were re-read and their main points and interesting details were jotted down on post-it notes. These were then put up and sorted in groups depending on similarity.

The affinity diagrams, as well as the process of creating them, were facilitators of discussion about the research that had been gathered over the weeks. The diagrams were visual maps of a large amount of information and in them certain themes could be discerned.

After analysis and discussion about the themes emerged from the maps, the common understanding extracted about the two subjects of personalization and software trials was visualized in concept maps. These were tools for effectively communicating the primary research base of the project both within and outside the team.

The concept map of the free trial findings (Appendix 1) adopted the shape of a chronological journey of evaluating a software, from the user's perspective. It contained distinct phases that the user goes through, what happens during them and what are important factors for each.

The concept map visualizing the findings about personalization (Appendix 2) depicted the relationship between a user and a personalized system. It showed the different parameters (such as whether the system is adaptive or adaptable) of the system, that will give rise to different usability qualities perceived by the user, as well as the different sorts of information and concerns of the user.

The primary results of the literature studies were a deep theoretical basis for the project, the visualization of the theory in concept maps and a planning report. The planning report contained a presentation of the theory background, a time plan and a new rationale based more rigidly in research. At this point, the focus on how personalization can facilitate the evaluation of a complex software was crystallized from the previous scope of improving the user experience in general.

5.2.2 Benchmarking

As a complement to the study of literature, an exploration of how personalization and software trials are applied in real products was conducted. Benchmarking was done with a wide range of products and services that were recognized as displaying good practices and/or innovations within either topic.

Benchmarking generally entails an element of comparison, often by posing a product against its competitors and making an evaluation based on certain metrics. In this project, the method referred to as benchmarking was more explorative, since the project aimed to add elements of personalization, something which was not present either in the Company's product itself or its competitors. A broader perspective was adopted, analysing and seeking inspiration from good examples found in other softwares and services.

Relevant prospects were identified from browsing the web, examples mentioned in literature, the team members own experiences and discussion with UX-designers at the Company. Famous examples of recommender systems, such as Netflix and Amazon, were investigated. The different ways that free trials are offered by services such as Spotify and World of Warcraft were also covered.

The study of the products was done against the background of the understanding and concept maps from the literature studies. This provided a tool for analysing aspects of the personalization and trial offerings that were found. It allowed for describing and understanding benefits and drawbacks of different solutions as well as how they fit into the bigger picture.

The benchmarking was done by highlighting certain features of the products that could be identified as either positive, negative or simply interesting in relation to the concept maps. For documenting this, screenshots and note taking was done and the material was compiled in a joint document. Finally, the results were overimposed on the concept maps, in an attempt to make the benchmarking easier to communicate and overview.

In addition to the new concept maps, the benchmarking resulted in a valuable vault of inspiration; a solid understanding of what personalization and software trials actually mean when applied in real life. It provided some strong indications on "do's and don'ts". Also, it presented an opportunity to put the theory into practice as a tool for analysis of real products.

5.3 Service study

Working with the Company and using their analytics service as the design canvas for the project meant that a solid understanding of the service itself would be essential. The resulting design would have to fit in with the current product and match the requirements of its users, in order for it to be an effective way of investigating the research topic. Another important aspect was to understand the Company's service against the background of the domain research.

Thus, studies were carried out to build up a broad view on the Company's service. Multiple perspectives were considered, including new users, long term users and developers of the Company's service. These views were gathered either from first- or second hand sources. The following section describes how this work was approached.

5.3.1 Autoethnography

In parallel with the literature studies, the first weeks were used to get familiar with the Company's service, from the perspective of a new user. Being unfamiliar with the service ourselves, this was an opportunity to document our own experiences of starting to use the service. Going through the process of finding out about, signing up for and starting to use the Company's service, our impressions were collected through an auto-ethnography diary,

under the form of: notes, documentation and screenshots taken during the process. The documentation was more throughout in those areas where particular issues were identified.

5.3.2 Think aloud and semi structured interviews

In addition to the introspective approach of the autoethnography, participants from outside the project team were brought in to test the starting out experience with the trial of the Company's service. The people were chosen on the basis on them representing the persona Asad; not being analysts but working with tasks that sometimes require analytics.

Five participants were engaged for testing and their first impressions and reactions were collected through think aloud testing (4.2.12.1) accompanied with semi structured interviews (4.2.4.1) to get more insights on relevant users' perception of the very early experiences of using the product (roughly 20 minutes).

The test structure was based heavily on think aloud tests that the Company had carried out with new users previously, investigating similar aspects of the service. This ensured that the tasks in the test were suitable to beginners. The test took participants through a scenario that started at the website of the Company's service, browsing and signing up for a free trial month, to creating a first analysis. For the test, a sample data set about olympic medals over the past few olympic games was used.

Against the background of the domain research, focus was directed towards how new users were able to evaluate the Company's service, especially its usefulness and ease of use. Along with the tasks were questions at different points of the scenario, inquiring about the participants' perception of the service. The purpose of these questions was to capture whether/how the perception would change during the course of the test. After finishing the tasks, the participants were interviewed about their experience and how they thought they could apply the Company's service themselves.

During the tests, two researchers were observing and conducting the post-test semi structured interviews. All tests were recorded in audio (the participants voice) and video (a recording of the computer screen). The recordings were watched afterwards and synthesized into documents recapping the main findings from each test, based on comments, answers and observed behaviors.

5.3.3 Expert interviews

A rich opportunity for acquiring a wider perspective on the Company's service was granted through the access to employees working with it on a daily basis. The people working with development, support and sales of the service could give insights from many different viewpoints. They could share their experiences of, among many other things, how new customers approach the product, what long time users use the service for, what the latest pursuits and trials of the Company are.

Eight interviews were conducted with employees at the Company. Participants were chosen in counsel with the project supervisor at the Company, with the goal of getting a wide and

relevant representation from different fields and roles. Four product managers were interviewed, on basis of their rich overview of the products from different aspects, contact with existing customers and involvement in staking out the future direction of the product. Two interviewees were salesmen, with plentiful knowledge of the perspective of new users. One person working in support was involved because of his day to day contact with existing customers. And lastly, one UX designer was interviewed to get the user experience perspective.

The style of the interviews was semi structured. A general interview guide (Appendix 3) was put together, that included questions about the Company's product in general, the experience of new users and many other questions. The guide was modified with specific topics ahead of each individual interview.

Although the main purpose of the interviews was to build up a richer understanding of the Company and its service, a certain element of ideation was also included. Participants were posed with some more hypothetical questions about how they envisioned a better first impression for new users and what role they thought personalization could play in the Company's service.

Five of the expert interviews took place at the Company's office. The remaining three were conducted remotely. The conversations were recorded in audio, in order to be transcribed and summarized for further analysis.

5.3.4 Service study results

All the data collected during the study of the Company's service served to paint a clearer picture, particularly of the current state of the experience of starting a trial of the service. This emerged after compiling and sorting the findings from the autoethnography, expert interviews and think aloud tests in an affinity diagram. This analysis was done in the light of the domain research, which meant focus was directed towards issues that would impair the evaluation of the software. The findings were then assembled in a concept map (Appendix 4) describing the problems identified in the first impression experience.

Current free trial experience

It could be determined that the Company's service had some problems for allowing the user to make an effective evaluation of the product. The entire journey from browsing the product webpage to actually using it was considered. The analysis was divided up in three phases, mirroring the phases identified in the research on trials. This can be seen in the concept map (Appendix 4) and the phases are; (1) before making a decision to engage with the service, (2) at the beginning of using the service and finally (3) the impressions after having used it, that forms the decision of whether to adopt the product.

On the website of the Company's service, which is the main communication channel towards potential users, issues concerning what users actually would perceive about the service could be identified. The first was the language, that could be off putting to some less experienced prospect users because of the heavy use of a technical jargon. The other issue

was that the message communicated was confusing, with information scattered in an illogical manner, and either being very detail oriented or simply shallow oneliners. It gave an impression of the Company's service at the same time as too advanced and too simple.

After signing up and starting to use the service, there were continued issues of communication, making it difficult for the user to understand what it does and how it can fit in her work flow. Especially at the start page, there was a clear lack of directions and/or material to help users understand how to get started.

Also, it stemmed from the fact that teaching resources were scattered and not easily findable from within the service itself and that some of them would not suffice enough guidance for the user to feel comfortable and independent within the service possibilities.

From getting to know about the service from the marketing page til starting using it, a gap of expectation appears, mostly due to the confusing communication in the first stages and examples data too far from each individual's expertise during the exploration of the service.

5.4 Ideation

5.4.1 Design goals

A first draft of what would later evolve into design guidelines was created at the start of the more ideation-heavy phase of the project. At this point, the purpose of this activity was to bring some focus to the ideation and the guidelines were created for use in an ideation workshop. The goals or design principles, as they were then referred to, were written short and easily graspable summaries of the findings from the background research. They took into consideration the issues that had been identified in the current trial of the Company's service, what is important for evaluation of software during a trial and what strengths of personalization would be applicable.

This draft consisted of six guidelines (Fig. 7)

Use and personal utility	Facilitate learning
During a trial of a product, the user needs to understand the general use of a product and specifically how it can serve that person's individual needs. How can personalization be applied in the Company's service to help make the user reach this understanding?	The time that it takes the user to be able to produce some valuable results is an important factor when starting to use a product. How can this process be shortened in the Company's service, with the use of personalization?
General usability	The "WOW!" Experience
General usability is, of course, a factor that the user evaluates during the trial. Is the product easy to use? Is it intuitive, logical, fast… and so on, and so on. How can personalization help improve the general usability of the Company's service?	Emotion is important for peaking interest in a product. An experience that rattles the user and makes her feel something will make her more likely to want to use it. How can personalization in the Company's service create these experiences?
The ease of use/power paradox	Time investment
The Company's service is at the same time an easy to use product and a very powerful one with which you can carry out very advanced tasks. Getting both these qualities across to the user is a challenge - how can personalization help the user reach this understanding?	Investing time in something makes us more likely to invest more time in it. How can personalization make users invest more time in the service in order to reach this effect?

Fig. 7. - A first draft of guidelines/design goals

Notes, concept maps and findings collected from the domain research and service study were used in order to define these six first guidelines. Upon conception, they were mainly purposed to be used as design inspiration during an ideation workshop with UX designers from the Company. Thus, the design goals were more specifically geared towards the Company's service (which is also evident from how they were phrased as "design goals" at this point). They encaptured how the benefits of personalization could line up with the UX goals of Company's service.

5.4.2 Ideation workshop

To initiate exploration of how to apply personalization to the Company's service and test out the early draft of design guidelines, a workshop was organized at the Company with members of the UX team. The purpose was to generate ideas for designs by combining the expertise of the employees, who work with the product everyday, with the research condensed in the guidelines. These ideas would then be used as stepping stones for further ideation, staking out some promising directions to venture.

The first guidelines draft was used as inspiration for the workshop. The scope was to ideate around the applying those guidelines to the company service. The method used as a framework was design charrettes (4.2.9.2), in combination with some short warm up exercises. Eight designers participated and also one member from the research team joined the activities. The workshop was scheduled for 90 minutes and a facilitator led the activities and took notes.

After a warm up exercise, the participants were asked to ideate individually around two guidelines that were randomly assigned. After this first phase, the participants were split in groups of three, starting out the design charrettes session. In the groups, which all were assigned their own rooms, the members would present their guidelines and the design ideas they had come up with. Every ten minutes, the groups would rotate, and the participants brought their favourite ideas from the previous discussion to elaborate and discuss in the new group (Figs. 8 and 9).

Fig. 8 - Individual ideation phase.   *Fig. 9 - Charrette session with moderator.*

After three rounds of rotation, the groups were tasked with narrowing down the results of the discussions to the ideas that they deemed most promising. Then they presented them and discussed with all the other participants of the workshop.

Result and analysis

The final presentations were recorded in audio. Notes and post-its from the activities were collected, and after the workshop was over, all this material was compiled into a document describing the ideas that had been presented. In order to analyse the results, all the ideas discussed and generated in the workshop session were collected and grouped by affinity together with the first guidelines.

5.4.3 Matrix of guidelines

The affinity diagram generated from the workshop and the guidelines needed further refinement, in order to create a solid base for the application of the guidelines to the company's service. To attempt to clarify the results, a matrix of the first draft of the goals was created, which aimed to identify what goals would have a major impact on the user's trial journey.
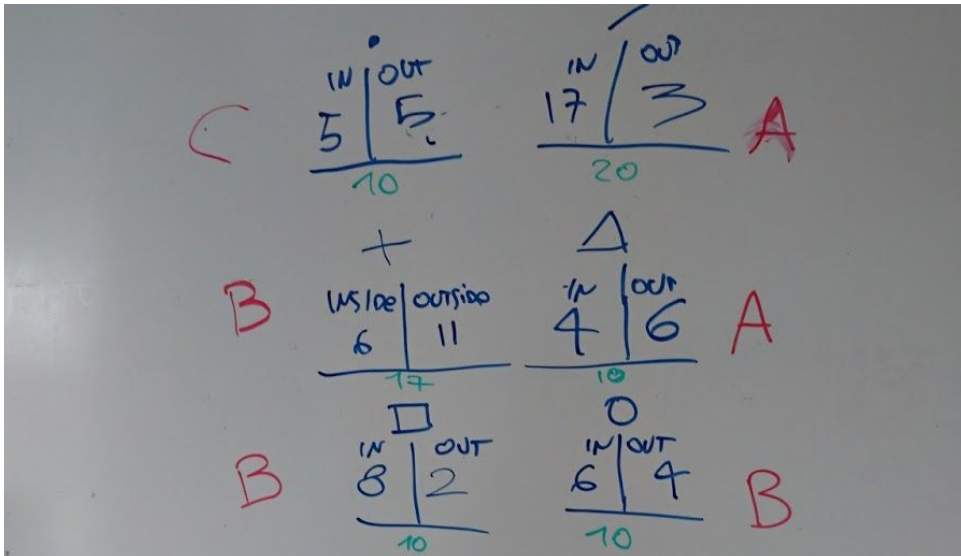
Fig. 10 - Matrix of results from guidelines and workshop ideas

In Fig. 10, the letters correspond to different areas of the user's journey of a trial, the different symbols represent different goals/guidelines that were analyzed and the numbers represent the amount of ideas that fit or don't fit into the application of a certain guideline. The matrix turned out not to be of any help for clarifying and defining the scope of the goals, and was not put to use when going forward with the project.

5.4.4 Brainstorming

Further ideation was conducted in a brainstorming session within the team. The purpose was to expand upon the findings, themes and ideas that emerged from the UX-team workshop. In addition to these findings, the first draft of design guidelines was also used as a guide and inspiration for the session.

The main part of the session was conducted using the 101 ideas method (4.2.9.1) and a long list of ideas was generated. Other methods were touched upon to keep the flow of ideas constant, most notably using "what if?" scenarios, which had been thought up before the session.

The post-its with notes generated were mapped into an affinity diagram mapped to the flow of the trial, to identify which ideas were related to what areas of the experience (See Fig. 11 below).
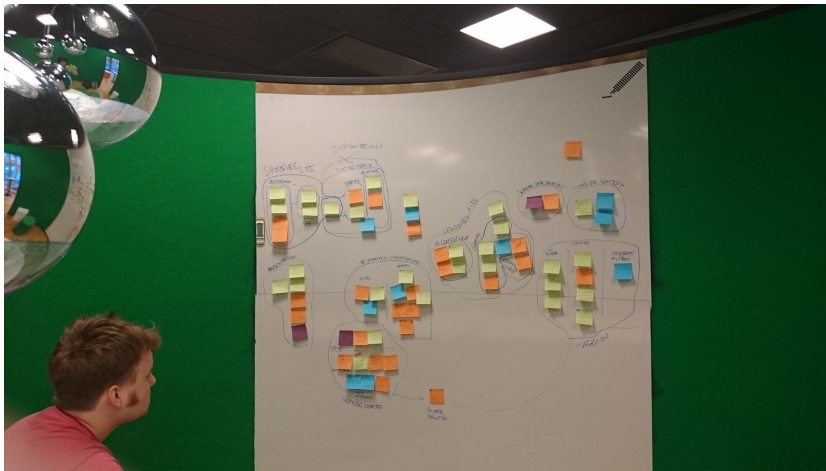
Fig. 11 - Affinity diagram mapped to the trial flow.

5.4.5 Design guidelines (first draft)

With the massive amount of ideas, suggestions and themes that had emerged from ideation, it was difficult to move forward to a more coherent design. Some ideas were very small, while others were major additions or changes to the Company's service. Some fit together nicely, and were more of a compounds of different ideas, and others were eccentric and isolated.

In order to have a framework for understanding and evaluating the material from ideation, it was decided that elaborate design guidelines were required. These were to be based in and backed up by research. To create the guidelines, we backtracked to look back on the research material. Also, some additional research was done for the following concepts: personalization, trialling products, and guidelines generation. This second research phase also made use of the previous papers collected. The new research was used to fill in some gaps in the guidelines. In comparison with the design goals, the guidelines were phrased more clinically with deeper roots in academia to provide a clearer rationale.

The result was a set of 14 guidelines for for designing personalization in trial services. In this draft, the guidelines were categorized according to the different areas of the trial journey that they would impact the most. The guidelines were written in the format of a concise title describing the recommended action, followed by a rationale that would typically cite research and often explain how the guideline was relevant to the Company's service.

5.4.5.1 Getting personal data from the user to provide personalization

A personalization system is a two way communication with the user experiencing a service. Therefore it's important to find out how, when and with what type of information the user can communicate with the system for a better experience. For instance location data, level of experience with the given tool, file type usually utilized, etc..

- **Identify what information is required about the user, in order to personalize the product in a relevant manner. Gather this data!**

Every product that aims to provide a personalized service to its users should identify what are the core information needed from her. The effort to collect this information (either manually or automatically) and to process it, should be minimized by focusing on solely the most relevant data.

- **Invite the user to give data to the system to improve her experience**
  To get permission to collect data automatically from the user, or enable her to give information manually to the system, this should be communicated to the user in the most effortless of even fun way available. The manual input should not bother the user during important tasks, should be elective and always available for the user to edit at her pace and liking.

5.4.5.2 Before starting the trial: Information presentation

During the trial journey, the purpose of communication to the user, via forums such as the service's website, should be to help the user form an understanding of what the product is for and what she, personally, can use it for. This communication should generate accurate expectations.

The role of personalization in this context is to highlight information that is relevant to each individual user, helping to understand the product and build accurate expectations with as little effort as possible. We recommend the following elements for personalization.

- **Highlight relevant information and hide away less relevant information**
  Personalization can be effective in reducing information overload (Li & Unger, 2012) and supporting information acquisition (Jameson, 2007). For a complex software, such as the Company's service, there can be overwhelming amounts of information required to describe the full range of possibilities it offers. This may result in a cumbersome experience for the user, when trying to understand the relevant qualities and use cases for her. Personalization can be applied to identify what the user needs to know, and highlighting this information while hiding away what is less important, so as to allow the user to faster gain an understanding of the product and reduce the effort required for the process.

- **Communicate qualities/selling points that match the expected use of the user**
  For a user to engage with a trial offering of a product, she needs to understand it at a basic level: what does it do, and what are its distinguishing features? Among a complex product's wide array of features and functionalities, some will be of higher importance to a certain user. In a personalized solution, this information should be highlighted to the user.

- **Communicate the most valuable benefits that the product can bring to the user**
  Zhu & Chang (2014) have shown that the degree to which a user perceives that a product will help her in her life or job, positively influences her intention to engage with a trial offering of it. What is perceived as useful for a certain user differs depending on many factors, especially for complex products with a wide array of uses.

Personalization can be used to identify and highlight information about those "perceived usefulness" attributes that the product can bring to a certain user. This can facilitate the process of understanding the personal usefulness of the product before gaining first hand experience with it.

- **Communicate in a tone and language that allows the user to understand the use and benefits of the product**
The background and level of expertise of users may vary, and it may be beneficial to communicate differently with different users. During the initial user research, the think-aloud tests and semi-structured interviews with beginners, it could be noted that some users had difficulties understanding the more technical jargon applied on the website of the Company's service. This would reduce these users' chances of understanding the service correctly.

    In order to clearly communicate the value and use of a product to each user, the language and jargon could be adapted accordingly. Jameson (2007) described such adaptation as a possible application of personalization.

5.4.5.3 After trial sign up: a first hand experience evaluation

The purpose of trialling a product is to get first hand experience on which its usefulness and ease of use can be evaluated. In order to make this judgement, the user needs to understand the product, learn to use it and see a broad spectrum of its features. We propose that personalization can be applied to help the user more effectively evaluate the ease of use and usability.

- **Adapt welcome message according to the user's prior knowledge of the system**
The impact of the first screen of an interface can determine the perception that the user has of the product and of the potential actions she could take. Approaching different users, who have different background knowledge, with the same first welcome interface, might lead to a mismatch with the expectation built prior to entering the service.

    Adapting the welcome screen, the elements and help system to first show, should support the user according to her previous understanding, for example by giving more guiding support to beginner users and showing more advanced features to expert users.

- **Personalize teaching resources**
Learning can be facilitated through personalization (Jameson, 2007) and could reduce the perceived learning cost, which is a factor in evaluating a software trial. Also, by becoming more proficient with the software, the user will also get a deeper understanding of its usefulness and ease of use. An example of personalized learning is to make recommendations about teaching material. Klasnja-Milicevic et al.

(2011) show how a simple recommender system, highlighting teaching resources that fit the user, can make learning more effective.

Teaching material should be made relevant to the user, for example by making recommendations about what material is relevant to the user according to her level of expertise (e.g. what lessons has she already completed?), interests and learning style.

- **Supply guidance on relevant courses of action and features**
Zimmerman & Nerdinger (2011) argue that software evaluation, because of being immaterial goods, is often done in a more realistic and ad-hoc manner. This means the user adapts a less careful "just try it out" approach.

  To support this behavior, personalization can be applied in the form that Jameson (2007) describes as advice about system use. For example recommendations could be made, not only about teaching material, but courses of action and features that could relevant to the user, based again on previous use, interests etc. The purpose is for the user to get a better sense of the scope of the software and its usefulness, without being overwhelmed by information about features that are not currently of interest.

- **Support serendipity**
Zimmerman & Nerdinger (2011) suggest that users are often aware of their needs only implicitly, when deciding to trial a product. They may only have a vague idea of what they need the product to do, in terms of a certain function for example. Allowing the user to fulfill this need is naturally first priority, but there might also be other features of interest to the user, although she is not explicitly aware of it.

  By making suggestions that are outside of what has been explicitly expressed by the user, the user might get a richer understanding of the usefulness of the product.

5.4.5.4 General guidelines for a qualitative personalization experience

Some personalization attributes are present not just in one area of the user journey, but across different touchpoints. In order to keep the synergy among personalization features, some guidelines are to be applied across the entirety of a service.

- **Clearly communicate what information has been used in order to personalize and what value it gives back**
Perceived risk is a factor that influences the user's decision of engaging with a trial offering (Zhu & Chang, 2014) and it should be kept low. Factors that increase the feeling of risk include giving up personal information, which may be necessary for personalizing content. In general, privacy is an important user concern for personalization (Jameson, 2007; Li & Unger, 2012).

  For these reasons, it is of utmost importance to be transparent about what information is being gathered and used for personalization content as well as how it

is being used, as proposed by Li & Unger (2012). They also argue that the quality of the personalization is key to reducing the user's worries about giving up information. Thus it is relevant to communicate the value of personalizing the content explicitly to the user.

- **Use a general personalization, based on only a few pieces of information, and allow users to explore deeper on their own**
  As Jameson (2007) researched, the use of spontaneous adaptive help over on-demand help can be obtrusive and make the user feel a lack of control. Just a small amount of personalization should be provided at first, based on the user model, the rest of the service should be allowed to be explored by the user herself. If any further information is used to keep using personalization in deeper exploration of the service, refer to the point above (Clearly communicate what information has been used in order to personalize).

- **Give user control over personalization**
  When interacting with a service that uses a user model for personalization, it is important to give the user a certain level of control. Jameson (2007) discusses different level of control that can be given to the user in order to allow either macro or micro changes.

  Some more specific guidelines follow on how to give control to the user:

  - *A. Allow access to non-personalized ('vanilla') version of information, in a clear manner*
    If a personalized version of a service is not following the needs of the user, she should be able to understand that she can change it back to a blank version.

  - *B. Allow manual tweaking of user model, for 'correcting' personalization*
    The user should have access to the outline of the user model built by the system and should be allowed to make changes to fit her better.

  - *C. Give the user power to adjust help given from the system*
    If the system personalizes the type of help given to an user based on its understanding of her prior experience, the user should be able to access those settings in order to tune them accordingly to her needs.

  - *D. Clearly communicate what the effects of manual 'tweaking' of personalization will be*
    When interacting with the personalization parameters of the system, the user should understand easily how her changes will affect the personalized result. This attribute is defined with the term *predictability* by Jameson (2007), and it works closely to its connection with the level of *transparency* of the system, that helps the user understand how the system works

- **Keep "non-highlighted" information clearly accessible**
  When using recommender systems to highlight relevant information, it is important not to completely hide the information that was deemed "not relevant" from the user. In research carried out from Pariser et al. (2014), it is shown that over time recommender systems narrow the user exposure to the system itself, closing the user in what is called a "filter bubble".

  It's important that recommendations don't limit the user's perception of the system. By keeping the less relevant options within reach, the user can choose to follow the suggested path, or to explore different different solutions and options, that might not yet be part of the system's recommendations to the user.

5.4.6 Ideation evaluation

At this point, some evaluation was required, in order to narrow down and eventually make the ideas generated more comprehensive. Then it would be possible to move on to a more tangible exploration of the remaining ideas.

For evaluation, the design guidelines were used as a framework. For the sake of exploring the research question, the design that would be tested needed to apply as many of the guidelines as possible. With this goal in mind, the ideation material was reviewed through discussion. Ideas were weighed against the guidelines, seeing which ones they matched up with and not. In this process, a large amount of material was discarded and some strong idea candidates were identified.

5.5 Sketching and prototyping

With ideation having resulted in a wide range of ideas, which had been narrowed down by using the design guidelines as selection criteria, some more tangible results were required to be able to understand and evaluate the ideas that were left. On paper, in the abstract domain of short titles and discussion, it was no longer possible to make sense of how the ideas would fit together with each other or the Company's service as a whole. Therefore, a more physical and visual approach was adopted to move the project forward; from sketching, via fleshed out concepts, to further development into prototypes.

5.5.1 First iteration

Using the list of ideas and guidelines, a first iteration of testing out the application of the concepts to the company service was carried out through either text format or sketches (Fig.12). This enabled an open discussion on the concepts, helping to identify what were relevant ways to apply the guidelines to the current system.
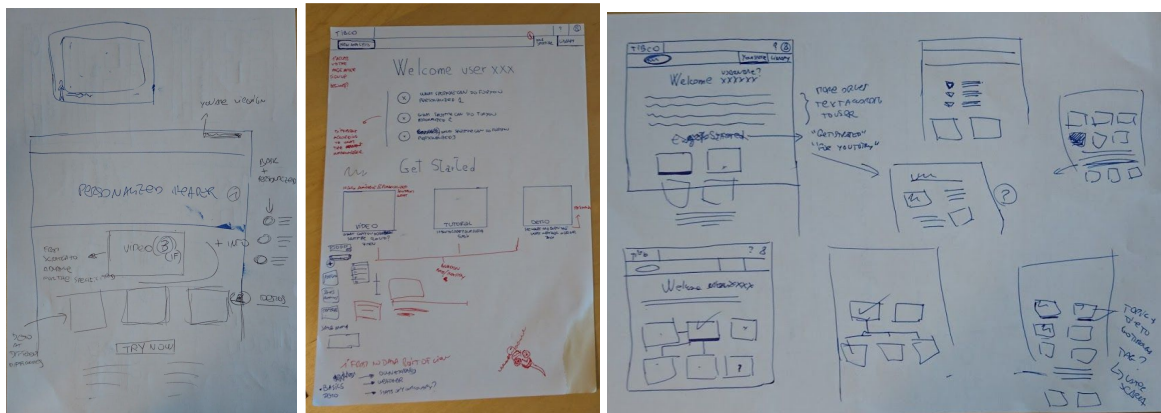
Fig. 12 - First iteration sketches

After discussion on the ideas generated on paper, a more visually concrete approach was used to visualize the stronger concepts. Balsamiq was used to rapidly create simple prototypes. A simplified mockup copy of the interface of company's service was created, to be used as a base for creating multiple sketches of the ideas for applying the guidelines.

The cloud version of Balsamiq made it possible to parallel prototype, working together on shared collaborative files. Prototyping in Balsamiq this way made possible to identify weakness and strength of the concepts explored.

5.5.1.1 The first concept

The concept that was settled upon after sketching and discussing multiple ideas was a recommender system that incorporated multiple different kinds of material. This concept was deemed to be one that would fulfill and apply all the design guidelines, at least to some degree.

Fig. 13 - First prototype created in Balsamiq

The recommender system would be a new addition to the Company's service, a HUB where the user could go for advice and inspiration on what their next step using the service would be. It would serve as a launch pad for the user, showing different possibilities and opportunities based on information about her, for instance her previous actions and data about her field of work.

The different material that would be recommended was envisioned to be quite varied; it would include teaching material (such as tutorials, videos and demos), information about analytics and possibilities within the service and already set up analysis. The idea was for this HUB to be both inspirational and educational, able to cater to users with different styles of learning and interests.

Being a HUB, this concept was isolated from the analysis part of the service. It was rather an added part of the experience in between working with analysis.

A very low fidelity prototype (Fig.13) of this concept was built through parallel prototyping using Balsamiq. The prototype was not interactive but rather showed how the system's interface would look and adapt to a first time user; from logging in for the first time to recommending new material after having done some analysis using the Company's service. At this stage, different interface solutions were still being explored during prototyping and

the prototype included several different layouts and stylistic approaches to presenting information.

5.5.1.2 Feedback session

During a meeting with the UX team of the Company, the first iteration of the design was presented. The concept and its purpose was explained, along with different interface designs for the solution. The purpose of this presentation was to gather feedback, in order to understand how to continue evolving the design. The concept was presented in the form of a scenario where a user working in retail signs up for the Company's service and starts exploring it.

The biggest concern expressed during this feedback session was regarding the the lack of presence of the concept throughout the service. This stemmed from the design of the concept as a HUB, isolated in many respects from the main experience of using the service, which is that of working with and analysing data. The concern was that this would limit the impact of the personalization, since it would only be prevalent in a fraction of the user experience. Being a part of the interface that had to be actively sought out, the design would bring the benefits of personalization only to the types users who want help learning to use the service. And further, it would actually be easy to completely miss the feature.

The isolated nature of the design also made it difficult to distinguish from a regular HUB for teaching resources. The evolving personalization of the feature could be hard to understand for the user if it was not more visible throughout the user experience.

5.5.2 Second iteration

The feedback from the UX team paved the direction for the continued development of the design. The goal was to take the ideas from the previous concept and make them more prevalent and visible throughout the experience of using the Company's service.

Once again, the process of ideation started in quick paper sketches and moved towards digital sketching in Balsamiq as ideas grew more mature. This early ideation, however, was much shorter during the second iteration as an idea of bringing context more into the concept emerged.

5.5.2.1 The second concept

Understanding what the user needs and wants to do is not the only important aspect of personalization. It's also very important to understand when is the right moment for the user to do something.

It was therefore decided to apply the research findings not only to one part of the company's service, but to spread it throughout the experience of using the service. The core idea was to guide and suggest a personalized use of certain features to our target persona user, Asad (chapter 2.2), who is testing the system for his first time. It was not easy to integrate a set of changes, spread through such a complex product, so inspiration was taken from the existing "recommended visualization" feature of the company's service. The existing "recommended

visualization" feature is a tool where the user can select columns of interest, and the Company's service will suggest different ways to visualize this data.

The final concept from the second iteration of prototyping was named "Yellow thread" (Fig. 14). The name derives from the idea of having a visual element, which is constant throughout the interface, that represents a suggestion or recommended action, and that should act like a common thread in the experience. This constant element, represented by a yellow bulb would signal a personalized set of suggestions to guide the user through relevant actions.

The idea is to build on the user awareness of the personalization through the recurrence of a common element across different areas of the product. The collection of data for personalization and building a user model was not present in the prototype, and the concept would merely test the envisioned result when data had been collected and the system had understood that the user is a beginner who is working in retail. However, it is implied that the personalization would be built based on the usage data of the product from different users, from the information provided by her and from her individual actions taken within her visualization session.

Fig.14 - The logo for the Yellow Thread concept.

The concept was developed through parallel prototyping in Balsamiq, exploring different options and solutions. This low-fidelity prototype kept being shaped and refined while moving towards a uniform concept. The ultimate goal of this process was to reach a design that could be used as a blueprint for building a higher fidelity prototype in InVision, making most major decisions on functionality and layout before moving on.

Much like a sketchbook, the Balsamiq workfile would contain both old attempts and the more final suggestions for the design. During the second iteration of the design work, however, a scenario was not created but rather we worked on creating smaller modules - designs for spreading the personalization in different features of the service in a coherent way.

After discussion within the team, and with the project supervisor at the Company, the Balsamiq design was deemed complete. The final Balsamiq sketch contained, among other things, a personalized welcome, suggested teaching material at the start screen, example

data that could be loaded when creating a new analysis, and a way of presenting viable alternatives for taking an analysis further. An overview of those features is given in the following chapters and discussed further in the result chapter.

5.6 The prototype

For the purpose of testing the design, a higher fidelity prototype was built using InVision. The prototype was a scenario with interactions taking the user through a defined use case. It was made to mimic the look of the actual service client, but with the personalization design implemented. In this section, the final concept and the specifics about the prototype are covered.

5.6.1 Test scenario

To test the design, A/B think aloud testing would be used, comparing the prototype with the Company's service. The prototype would be a step by step walkthrough of this scenario and this would decide what each screen of the prototype would show. Thus, the tasks for the test scenario needed to be completed before starting implementation of the high fidelity prototype.

Some basic requirements existed for the test scenario. It needed to take circa 15 minutes for a new user to complete, because of limitations of the Usertesting.com service. For the purpose of comparing the prototype with the regular client, the test scenario also had to work within both with minimal differences.

From a research perspective, the purpose of the scenario was to expose participants to tasks of a suiting difficulty. It needed to present a broad range of features, so that the participants could get as rich a perception as possible of the Company's service. Also, it needed to involve the new personalization features in a meaningful way, in order for them to have an impact on the experience.

In the process of designing the test scenario, the target group of participants was narrowed down to only include only people working in retail. This was a prerequisite to be able to personalize the tasks and the material used for the tests. This group was chosen in consultation with the project supervisor, on the basis that their analysis needs are usually not too complicated to understand, which would facilitate the design of the test. Research on this user group was carried out to create a relevant use case scenario using some good example data, found among the Company's own tutorial material.

Once again, inspiration was siphoned from user tests that the UX team on the Company had done using Usertesting.com. The result was a scenario consisting of nine tasks, where participants would work with sales data from a store. The scenario was pilot tested before starting to build the prototype and after this tweaked continuously up until launching the final tests.

5.6.2 Invision prototyping

InVision was used for building the testable prototype. This tool was chosen because its integration with Photoshop allows for pixel perfect interface prototyping. This was deemed to be an important aspect for limiting the look and feel differences between prototype and service client for the A/B testing.

The prototype was built from a blueprint of the Balsamiq sketches and the tasks in the test scenario. From this, a more pixel perfect prototype was created, using a visual base of screenshots from company web client interface. This was tweaked in Photoshop to integrate the "Yellow Thread" design features in a coherent manner. Interactivity was added to the interface using the InVision App, linking the different screens of the scenario to make it appear to work like the real program.

The prototype was slightly iterated upon and tweaked after pilot testing. It was sometimes needed to rethink ideas to fit the company product purpose and to level down unexpected obstacles that emerged in the first couple of test launched.

5.6.3 The concept

Expanding personalization to be present throughout the experience of using the Company's service, the final concept was named Yellow Thread. It applies personalization in different ways depending on the context but strives to present itself as one coherent feature, through the use of one common symbol; a yellow light bulb. This light bulb is a signal to the user that what is shown is a suggestion based on her preferences.

The concept "yellow thread" was the final result of the second round of ideation on how to apply the guidelines of personalization to the trial of the company's service by spreading the features ideated during the first iteration in a more context relevant manner.

The concept was realized as several different new features; three in the intermediate steps outside data analysis and six in the actual data analysis interface. The first three were an adapted welcome message, suggested demos and tutorials in the library, suggested data sheets when loading data to start an analysis. The ones used when analysing data were recommendations of popular analyses, different ways of presenting suggestions of relevant actions to take the analysis further, and personalized information on highlighted analytics elements. The prototype was also personalized in that the scenario that the prototype was built around included analysis of a dataset with retail data, which would suit the intended testers, who should be working within retail.

The following sections present the final design and each separate feature and concept that was added to incorporate and test personalization in the Company's service.

5.6.3.1 Modal window with personalized welcome message

Scope of the feature

The first modal message is an initial information text that adapts according to the information the system has of the user. The purpose of this modal welcome window is to explain in short what the Company's service can do specifically for people in the field of work of the user. The idea is that this message and content initially would be based on information entered by the user at registration, the first piece of information used would be the "field of work", an added question asked when signing up to the trial of the web client.

The first time, this message will also explain to the user the meaning of the light bulb recommendation that she is going to see/find/use in the program. After some usage data of the system is collected, the modal message will adjust, highlighting more relevant content for the user such as: suggesting features that can be useful for her work, presenting relevant newly released features and so on.
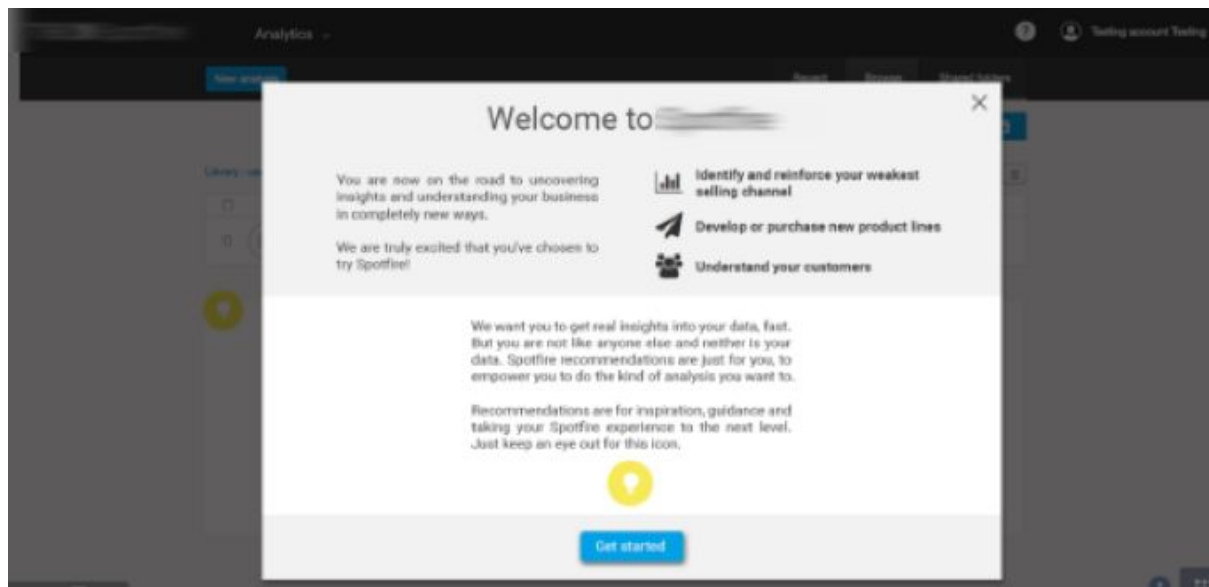
Fig.15 - Adaptive welcome screen, as shown to a first time user who works in retail.

Personalization guidelines applied

- *Highlight relevant information and hide away less relevant*
- *Communicate qualities/selling points that match the expected use of the user*
- *Communicate the most valuable benefits that the product can bring to the user*
- *Adaptive first impression*

5.6.3.2 Adaptive video, tutorials and demos on the library page

Scope of the feature

Getting to the library screen after signing up, without any further indication on what are the possibilities of actions can be a bit daunting. Including suggestions of content, such as demos, tutorials and extra content that is personalized based on the previous usage of the

system by the user, could be the key to enable first time users to learn, and to engage more experienced users with more advanced features they have not embraced before. The video would open as a modal window on top of the interface (Fig. 16), and be possible easily close, demos and tutorial would appear on the side of the interface (Fig.17) in order to guide the user with step-by-step instructions, in the context of the interface.
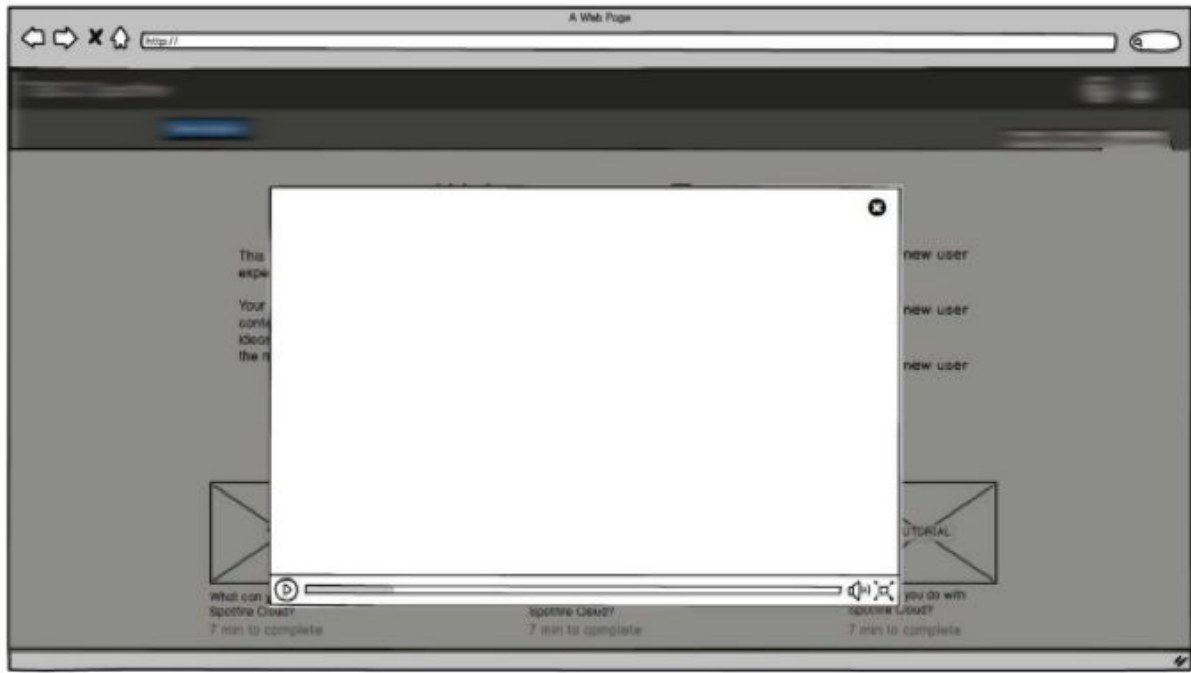
Fig. 16 - First prototype in balsamiq showing how video content would appear in the interface.

Fig.17 - First prototype in Balsamiq, showing where tutorials and demos would be displayed in the interface.

- *Clearly communicate what information has been used in order to personalize and what value it gives back.*
  It's important to show to the user, what data the suggestions are based on.
- *Personalize teaching resources*
  Adapting the content of demos and tutorials according to the learning and explorative flavour preferred by the individual user could help them understand the product better.
- *Support serendipity*
  Suggestions could be outside what the previous recommendations have been based on, in order to allow the user to explore and discover new facets of the product.

5.6.3.3 Recommended personalized dataset for analysis

Scope of the feature

The idea was to provide sample data to the user, which would be suggested based on relevancy for the user. The implementation in the prototype was to add a new way to load data when creating a new analysis file, where the user could open suggested datasets.

In this case, the data suggested would be based on: location of the user and field of work of the user, informations provided when signing up. In time this recommendation would evolve based on the usage data. For example, by connecting to a library shared by other colleagues, the user could be suggested to use a dataset that seems to be relevant, based not just on the individual usage of it, but related also to the usage that other users have registered in the same organization. By providing, upon first use, sample data that the user can relate to based on her field of work, the aim was to make the first interaction with the system more graspable and relatable to personal cases. The aim was to highlight the value of the product, by providing data that enables the user to perform data analysis tasks similar to what she might want to do with her own data. (Figs. 18 and 19)
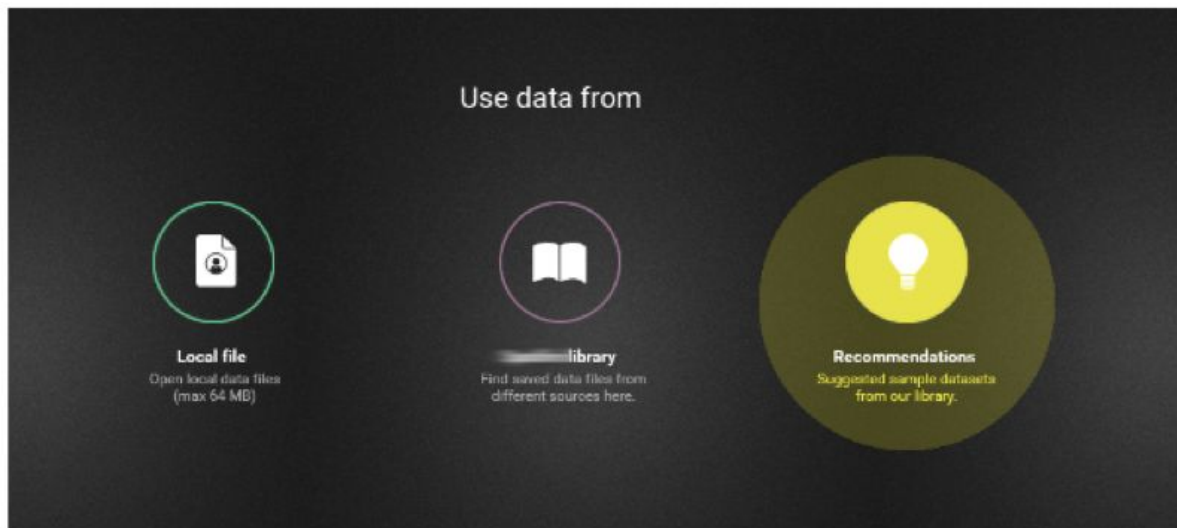
Fig.18 - The recommended data access point
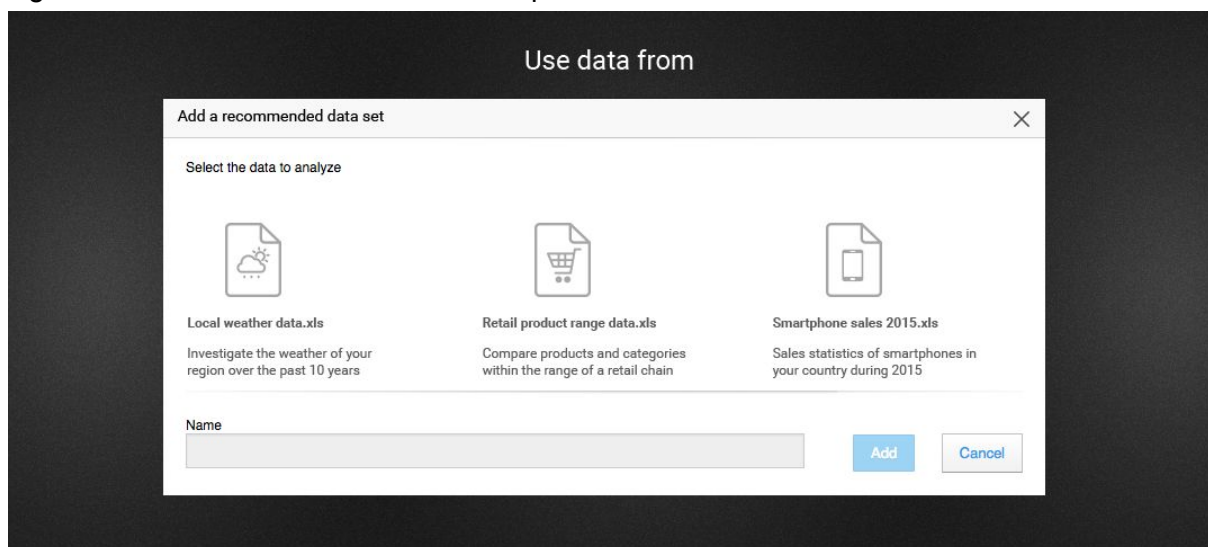
Fig. 19 - An example of datasets recommended in the prototype.

Personalized guidelines applied

- *Highlight relevant information and hide away less relevant information*
- *Use a general personalization, based on only a few pieces of information, and allow users to explore deeper on their own*

5.6.3.4 Trying the product with a personalized, suggested dataset to fit the user

Scope of the feature

The initial idea of narrowing down what dataset to provide to which type of user was guided by the need to restrict a testing scenario for the personalization concept. The prototype would include the task of analyzing a dataset with retail data from a store chain, and the testers would be people working within retail.

To enable such personalization, while not part of the prototype, one idea is that at sign-up the user should provide among the registration information, the field she is working with and

location. Those two pieces of information would be used to suggest suitable sample datasets for the user to try the product with. The suggested datasets are meant to be as close as possible to what is the user's personal or work data, so that she could understand the data intuitively while experimenting with the product.

Personalization guidelines applied

- *Highlight relevant information and hide away less relevant information*
- *Communicate in a tone and language that allows the user to understand the use and benefits of the product*

5.6.3.5 Recommended visualization "popular analyses"

Scope of the feature

Having loaded some data and starting to work on new analysis for the first time, the recommended visualization window is opened by default. The addition to the recommended visualization window is a panel on the right-hand side that shows popular visualizations (Fig.20). As opposed to the recommendations in the standard version of the recommended visualizations tool, the suggestions are based on usage data from other users, instead of being based on a selection of data columns made by the user. The suggested popular visualizations would evolve over time, based on the usage of a dataset.
For example:
- The popular analyses panel shows how a specific dataset shared within a group or organization is commonly visualized by other users using that same file.
- The popular analyses panel could present popular visualizations that have been configured for analyzing similar datasets by other users in the same field of work
- The popular analyses panel could also show visualization configurations that the user herself uses frequently in her analysis files, so that she has easy quick access to them.
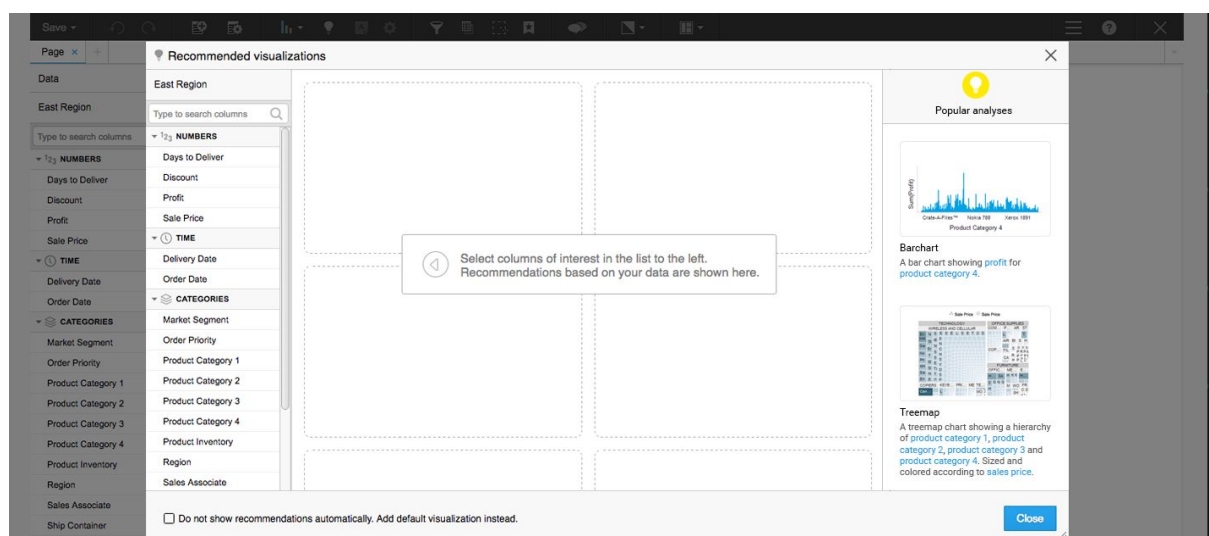
Fig. 20 - On the right-hand side of the recommended visualization panel, suggestions of popular visualization configurations for the dataset are previewed.

- *Support serendipity*
- *Use a general personalization, based on only a few pieces of information, and allow users to explore deeper on their own.*

5.6.3.6 Light bulbs indications on the top menu

Scope of the feature

The Company's service is a complex product with tonnes of features and analysis options available for all users, independent of experience level. Getting oriented among all this functionality can be an overwhelming experience for users that explore the product for the first time.

To facilitate getting oriented while working with an analysis, without removing options for any users, subtle light bulbs indicators were added on the top menu (Fig.21). The light bulb icons serve the purpose of guiding and to suggesting interesting relevant actions to the user. The suggestion would be based on the users past usage of the product. A new user might have more basic suggestions related to the main and most important function of the interface, while a more experienced user could get fewer suggestions but more specific, and the suggestions would at that point serve the purpose of deepening the knowledge of the product and supporting serendipity by presenting options that the user might not be aware of. A recurrent user would have more data collected, that would enable the system to calibrate when and what type of new suggestions could be given in order to stay relevant.
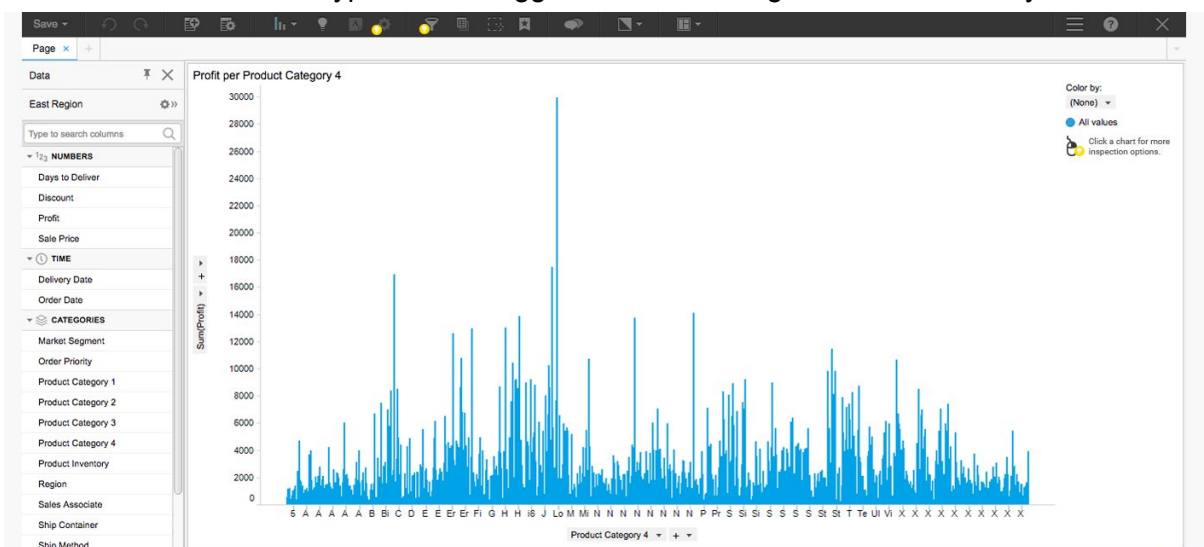
Fig. 21 - Highlighting the Properties and Filters controls in the top menu are light bulb icons, suggesting that these could be actions for developing the analysis further.

Personalization guidelines applied

- *Supply guidance on relevant course of action and features*
- *Support serendipity*

- *Use general personalization, based on only a few pieces of information and allow users to explore deeper on their own.*
- *Keep "non highlighted" information clearly accessible*

5.6.3.7 Light bulbs showing recommended charts to add in the "add visualization" and "add detailed visualization" menu

Scope of the feature

When adding a new visualization from the create visualization drop-down menu, an indication in the form of a light-bulb icon shows what could be a suitable type of visualization (Fig. 22). The suggestions are either based on the type of dataset that is used, or on the useful visualizations according to information provided by the user: field of work, role, most used visualization types by the user herself or other similar users. If the user doesn't know what a suggested visualization type is, or wants to know why it has been suggested to her, she can click click the light bulb icon. Clicking the light bulb icon will open a side panel with more explanation about the visualization type. The information panel will show some relevant examples on how to apply that visualization to the current user situation, or how such a visualization is used in the field and what is achieved with it.
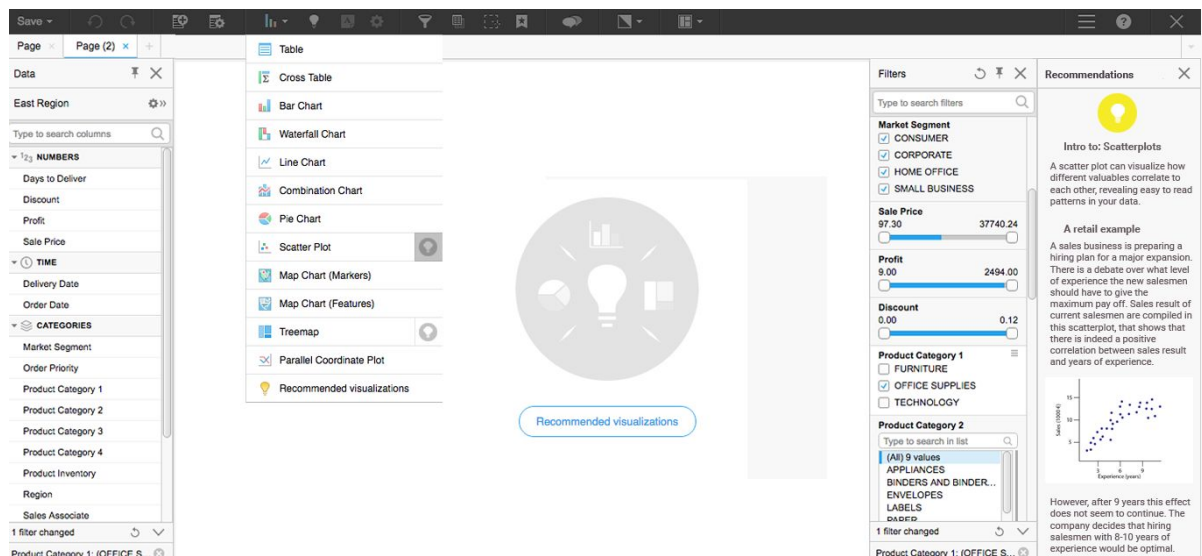
Fig. 22 - Suggested visualizations in the add visualization drop-down menu and a personalized explanation of the scatterplot visualization.

Similar recommendations are provided in the Create details visualization drop-down menu. When a user wants to drill down into the data in a visualization, by creating a details visualization, the system will suggest which type of visualization better fit together with the main visualization (Fig. 23). Similar to the recommendations given in the add new visualization drop-down menu, it will be possible for the user to get an explanation of the suggested visualization types and why they are recommended, by clicking the light bulb icons.
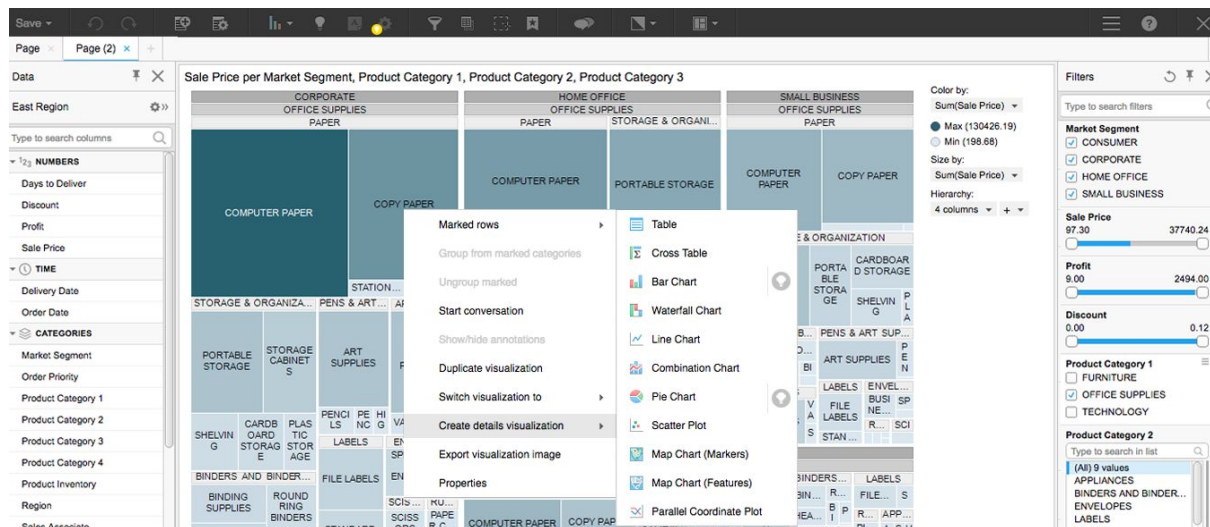
Fig. 23 - Suggested visualization in the Create details visualization drop-down menu.

Personalization guidelines applied

- *Supply guidance on relevant courses of action and features*
- *Support serendipity*
- *Clearly communicate what information has been used in order to personalized and what value it gives back.*
- *Use general personalization based on only a few pieces of information and allow users to explore deeper on their own.*
- *Keep "non-highlighted" information clearly accessible.*

5.6.3.8 Right click/Click for further inspection icon

Scope of the feature

To suggest and indicate viable right-click interactions. When using a service in a web browser, it can be difficult to intuitively understand that right-click interactions are available in some parts of the product. Some of the features in the Company's are only accessible this way.

Often, viable options and features for developing an analysis further are available via right-click interactions, such as options for marked rows and drilling down, often by right-clicking on the visualization of interest. The problem with the right-click is that some features like the details visualization one, are not accessible from other parts of the interface, and the affordance of the right-click in a web browser can be problematic. It could be confused with the browser right-click. That's why we thought we could hint the new user, who probably hasn't used the right-click on the visualization yet, into inspecting the chart through right-clicking.
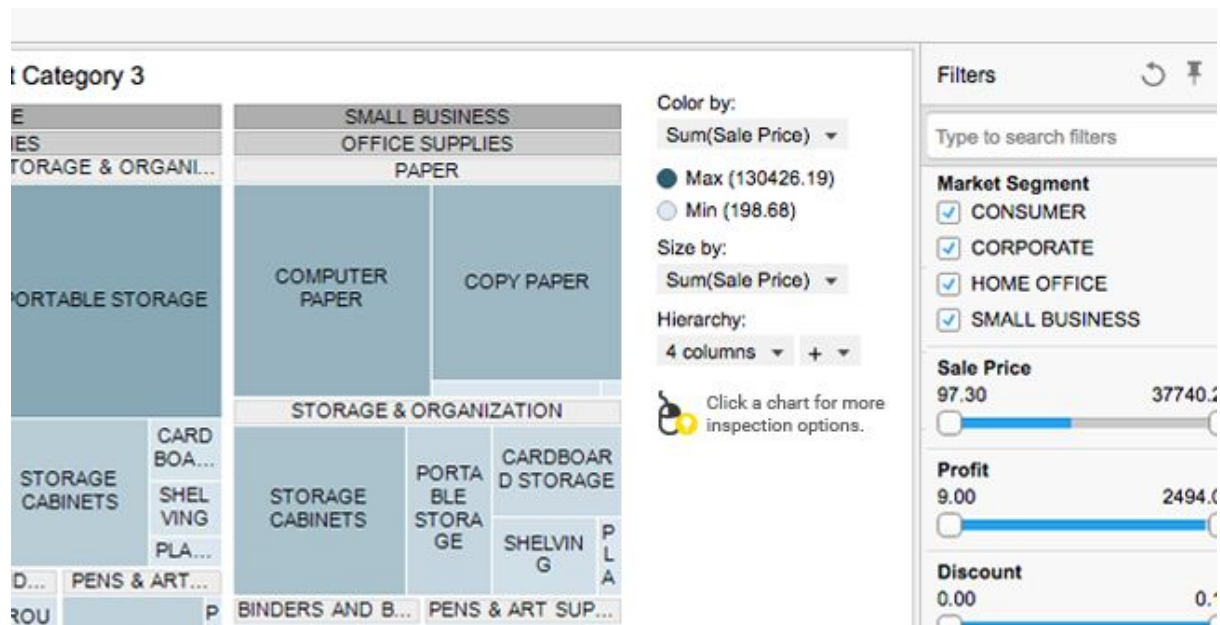
Fig. 24 - Positioning of the "right click for more inspection options" hint.

Personalization guidelines applied

- Supply guidance on relevant courses of action and features

5.6.3.9 Light bulbs indicating options in the visualization legend to interact with

Scope of the feature

Light bulb icons are used to guide the user's attention to axis selectors that might be of interest, for further configuration of a visualization. The purpose is to introduce further viable options for visualizing the dataset.

Once a visualization has been created and configured by adding columns of data to the basic visualization axes (for example the X and Y axes in a bar chart), the visualization can often be tweaked and developed further by adding columns of data to other visualization axes. Such axes include axes like color by, size by, and shape by. And sometimes, some axes can be configured in more advanced ways, such as the hierarchy axis of the treemap visualization (Fig. 25). The selectors for configuring axes like color by, hierarchies, etc are generally located in the legend of the visualization.

The suggestions to configure these options in the legend would be based on the user's usage statistics (has she used this feature before?) and on the current use context (what visualizations are being used?).
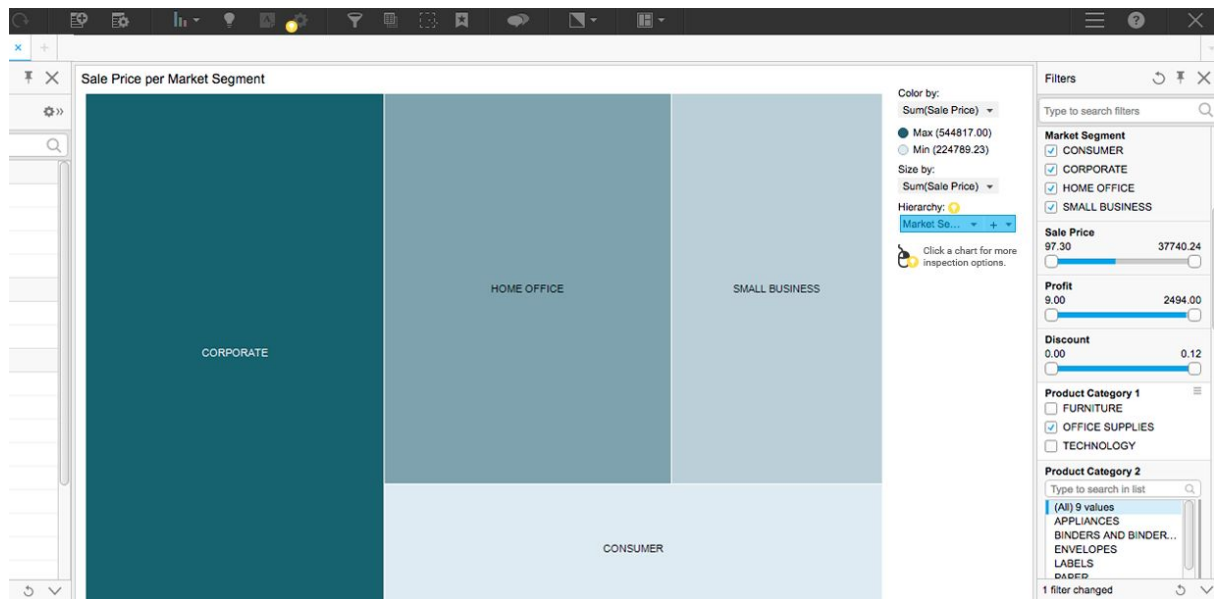
Fig. 25 - A hint next to hierarchy axis selector, suggesting an option for configure the treemap visualisation.

Personalization guidelines applied

- *Supply guidance in relevant courses of action and features*
- *Keep "non-highlighted" information clearly accessible.*

6 Evaluation

Having conceptualized the design guidelines as a design and put it into practice as a testable prototype, testing was required to investigate and validate the impact of these guidelines. Testing served to observe if using the guidelines would affect how user's experience and evaluate a product, and if they could be a possible answer to the research question.

Different evaluation methods were applied in an attempt capture the user experience of the design, in a range of different aspects. In order to have a more complete evaluation picture of our guidelines a combination of A/B user testing, expert evaluations and test interviews within people within the Company were carried out.

6.1 A/B testing

A/B testing was the primary method for investigating how the design and the application of the design guidelines would affect the user experience.

The user tests conducted were think-aloud tests followed by two short questionnaires (the first answered in speech as part of the think-aloud test, the other one answered in writing after the test and the recording was finished). Participants were given access to either the real client of the Company's service or the InVision prototype. They were asked to carry out a set of tasks in the program, while speaking out their thoughts and reactions. The tasks and questions used are the ones in Appendix 5

Participants did the tests in their own environment and on their own hardware, through the service Usertesting.com. During tests at Usertesting.com, participants are aware that their screen and voice are recorded. The Usertesting.com client is always visible to the tester as a small window containing the description of the current task. Only one task at a time is shown and the tester herself makes the judgment of when a task has been completed. Then she clicks to move on to the next one. If the participant stays quiet for some time, she will be prompted by a message reminding her to think aloud at all times.

To qualify for the test, the participants had to report that they work in retail and use Microsoft Excel as a part of that job. The requirement to work in retail was used because the scenario and prototype were designed to be personalized based on the fact that the user works in retail. The requirement to use Microsoft Excel was used so that participants would be familiar with working with data.

In total, twelve tests were carried out: seven participants tried the prototype and five did the test with the regular client. More were needed for the prototype due to technical issues during a couple of tests. The first tests were sent one by one, as pilot tests. The following tests were also sent out one by one as a safety precaution. In case some unforeseen error would occur, it would be possible fix areas of the test that would cause technical issues that would influence the output of the test.

One such error occurred midway through testing, a bug that could get participants stuck when using the prototype. This was fixed for the last tests, as it was deemed only a technical issue that would hinder the process of testing and cause frustration that had nothing to do with the design of the prototype.

The results were collected as video files of the participants' screens and recorded voices and text files of their written answers.

6.1.1 A/B testing data collection

All the data collected from the A/B testing had to be thoroughly sorted, coded and analysed. Upon completion of the tests, all video files and written answers were viewed by the research team together and discussed. After the initial viewing, all video files were reviewed in depth by one of the team members.

This deep review of the collected data included transcribing the tests. The method applied for transcribing was not a word for word account of each test, but rather a summary with more detailed accounts of certain portions of the tests, including notable quotes, comments, reactions and behaviors demonstrated by participants. Notability was defined as things that could be related to the research question, such as comments and actions that would give an insight to the process of evaluating the product.

The transcripts were then printed, together with the written questionnaire answers, and analyzed through reading and discussing together within the team. This process was done to acquire an overview of all the test results, that would facilitate identifying recurring patterns and reactions displayed by the participants.

6.1.2 Results

6.1.2.1 Transcripts Analysis

Four main comments and impressions were found in different areas of the test from different users.

Comments regarding the level of expertise that the users felt was needed to run the service were common. In the Company web client, at 8 occasions users expressed a wish for "more training" in order to understand the product better. The same wish was vocalized 12 times in the prototype environment.

The perception that the service was suitable and valuable for beginners was vocalized only in the web client testing, for a total of 5 comments. By reading comments and reactions in relations to problems encountered during testing, it seems possible that the limitations of the prototype blocked more testers from solving problems appeared during testing. This lack of flexibility might have led participants to perceive the prototype and the product as harder to maneuver without proper training.

Another area of recurring comments of interest, were those that reflected how tester perceived the product to relate directly to themselves and their needs, rather than to some other type of user. Among the web client testers, a total of 5 times it was vocalized that the service could fit the needs of the tester to help them in their work, while 3 times the comments were suggesting that the tester felt the product would be useful, but rather in the hands of another type of user.

Testers of the prototype also perceived the product as useful and could see benefits of using it, resulting in 9 comments across the tests that reflected how the testers could personally use the product in their work. In the prototype test no subject said directly that the software could benefit another type of user, rather than themselves.

Many features added in the prototype were hardly noticed by the participants. For example, the testers would read the new intro screen only briefly. The small guiding light bulb icons were not used as orientational help and most participants seemed not to make note of them. And the information pane about the different visualizations were never encountered by any of the participants. When asked about what recommendations they noticed during the testing, only one participant reported noticing any recommendations at all.

From analyzing both tests, the personalized features added in the prototype design were not a differentiating factor to affect perceived personal usefulness of the product.

The personalization that seemed to have a positive effect was present in the test scenario for both the prototype and the real client. The testers for both versions of the test were selected on the same criteria and they were all working in retail. In both tests the dataset that the testers were working with was one containing retail data, and the fact that all users could relate with the terminology and the examples and the data seemed to have a big impact on their ability to relate with the software. The scenario and most notably the data used was tailored to the target group tested on, and this type of personalization seems to have had the highest impact on speeding up the process of understanding the potential use of the service for our tester.

A majority of the participants gave answers and made comments regarding how they would use the product themselves, which referred to the tasks they had performed and the data. In total 7 out of 12 testers made such comments in the final questionnaire regarding the overall usefulness of the product and how they would apply it. 5 out of 7 of the prototype testers made such comments. In the client tests, such comments occurred in 2 out of 5 tests.

Often, users would refer to tasks they had performed and data that had been used to conceive of personal use cases:

"I like for example in the task in the end where we got the pie chart and were able to determine the most commonly used form of shipping. The visualization clearly shows that the vast majority of it was by the air. And I quite like that, you could use that in other ways to highlight other things that weren't going so great for you. It could prompt you to make changes that would eventually have an impact on your business."

"This is completely applicable to what we're doing as a business. Being able to take data like this, looking at individual store markets, merchandise categories, pricing, thresholds, market basket information... This is completely applicable."
-   **Client test, Participant 5**

Some users would refer to simply column names in the dataset, and use that information to form an understanding of the usefulness of the product, including columns that were not used in the test, by reading column names in the data panel:

"It has "Days to deliver", "Order" and "delivery date" - it has all these things that I would use in the retail industry. The categories or the products, the "Order priority"."
-   **Prototype test, Participant 3**

"I can use this product for any need that i have: for visualizations, for things to create powerpoint documents, or documents needed for court. Just to show, more so, sales prices... also shipping methods!"
-   **Client test, Participant 1**

"You can see several different [product] categories and you can see the shipping method too. I never thought you could see it like that. This is definitely more advanced than most business product i have seen."
-   **Prototype test, Participant 4**

Using a personalized scenario with test tasks tailored to emulate a retail use case, and having the testers work with a personalized dataset with retail data, seemed to have a clear impact on the way that the participants formed an understanding of the personal usefulness of the product.

6.1.2.2 Problematic usability issues of prototype

The participants testing the prototype displayed a significantly higher degree of frustration, because of technical issues that stemmed from using Invision. For some users, responsivity was very slow and loading the next screen could take multiple seconds, which would cause confusion regarding whether the prototype was working or not. Also, in some cases, participants would carry out an action correctly without realizing, because of the unresponsiveness of the prototype.

Two users ran into bugs in the prototype, that would cause them to get stuck on a frozen screen. Only one of these users managed to work around the bug. Another issue that could be regarded as a bug was cases of two users that managed to access parts of the Invision interface that were not part of the prototype (an overview of all available screens in the prototype).

Another prototype issue, unrelated to the design, that could be observed to impact the user experience was that the participants were limited in what they could interact with in the

prototype interface. Since the prototype was made to look like the interface of the real client, it contained lots of visual elements that would be interactive in the real client but were not in the prototype. This would lead all prototype testers, to varying degrees, to try interacting with many elements that were not interactive in the prototype.

6.2 Distorted heuristic evaluation

In order to capture and evaluate other aspects of the design, an evaluation using experts was carried out. The experts who were brought in as evaluators were master's students in the field of interaction design.

The tests were framed so that the experts were tasked with evaluating the prototype design from certain perspectives. The method of Heuristic evaluation from Nielsen (1992) was used as a starting point, his heuristics method was tweaked. 4 experts were given the task to evaluate our guidelines through the use of the prototype through the lenses of the personalization qualities (Appendix 6).

A brief description of the quality of personalization is given in the following paragraphs.

Unobtrusiveness

The level to which the personalization demands the attention of the user. An unobtrusive system does not disturb the workflow of the user, by requiring action, distracting or annoying her from the main task.

Controllability

The level of control that the user has over the system and the personalization features. A controllable personalized system should allow the user to carry through the action she wants to influence the personalization and its behaviour.

Predictability

The level to which an user can understand how her actions will affect the system. An adaptive system reacts not only directly to actions of the user, but also make interpretations of her behavior and adapt accordingly. Thus, for a personalized system the user needs to be able to predict not only the direct consequences of what she does but also how her behavior will affect the system.

Transparency

The level to which the user can understand the actions and changes of the system. For a personalized system, certain elements will adapt according to the user and the user should be able to understand why the system adapts in a certain way.

Accuracy

The level to which the personalized adaptations (recommendations, suggestions etc.) matches the user's intent, taste and interests. An accurate system should personalize in a manner that feels relevant to the user.

The level to which the personalizing process requires upkeep and input from the user, adding cognitive effort. An appropriate light personalized system should not be perceived by the user as a burden. The tasks required from the user to personalize different aspects of the system should feel effortless and fast flowing.

Breadth of experience

To which degree is the user made aware of features and options of the system? Is she boxed in and encouraged only to use a limited portion of the product (low breadth of experience)? Or is she introduced to new features and encouraged to explore (high breadth of experience)?

6.2.1 Distorted heuristic analysis

When looking at the collected data from the expert evaluations, it was possible to get an overview of which of the qualities the prototype fulfilled to varying degrees.

Two qualities, *unobtrusiveness* and *breadth of experience*, were deemed fully present. Two qualities, *predictability* and *transparency*, were deemed lacking in the prototype. The final three qualities, *lightness of use*, *accuracy* and *controllability*, were not possible to make a proper assessment of based on the limited scope and low interactivity prototype used for the evaluation.

Unobtrusiveness was deemed to be fully present in most of the personalized features of the prototype. Even when giving visual hints suggesting possible paths to take, the yellow light bulbs were perceived as noticeable, but not demanding too much attention. The personalization was never perceived as preventing users from doing other actions.

Predictability was perceived as lacking. For most experts the personalization features were not highly predictable, some testers related it to their unfamiliarity with the product or to usability issues, two testers specifically declared that they didn't noticed any predictive behaviour, that could also be caused by a too high level of unobtrusiveness present in the personalization features.

Transparency was also perceived as lacking. The lack of transparency led most of the experts to question how the system would know how to personalize certain aspects and why, given the fact that in the prototype the user was not allowed to enter such information.

Lightness of use, *accuracy* and *controllability* were not possible to evaluate properly. The use of a predetermined scenario made it difficult to assess the presence of these qualities. Regarding the lightness of use, a tightly guided step-by step tour of the prototype limited the effort required for the testers, and removed the risk of error and experiencing other parts of the product. Therefore it very difficult to assess similar features in a real life scenario. Similarly, the perceived accuracy was probably altered by the same testing environment, as the expert had the feeling that the system was "a step ahead of me the whole way through

the scenario". Last but not least, even if roleplaying the target user during evaluation, the test didn't leave space to free exploration to make possible for the users to evaluate the presence of *controllability*. The overall personalization features were perceived as not mandatory suggestions to follow, all participants felt the freedom to click outside the scenario set and explore different areas of the prototype, nothing was constrained.

Breadth of experience was perceived as a quality fulfilled in the prototype. In spite of the limitations of the prototype, most of the participants in the evaluation reported that the prototype fulfilled the breadth of experience quality.

6.3 Internal Evaluation

For further feedback, to enable us to assess our design guidelines, we decided to expose the prototype with the altered design of the Company's service to some people with a deep understanding of the Company's service. This would serve as a way to get a different perspective from that of the beginner users and IxD experts in the previous tests. A total of 4 employees from the Company were recruited to test our prototype and discuss it in semi-structured interviews. During the evaluation session the tester would go through the prototype scenario. Instead of answering questions during the scenario walkthrough, a more open discussion around the concept's potential was initiated at the end of each session. Testing and interviewing took approximately one hour with each subject. Notes were taken during the test, to use as record for further analysis.

6.3.1 Internal evaluation Analysis

Upon discussion with the interviewed subjects some aspects of "yellow thread" were frequently brought up: the welcome pop up screen, the additions to recommended visualizations, the notification icon for suggestions, and the "why" behind recommendations.

Some of the discussions were focused on the visual incoherency of certain elements, such as the yellow thread light bulb icon, its affordance, and the priority ranking of recommendations. Just as in previous tests, the welcome screen was mostly skipped by the testers or only read briefly. They revealed that they would assume to know the unimportance of the content.

Two subject expressed interest in using the personalized pop up screen as a way to communicate news for users.

The most appreciated feature seemed to be the added popular analyses panel in the recommended visualizations. A lot of input was provided on how to implement the concept even better, by providing for example a pre-configured visualization based on popularity. This, the interviewees said, could be a valuable feature for those experts users who are no longer using the recommended visualization (probably because it can currently be perceived as a feature geared towards beginner users).

The light bulb indications suggesting a course of action were either perceived as a possible annoyance, or simply as a feature that would go unnoticed.

Another dual perspective was provided regarding the notification light bulb and demos and tutorials; when some tester found very useful to be guided through their visualization, a tester declared that it might be confusing to understand if the first visualization it's just a demo or a tutorial rather than a real exploration, this could have been due to the restricted scenario of the prototype.

A common point of discussion was regarding the sources of the personalization features. All subject questioned why certain things were personalized for them and how the system could know what they would be interested in. This echoed the concerns raised during the distorted heuristic evaluation tests (chapter 6.1). The reason for those doubts could be theorized to stem from two main factors. Firstly, the test scenario was personalized for a different target user, far away from what the Company employees, who are working in IT development and are expert users. Secondly, due to the low interactivity and explorative nature of the prototype, it might be hard to see what actions lead to what kind of personalization.

6.4 Pitch presentation

The company employees have a wide range of different expertise from different point of view of the service, presenting our concept to all the employees in house could have gave us a great variety of feedback from different perspectives and give back the Company the result of the work produced during the last months of the thesis.

A presentation was held during the weekly office meeting of the Company, giving an introduction of the personalization and trial concept that had been researched and going through the prototype with the scenario used for testing.

Most of the feedback and questions were based on the testing done with users and about hypothetical cases that could arise.

7 Results

In this chapter, the results of the project are covered. First, the final concept and prototype that was built to test the application of the design guidelines is presented. This includes the results and considerations that were derived from the evaluation of the prototype. Closing off the chapter is a presentation of the final proposed design guidelines for designing personalization of a cloud-based analytics service for achieving facilitated evaluation of the system for a trial user.

7.1 Yellow Thread - Personalization applied to a cloud-based analytics service

The final concept, which was realized as a prototype, was named "Yellow Thread". The concept is an attempt at incorporating personalization as an aid throughout the user experience of the Company's service. Depending on the context, if the user is browsing the library of content or working with an analysis, the type of aid provided and personalized will differ, but the concept is tied together by the use of a common element signalling the personalized aid; a yellow light bulb symbol.

Figure 26 - The concept logo

At a conceptual level, this design implies that the system should collect information about the user in three areas; (1) the users field of work, (2) her prior experience analytics and analytics tools, (3) and data generated from her (and also other users' within the same organization) usage of the Company's service. These are the types of information used for being able to provide the personalized experience in the "Yellow Thread" concept.

The concept was realized as a prototype, which was created in InVision, that simulated the experience of working with the Company's service with the "Yellow Thread" concept implemented. The scope of the prototype was limited to only include the a scenario of creating a first analysis based on a personalized demo dataset, which was the designated

test scenario. The prototype was created from modified screenshot images of the Company's service, and provided only limited interactivity required for testing the added personalization features and completing the scenario.

A number of features applying personalization were designed and added to the prototype, tied together within the "Yellow Thread" concept. In the following subchapters each feature will be described, followed by specific results from evaluation regarding the feature, that could be extracted from the A/B testing, distorted heuristic evaluation, and expert interviews.

7.1.1 Modal window with personalized message

Scope of the feature

This is a welcome message dialog, which is displayed after logging in to the service, which shows an introductory message that adapts according to the information the system has of the user. In the prototype, the purpose of this modal welcome window is to explain in short what the Company's service can do specifically for people in the field of work of the user.

Upon first use, this welcome message dialog also serves the purpose of introducing the recommendation system, explaining the meaning of the light bulb icons hat she is going to see/find/use in the program.
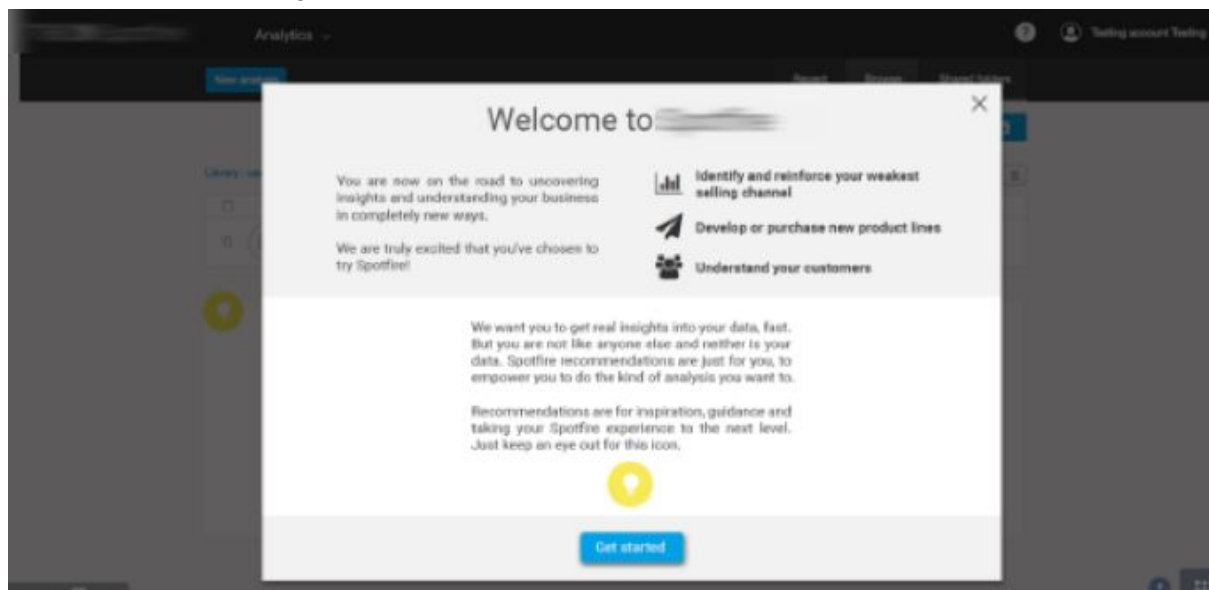
Fig.27 - Adaptive welcome screen, as shown to a first time user who works in retail.

Personalization guidelines applied

- *Highlight relevant information and hide away less relevant*
- *Communicate qualities/selling points that match the expected use of the user*
- *Communicate the most valuable benefits that the product can bring to the user*
- *Adaptive first impression*

76

General results on the application of the feature

The modal message dialog, even when it was noticed and read, was scanned so quickly that the information communicated did not seem to stay with the user during the following tasks. Very few users remembered that the welcome message recommended them to look out for the light bulb icon. Most users just closed the dialog box as soon as possible.

Positive sides emerged from testing

Some users remembered the light bulb indication, even if they had trouble connecting all of them because of coherency problems, such as that the light bulb icon would sometimes be gray, and that it would appear in so many parts of the interface.

An internal tester from the Company suggested that this "in-between screen" could however be a good channel of communication to the users to keep her informed on news and so on, like a context newsletter.

Negative sides emerged from testing

One of the reasons why the message was probably read by users is the nature of testing itself. Users followed instructions carefully without questioning too much what was presented, to achieve a more reliable feedback. The concept should be tested in an environment where the user won't feel obliged to perform a task. Testing a one time only login/registration interaction doesn't give enough insight of what could be the effects of changing and personalizing the welcome screen message more.

Future work

To determine whether to include and evolve the modal welcome message, it would be required to do longer and more thorough evaluation to determine if it achieves the goals of communicating with the user and showing relevant information. A good example to explore is how Adobe Cloud welcomes users at launch (Fig. 28) - to know what to display when downloading the software, the user is asked to specify her the level of proficiency
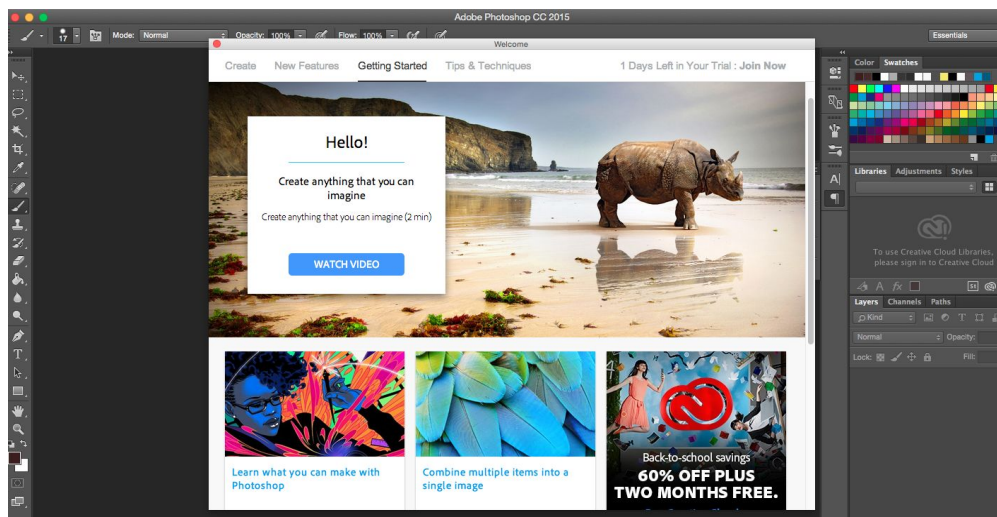
Fig.28 - Personalized welcome screen with tutorials relevant to tool's proficiency used by Adobe Cloud

Another solution for improving the initial modal window could be to reduce the text to bare bones.

7.1.2 Adaptive video, tutorials and demos on the library page

Scope of the feature

Getting to the library screen after signing up, without any further indication on what are the possibilities of actions can be a bit daunting. Including suggestions of content, such as demos, tutorials and extra content that is personalized based on the previous usage of the system by the user, could be the key to enable first time users to learn, and to engage more experienced users with more advanced features they have not embraced before.

The prototype implemented this addition as a new section of the library browser, Recommendations, where the recommendations light bulb icon was once again explained and two pieces of learning content were presented as recommendations; a video about the Company's service for users working in retail, and a generic getting started tutorial (Fig. 29). These recommendations were only conceptual and could not be clicked, however, and included to give a sense of what kind of content could be recommended in this context.
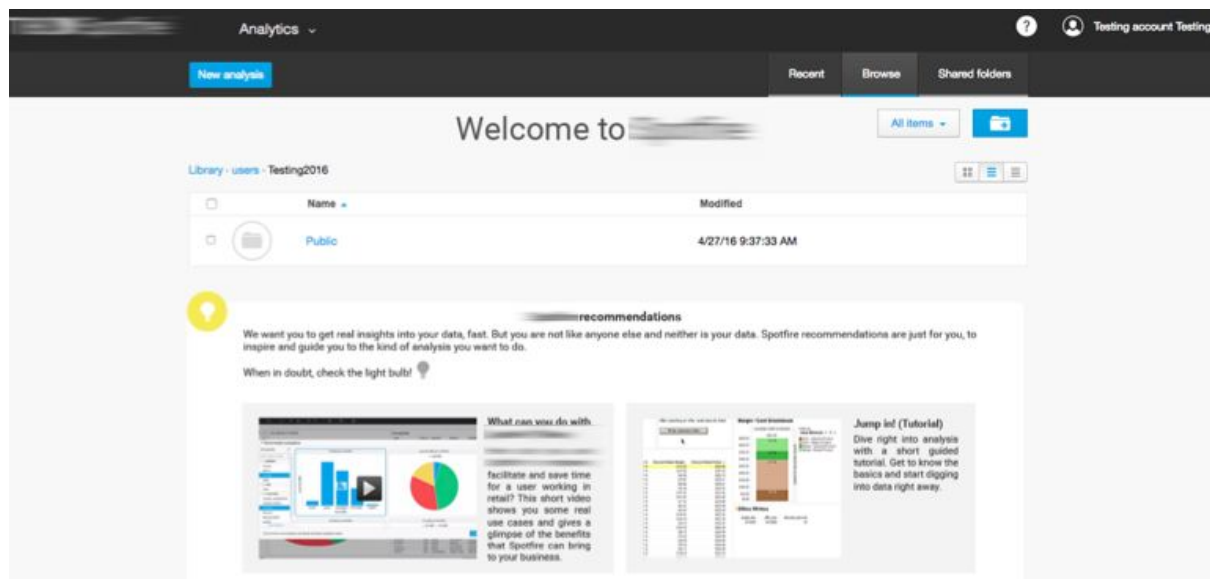
Fig. 29 - The Recommendations section in the library browser.

Personalization guidelines applied

- *Clearly communicate what information has been used in order to personalize and what value it gives back.*
- *Personalize teaching resources*
- *Support serendipity*

General results on the application of it

Even though some testers noticed the Recommendations section, the content recommended was out of the scope of the testing. Some of the users mentioned that they would have looked at them before starting the product, but the majority of users just went straight to the task. This could be due to the fact that the task given to the testers was very specific and they focused on following the instructions rather than figuring out what to do on their own.

Positive sides emerged from testing

Several tester vocally expresses that if they would have approached the service on their own, they would have started their exploration from watching some tutorials. The fact that some expressed this wish upon noticing this Recommendations section in the library browser, indicates that this might be a place to showcase recommended learning content that is worth exploring further.

Negative sides emerged from testing

Not providing real personalization or actually including the material displayed might have influenced the tester to ignore it, as not perceived as being of interest. This type of suggestions seemed to be deliberately ignored by those users that wanted to play around directly with the service itself. Last but not least, the guided task didn't required the tester to interact with the demos and tutorials, which might have influenced the perception of how those could have been of help.

Future work

It could be a bit redundant to have an adaptive welcome message, plus an adaptive personalized demo and tutorial in the starting page. A good balance would need to be achieved between the two, if not blended into a single segment of the user journey.

7.1.3 Recommended personalized dataset for analysis

Scope of the feature

The idea was to provide sample data to the user to start working with, which would be suggested based on relevancy for the user. In the prototype, this was added as a new way to load data when creating a new analysis file, labeled "Recommendations", which would display suggested sample datasets to start an analysis from.

When clicking "Recommendations" a dialog box would open, where three datasets were suggested. The datasets displayed as suggestions in the prototype were conceptualized as being personalized based on the user's field of work ("Retail product range data" and "Smartphone Sales") and location ("Local weather data"). The actual dataset used for the scenario was the "Retail product range data" dataset.
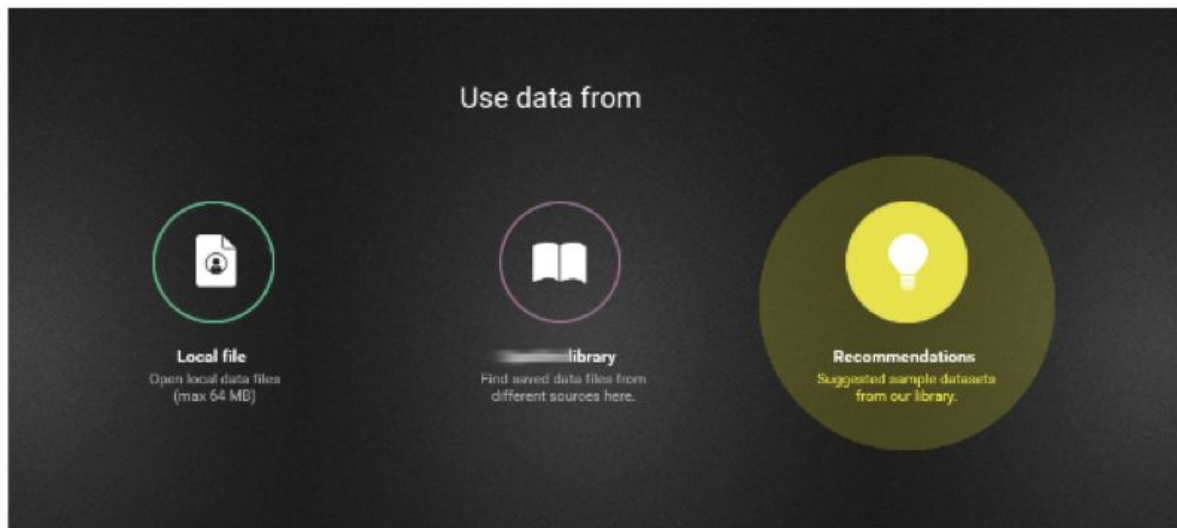
Fig.30 - The recommended data access point
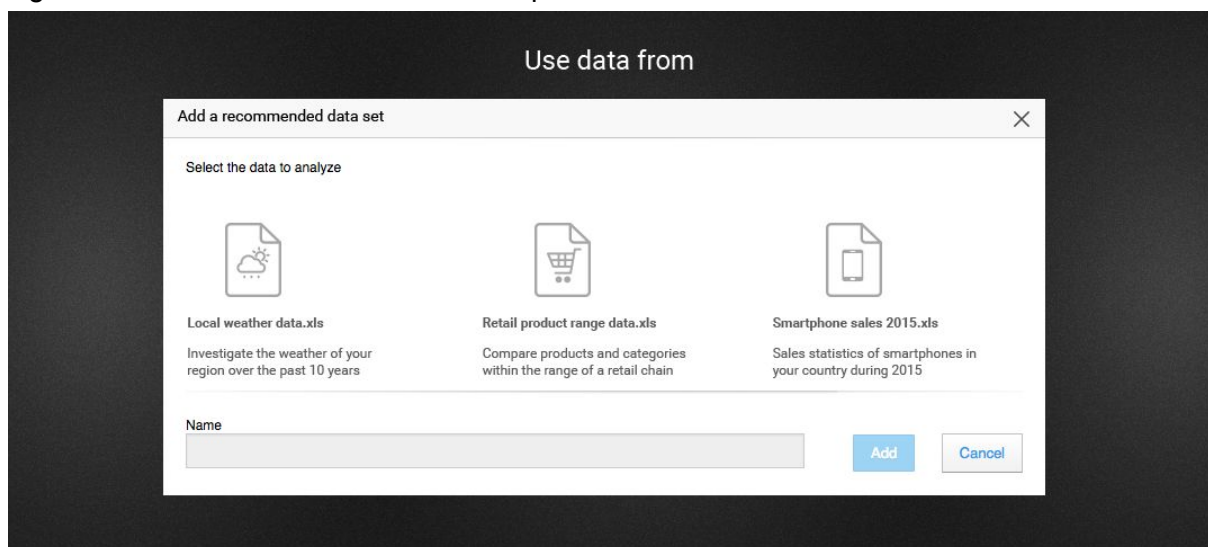
Fig. 31 - An example of datasets recommended in the prototype.

Personalized guidelines applied

- *Highlight relevant information and hide away less relevant information*
- *Use a general personalization, based on only a few pieces of information, and allow users to explore deeper on their own*

General results on the application of it

In the test scenario, the tasks during which this feature was included was tightly guided, so not much relevant data could be collected regarding this specific feature. The users were tasked with opening the recommended dataset "Retail product range data" and did not reason or comment regarding the different adjacent suggestions in the interface, rather they aimed to complete the task that asked for. that was also the most centred option given.

However the positioning of the icon to access the recommended data seems to be very important, some user took some time to find the "Recommendations" access point, because the access point was the most right one on screen.

Once the "Recommendations" access point in the interface was found, it was very simple for the user to find and open the suggested data. It was however not clear if they understood why the data was there and why and if was recommended to them. Feedback from internal testing suggests this could be a positive feature, as it could be very useful for new user not to get lost with a badly formatted dataset, and to work with data that is (hopefully) familiar to them.

Negative sides emerged from testing

It seemed it could be a bit confusing for a new user to understand the different options presented for loading data for the new analysis: "Local file", "Library" and "Recommendations". The common color element of the yellow light bulb was somewhat broken, because to fit in with this part of the interface of the Company's service, the light bulb icon is gray until the user hovers the mouse over it. And when hovering over it, the colors are inverted, the light bulb itself being white with a yellow background. Before hovering over it, the yellow light bulb icon is very subtle and was not immediately recognizable, adding extra cognitive effort from the user to invert the color and understand the lightbulb suggestion part of the interface.

Future work

A future step to take to improve and test this personalization feature would be to consider wisely where to place the access point for the recommended dataset feature. Perhaps the user does not expect to be recommended a dataset to work with after initiating the "New analysis" workflow, and the access point should be moved.

In the context where it was placed in the prototype, after clicking "New analysis", details should be adjusted and tweaked to make sure the feature is understood correctly, and is suitably noticeable. Naming the access point in a clear and distinct way would be important for making users that want to use such a feature notice it.

7.1.4 Trying the product with a personalized, suggested dataset to fit the user

Scope of the feature

The test scenario in the prototype centered around the task of working with and analyzing a suggested sample dataset, personalized for the user based on her field of work. The dataset used in the prototype contained sales data for a retail store chain, which should supposedly be familiar to the users selected for testing the prototype (who were selected on the criteria that they should be working in retail).

The selection of this dataset would set the tone for all the following analysis tasks in the scenario, and the purpose was to facilitate for the users the process of relating the Company's service to their own daily work.

General results on the application of it

The personalized dataset was used both in the prototype tests, and for the control group that tested the real web client of the Company's service. From observations of the user tests with the real web client and the prototype, it seems that the use of a personalized dataset, that the user can relate to, allows the user to understand the product better. The users managed to come up with their own hypothetical user cases and to actively think how they could use the product in their work, often referring to the dataset and using details like column names, that they could read in the interface, to come up with further use cases.

Positive sides emerged from testing

Working with data with content that feels familiar seems to shorten the "mental gap" that the user has to traverse in order to understand the product in her own context. There is a level of "translation" required when carrying out certain activities in a program to be able to imagine what role it would fill in the user's real context. Even if an example data set does not exactly match the user's own data (of course, it never will), the mental leap from a collection of "Product range sales" to the user's retail environment is unquestionably easier to make, than from a file with "High jumping records" data.

Such an effect seemed quite strongly present during our user tests. The users were not familiar with the data set, but they displayed an intuitive understanding of the columns they were working with. Columns were labeled profit, selling price, product category 1 etc., which were concept that seemed very familiar to the users. Most users could quickly start describing how they could apply the product in their working lives. The scenarios they described were mostly quite similar to analyses that could be made with the sample data set; including profitability, sales prices, store performances etc.. The effortlessness with which users could think of these scenarios, as well as their similarity to the activities carried out within the product, lead to the assumption that working with a personalized sample dataset facilitate the understanding of the usefulness.

Familiarity with the names of data columns inspired the testers to come up with their own scenarios and to use the data set for their own curiosity (when in the web client test). The facility with which they explored hypothetical use cases was mostly to be attributed to the data set they were being exposed to, in either the prototype or the company web client.

Negative sides emerged from testing

No evident negative effects on the user experience could be captured from the testing of this feature.

Future work

Personalizing this aspect of the trial of an analytics service, to facilitate the evaluation process for new users, shows much promise worth exploring further. It would be interesting to investigate the effects of personalizing the sample data on other factors (for example location or other interests) and to test datasets that even closer match the user. The combination of data retrieved by sign up information and user's usage of the service could provide a more precise match of data to explore, not only based on field of work, but also on the expertise and other parameters, which would be interesting to further research.

7.1.5 Recommended visualization "popular analysis"

Scope of the feature

Having loaded some data and starting to work on new analysis for the first time, the recommended visualization window is opened by default. The addition to the recommended visualization window is a panel on the right-hand side that shows popular visualizations (Fig.32). As opposed to the recommendations in the standard version of the recommended visualizations tool, the suggestions do not require that the user selects columns of interest, but would rather be based on other users' usage of similar data. This behavior was only conceptualized and mimicked in the prototype, in which a selection of a preconfigured barchart or treemap visualization was suggested.
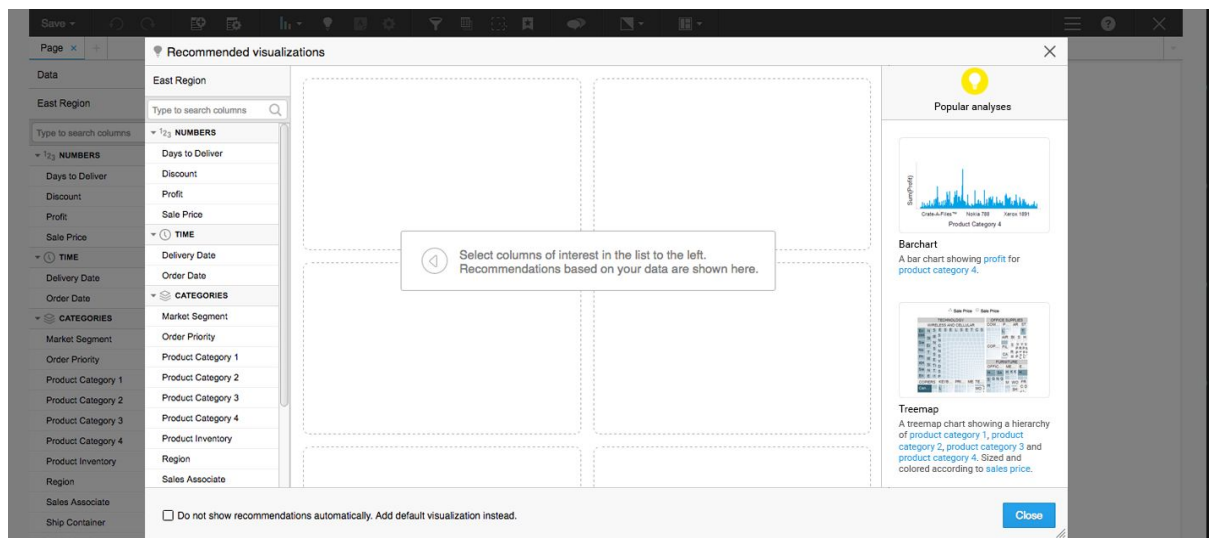
Fig. 32 - On the right-hand side of the recommended visualization panel, suggestions of popular visualization configurations for the dataset are previewed.

Personalization guidelines applied

- *Support serendipity*
- *Use a general personalization, based on only a few pieces of information, and allow users to explore deeper on their own.*

General results on the application of it

Among the additions to the graphical user interface, this feature seemed to be the most noticed and impactful. Most of the user taking part in the test directly or indirectly noticed the right-hand side panel with suggested visualizations. Some users used it to add the visualization, even if they got slowed down or confused by the lack of feedback on the action provided in the prototype.

It seemed that even the testers that used the feature did not understand fully that the visualizations were already preconfigured to visualize certain columns of data. Some of the users, after having added the visualization to their analysis, started looking for where to add the columns that were requested in the task.

It seems that the preview of the recommended popular visualization was perceived just as a way to add a type of visualization. This indicates that an interesting behavior to try, for example, could be instead of selecting columns and seeing what type of visualization were suggested, it could be possible to select a type of visualization and see what combination of columns it would be suitable for visualizing.

Positive sides emerged from testing

The testing suggests that the addition of an area of the recommended visualizations window to be pre-populated with suggestions is easily noticed. The right panel with popular analysis is the only part of the interface with some appealing elements (suggested visualization) this catched the attention of the users we tested the prototype with. Having some visualizations suggested to start with reduces the risk of the dreaded "blank first page".

Negative sides emerged from testing

The space in the interface is limited, the visualizations preview images were too small to be fully understood and most of the user expected as a feedback to see a bigger preview once selected. What was noticed was basically the name of the visualization, because the task was asking for a specific one. It was indicated that users, in the context of having just started their first analysis and landing in the recommended visualizations window, had a hard time understanding that the visualization was already configured to visualize certain columns of data.

Future work

The idea of suggesting visualizations based not only on the user's explicit selection of data columns to visualize, but on additional factors, is a concept worth investigating further. In the tests of this feature, it seems that suggesting visualizations this way, when the user has just started using the software, can provide a good starting point for the user, but that it also has implications on how the user can understand how visualizations are created.

Further design choices need to be taken on the nature of the suggested visualizations, what should the suggestions be based on? How much control should the user have on the suggestion criteria? If the user has control, is the decision being made in the interface itself,

or should it be located elsewhere among other options? If control is not given to the user to choose what are the recommended visualization how do we communicate to her why those visualization are thought to be the best for her? Could the user understand how to influence the recommendation or decide to silent them as not relevant?

To test this feature as it is intended to work, with suggestions based on actual usage data, a large collection of metadata on the usage of the software and of visualization created among common files is needed for this foundation. Even if most of the features in the design would require data collection, it is especially true for this feature.

7.1.6 Light bulbs indications on the top menu

Scope of the feature

This feature was intended to direct the user's attention towards relevant and interesting options in the analysis interface, depending on the context and what features the user has explored before. To facilitate getting oriented while working with an analysis, without removing options for any users, subtle light bulbs indicators were added on the top toolbar (Fig.33). The light bulb icons serve the purpose of guiding and to suggesting interesting relevant actions to the user.
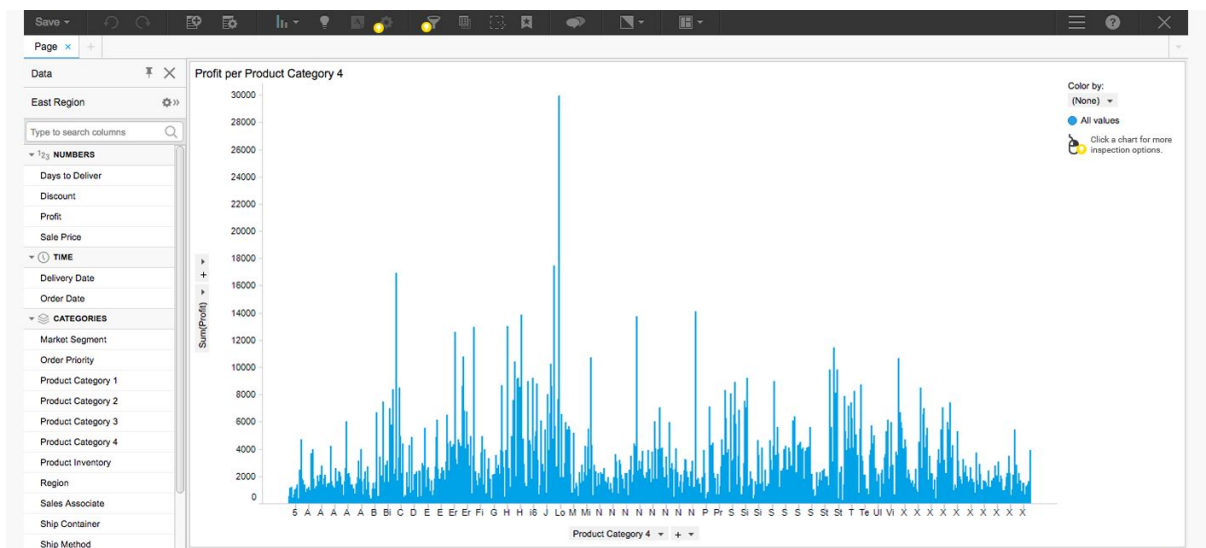
Fig. 33 - Highlighting the Properties and Filters controls in the top menu are light bulb icons, suggesting that these could be actions for developing the analysis further.

Personalization guidelines applied

- *Supply guidance on relevant course of action and features*
- *Support serendipity*
- *Use general personalization, based on only a few pieces of information and allow users to explore deeper on their own.*
- *Keep "non highlighted" information clearly accessible*

General results on the application of it

The idea of suggesting courses of action, relevant to the current use context, could be explored further more consideration and tweaks. Most of the users noticed the light bulb indications. This might however have been due to the the limited interactivity of the prototype, which meant that often the only available interactable elements were the ones highlighted with light bulb icons. This makes it difficult to draw clear conclusion on this feature. It should be noted that despite the presence of the light bulb icons, the users would often get lost and search around the interface for the correct course of action.

Some users reported that they found the indication of the course of actions useful, as a sort of tutorial in product that could help them find what to do, others wanted more freedom to explore, which was not not possible in the prototype.

Positive sides emerged from testing

The small icon was noticed in most in most of the tests. Among those tester that noticed it, some saw them as a neat seamless guide within the interface, a non intrusive guiding tutorial.

Negative sides emerged from testing

Some of the hints in the interface were not noticed at all during the tests, making it lose the role of guidance through the interface.

Also, in some cases even when users acknowledged that they had noticed the light bulb icons, users would ignore the indications or behave in a way that indicated that they could not quite understand the purpose of the light bulb icons. These were situations where the users would search through the interface for the correct option to use, seemingly not being helped by the highlighted options.

Future work

In the limited environment of the prototype, which lacks the possibility for real exploration and use of the Company's service, it's hard to evaluate the use of such a user aid. In order to truly test a personalized version of this feature, it would be required to identify what data to base the personalization on. The system would probably required data on the user's prior experience with the service, and it would have to be able to adapt according to the user's actions; accordingly it would have to adjust the type of suggestions provided.

From the internal testing with people at the Company, it was suggested that the visual appearance of the indications and the way they are displayed in the interface would have to be carefully considered. They would have to be clearly displayed and noticeable, but also subtle enough to avoid being disturbing and obtrusive. It would probably also have to be possible to at any moment turn off the suggestions.

Another improvement would derive from identifying what to suggest, at which stages of the user journey the feature would be most helpful, and what data to use.

7.1.7 Light bulb icon showing recommended visualizations in the "add visualization" and "add details visualization" drop-down menu

Scope of the feature

When using the toolbar to add a new visualization, a light bulb indications were added in the drop-down menu of visualization types, intended to recommend suitable visualization types to analyze the data in the analysis (Fig. 34). The suggestions are either based on the type of dataset that is used, or on the useful visualizations according to information provided by the user: field of work, role, most used visualization types by the user herself or other similar users. Clicking the light bulb icon will open a side panel with more explanation about the recommended visualization type. The information panel will show some relevant examples on how to apply that visualization, or how such a visualization is used in the field and what is achieved with it.
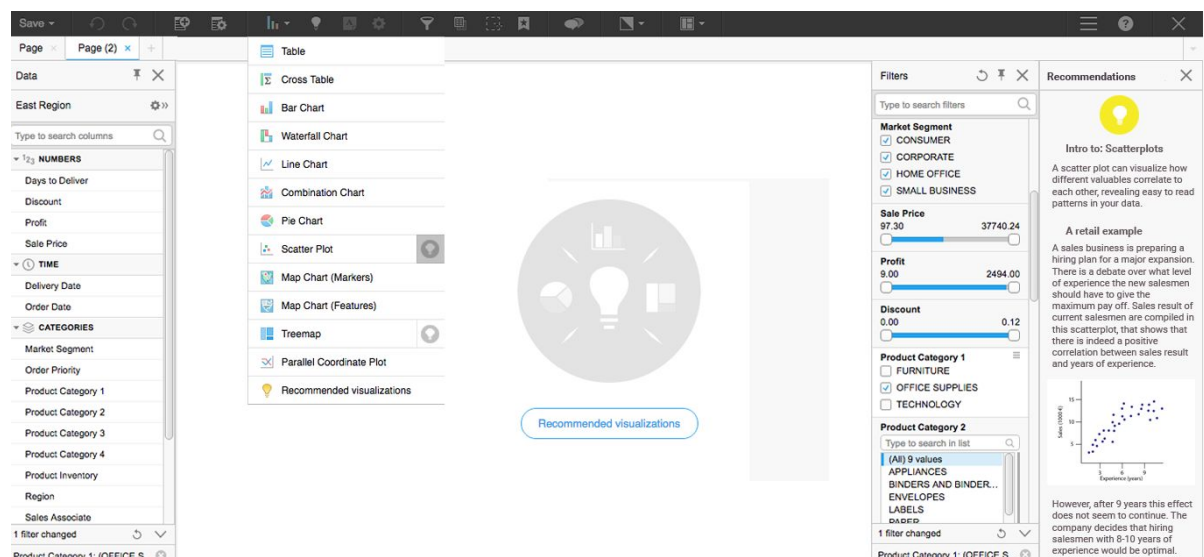
Fig. 34 - Suggested visualizations in the add visualization drop-down menu and a personalized explanation of the scatterplot visualization.

Similar recommendations are provided in the Create details visualization drop-down menu. When a user wants to drill down into the data in a visualization, by creating a details visualization, the system will suggest which type of visualization will better fit together with the main visualization (Fig. 35). Similar to the recommendations given in the add new visualization drop-down menu, it is possible for the user to get an explanation of the suggested visualization types and why they are recommended, by clicking the light bulb icons.
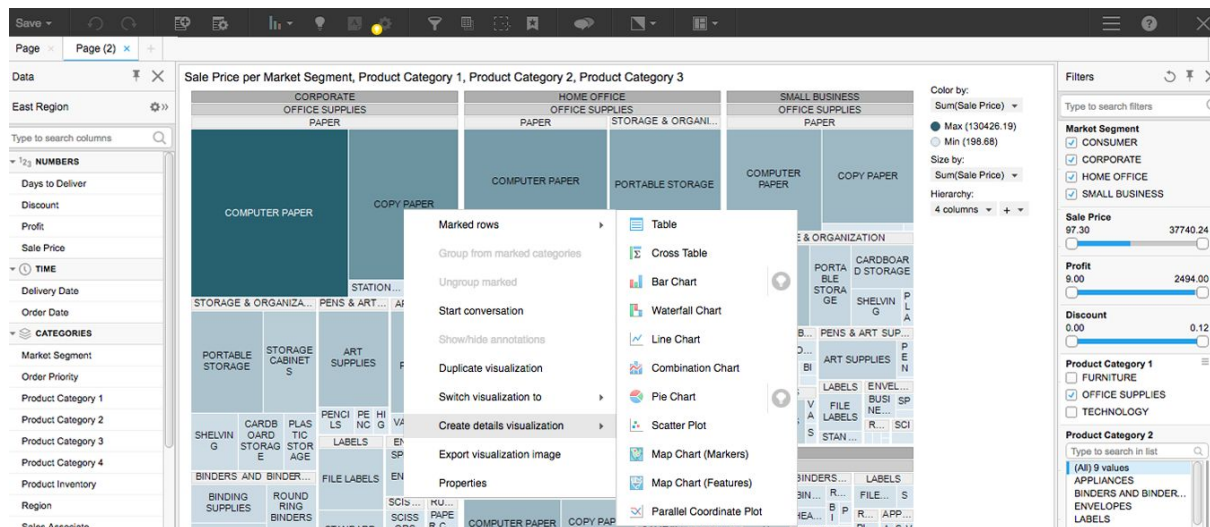
Fig. 35 - Suggested visualization in the Create details visualization drop-down menu.

Personalization guidelines applied

- *Supply guidance on relevant courses of action and features*
- *Support serendipity*
- *Clearly communicate what information has been used in order to personalized and what value it gives back.*
- *Use general personalization based on only a few pieces of information and allow users to explore deeper on their own.*
- *Keep "non-highlighted" information clearly accessible.*

General results on the application of it

Most of the testers did not seem to notice this added feature at all. None of them seemed to use the light bulb icons to facilitate navigating the different options, and they never clicked a light bulb icon so that they could discover the explanatory information. Rather than exploring the different available visualizations in the menu, the testers would follow the instructions in the task and identify the visualization type that they were tasked with adding.

Positive sides emerged from testing

Though the A/B testing results did not implicate anything other than the fact that the feature was difficult to spot, some positive reactions were voiced from the internal testers at the Company. The possibility to highlight a relevant path to take or visualization to use might help those users not familiar with the different types of visualizations.

Negative sides emerged from testing

During internal testing, concerns were voiced about the feature. For example participants asked why certain visualizations were recommended, and not others. It seemed that the light bulb recommendations for visualization type gave rise to questions that were not answered by the feature, creating an unsatisfactory experience. Even if additional information about the recommended visualization could be presented by clicking the lightbulb, this seemed not to be enough..

Another problematic aspect that was brought up during internal testing was the inconsistent color of the light bulb in this part of the interface. In this feature, it was grey instead of yellow, which is not only inconsistent with the other recommendation icons, but also less noticeable in the user interface. This might have been a reason why the feature was not noticed by most testers.

Future work

A few adjustments could be made to improve the experience of using this feature, by for example clarifying directly why a certain recommendation is provided, maybe by using a mouse hover with a quick explanation. Applying a consistent style of the light bulb and a better positioning would also make it more clear for the user that the feature is part of the same personalized recommendation system. A different way to present suggestions for relevant visualizations could be by ranking them based on relevancy.

Another aspect of this feature to investigate further is the effect of providing on-demand personalized help information about suggested visualizations or other parts of the product. This part of the feature was not noticed so no input could be gathered on its impact.

7.1.8 Right click/Click for further inspection icon

Scope of the feature

To suggest and indicate viable right-click interactions. When using a service in a web browser, it can be difficult to intuitively understand that right-click interactions are available in certain parts of the product. Some of the features in the Company's are only accessible this way.

Often, viable options and features for developing an analysis further are available via right-click interactions, such as options for marked rows and drilling down, generally accessible by right-clicking on the visualization of interest. Because the right-click interactions can be difficult to discover for new users, this feature was added - a lightbulb icon with a text hinting at the availability of right-click interactions, designed to be displayed for users who have not yet used the right-click on the visualization.
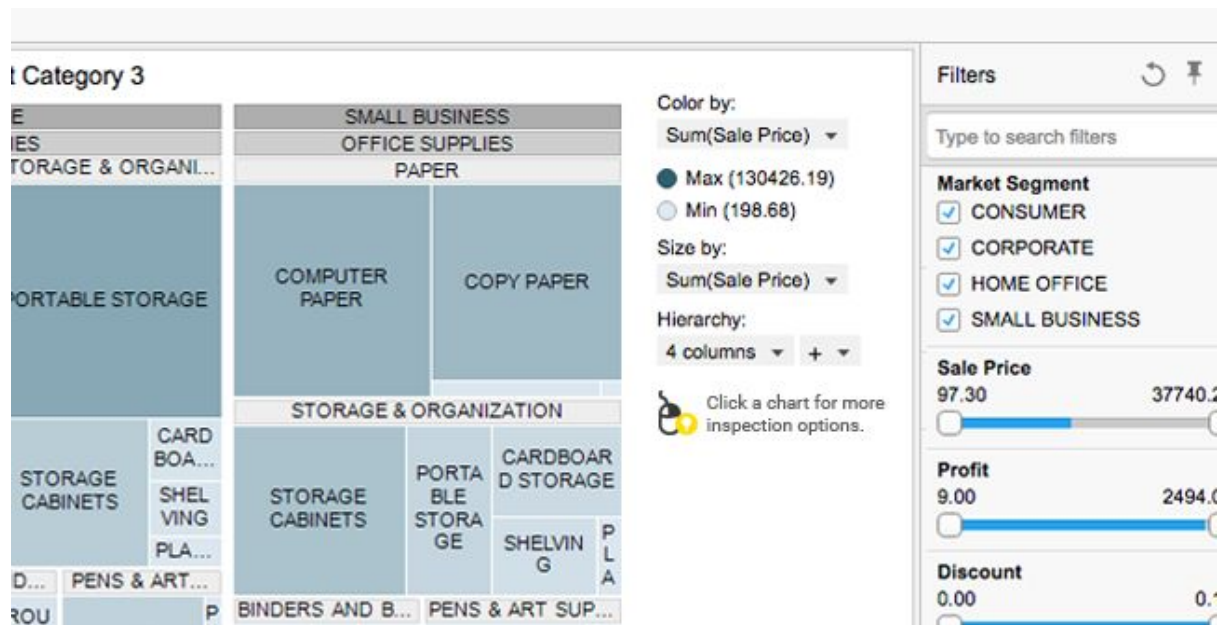
Fig. 36 - Positioning of the "right click for more inspection options" hint.

Personalization guidelines applied

- Supply guidance on relevant courses of action and features

General results on the application of it

The hint icon highlighting the availability of right-click interactions was ignored in most of the tests. Even for the few tester who noticed it, it was seemingly difficult to understand where one should right-click to access the extra options.

Positive sides emerged from testing

During our test we could observe than when reaching high frustration levels, users try to scan the interface to find what they were looking for. In these cases, these kinds of visual hints can be helpful for guiding the user towards viable options, but this particular visual hint did not seem to provide sufficient help.

Negative sides emerged from testing

Unfortunately the program used to create the prototype (InVision) doesn't support right-click interactions. When testing, this caused even more confusion for the users who did notice the hint, which used an icon that visually indicated right-clicking.

Future work

It could be argued that highlighting the availability of right-click interactions was not a problem well suited for solving with the use of personalization. It is a usability issue where adaptability based on the user is not quite necessary. The hint should be removed and more work should be done from a general usability perspective.

7.1.9 Light bulbs indicating part of the visualization legend to interact with

Scope of the feature

Light bulb icons are used to guide the user's attention to axis selectors that might be of interest, for further configuration of a visualization. The purpose is to introduce further viable options for visualizing the dataset.

Once a visualization has been created and configured by adding columns of data to the basic visualization axes (for example the X and Y axes in a bar chart), the visualization can often be tweaked and developed further by adding columns of data to other visualization axes. Such axes include axes like color by, size by, and shape by. And sometimes, some axes can be configured in more advanced ways, such as the hierarchy axis of the treemap visualization (Fig. 37). The selectors for configuring axes like color by, hierarchies, etc are generally located in the legend of the visualization.

The suggestions to configure these options in the legend would be based on the user's usage statistics (has she used this feature before?) and on the current use context (what visualizations are being used?).
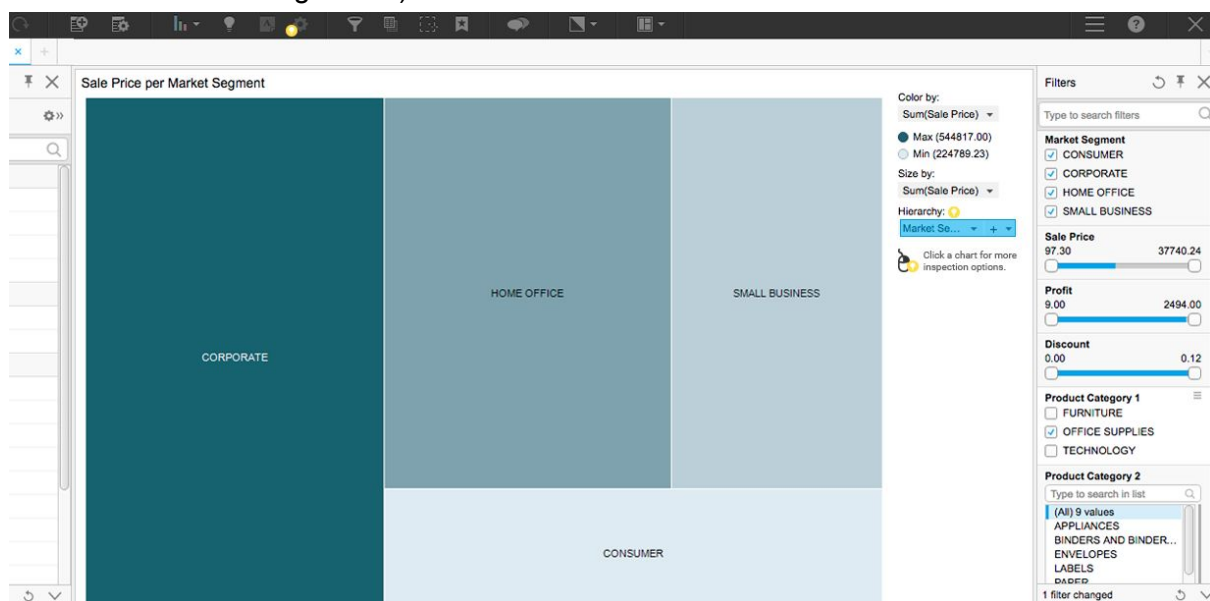
Fig. 37 - A hint next to hierarchy axis selector, suggesting an option for configure the treemap visualisation.

Personalization guidelines applied

- *Supply guidance in relevant courses of action and features*
- *Keep "non-highlighted" information clearly accessible.*

General results on the application of it

The hints were ignored or not noticed by most of the participants testing the prototype, and it seems that it did not seem to make a difference that these lightbulb icons were there to indicate a possible way of action, compared to the tests with the real client.

Positive sides emerged from testing

No particular positive effects of this feature could be discerned, given the limited response received.

Negative sides emerged from testing

In the few cases were the hint was noticed, it was hard for users to identify if what the lightbulb icons were suggesting that they interact with. It seemed users were not sure if they were they supposed to click the icon itself, or the drop-down menus.

Future work

This minor tweak is probably not a viable way to go to use personalization efficiently in the trial experience. As future work, it would be good to remove it from the test as it creates more visual clutter, and focus on other features that have a higher impact for helping the user make a first evaluation of the product..

7.2 Guidelines for the use of personalization in the trial of an analytic cloud

The following are the final guidelines proposed in the project.

7.2.1 Guidelines

1. **Identify what information is required about the user, in order to personalize the product in a relevant manner. Gather this data!**

   Every product that aims to provide a personalized service to its users should identify what are the core information needed for her. Some data might be already being collected by the system and ready to be reused for personalization purposes. In some cases as little as couple of question to assess the proficiency of the user and their field of expertise can be enough to provide a good personalization.

2. **Invite the user to give data to the system to improve her experience**

   Getting permission to **collect automatically data** from the user or letting her **giving manually information** to the system, it's to be addressed to the user in the most effortless of even fun way available. The manual input should not bother the user during important tasks, should be elective and always available for the user to edit at

her peace and liking.

Ask all the information that COULD be needed at once before the user get to benefit from the system being tested.

Ask only for the information that are needen when they are relevant and gather the other automatically as much as possible. (IP adress for location and file extension for type of file)

Before we start. could you tell us where you are located?

Next →

Use IP adress to locate the user. Decrease the cognitive effort required from the user to insert her data.

✗ Location asked with no way out

Which file do you prefer to work with?

Next →

Analyze extension of file (.csv .xls) when the user starts exploring the potential of TheProduct.

✗ Out of context question, the user didn't get the time yet to experiment with the system and get asked question about how she will intend to use it.

Fig. 38 - Few examples on how to get data to use for personalization.

3. **Highlight relevant information and hide away less relevant information**
Personalization can be effective in reducing information overload (Li & Unger, 2012) and supporting information acquisition (Jameson, 2007). For a complex software, such as The Company Product, there can be overwhelming amounts of information required to describe the full range of possibilities it offers. This may result in a cumbersome experience for the user, when trying to understand the relevant qualities

and use cases for her. Personalization can be applied to identify what the user needs to know to highlight this information and hide away what is less important, so as to allow the user to faster gain an understanding of the product and reduce the effort

Show all information and complex functions available from first use.

Show a recuced amount of functions and informations that are relevant to the user according to the information she provided or the system gathered.
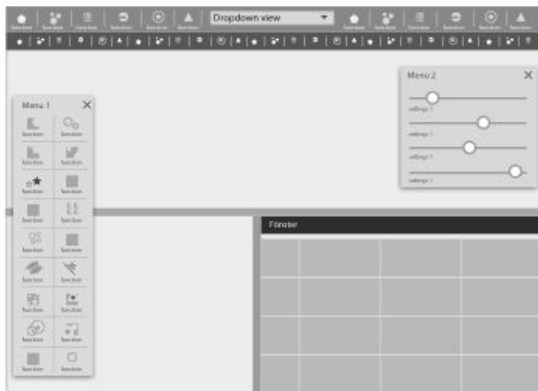
❌ For example using the type of teaching resources as a way to provide further perosnalization, ignoring the skill level that the user has reached or previously aquired.

✔ For example recognizing that the user is already at a proficiency level interested in a specific type of graphs, and provide not only video but other advance materials about these typologies of graphs.

required for the process.

Fig. 39 Exempel figure on highlight relevant information

4. **Personalize teaching resources**

Learning can be facilitated through personalization (Jameson, 2007) and could reduce the perceived learning cost which is a factor in evaluating a software trial. Also, by becoming more proficient with the software, the user will also get a deeper understanding of its usefulness and ease of use. An example of personalized learning is to make recommendations about teaching material. Klasnja-Milicevic et al. (2011) show how a simple recommender system, highlighting teaching resources that fit the user, can make learning more effective.

Teaching material should be made relevant to the user, for example by making recommendations about what material is relevant to the user according to her level of expertise (e.g. what lessons has she already completed?), interests and learning style.

Fig. 40 - Examples on how teaching resources could be personalized

5. **Supply guidance on relevant courses of action and features**
   Zimmerman & Nerdinger (2011) argue that software evaluation, because of being immaterial goods, is often done in a more realistic and ad-hoc manner. This means the user adapts a less careful "just try it out" approach.

   To support this behavior, personalization can be applied in the form that Jameson (2007) describes as advice about system use. For example recommendations could be made, not only about teaching material, but courses of action and features that could relevant to the user, based again on previous use, interests etc. The purpose is for the user to get a better sense of the scope of the software and its usefulness, without being overwhelmed by information about features that are not currently of interest.

6. **Support serendipity**
   Zimmerman & Nerdinger (2011) suggest that users are often aware of their needs only implicitly, when deciding to trial a product. They may only have a vague idea of what they need the product to do, in terms of a certain function for example. Allowing the user to fulfill this need is naturally first priority, but there might also be other features of interest to the user, although she is not explicitly aware of it.

   By making suggestions that are outside of what has been explicitly expressed by the user, the user might get a richer understanding of the usefulness of the product.

Show actions and features available all at the same time.

Show actions and features available based on previous usage of the system and knowledge gathered of the user.
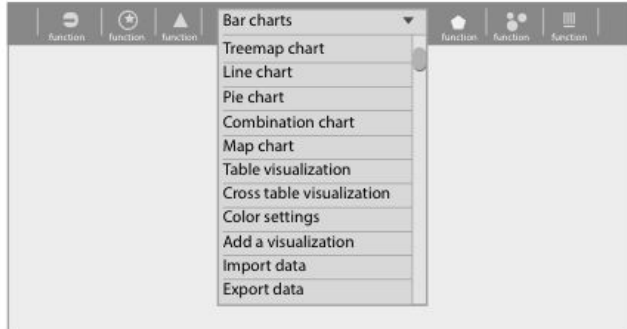
In a drop down menu, showing all the available options in along list without considering the latest or most common used one.

In a dropdown menu, highligting on a separate groups, the options recently used or the one related or suggested for the current workflow.

Fig 41 - Support guidance of relevant course of action and support serendipity

8 Discussion

In this chapter, topics relevant to the project and its outcomes are discussed. Topics covered include methodology, positive and negative factors that might have affected the results, things that could have been done differently, as well as future work in relation to the research question.

8.1 Research question

During the course of the work with this project, the research question has slowly been molded into its final shape. This was a process that continued long into the project, and it would be influenced by findings made all the way into the ideation phase. Tweaks to the phrasing were done all the way through the later phases of the project, in order to make it as clear and understandable ass possible, but these alterations were soley linguistic.

While there were no radical detours from the initial draft, the final research question has a much clearer focus and has an evident base in the findings from the literature studies. How personalization could influence the effective purpose of using a trial version of a digital service, that is to evaluate the product, was brought into the forefront of the question, instead of the broader idea of the "user experience during the trial journey".

Leaving the door open for iteratively working on the research question, letting it be influenced by findings during the project was largely positive, as it meant the project was not tied down to a question based on ill-founded early preconceptions about the subject matter. Continuously working on the question also meant that we did not lose track of the purpose of the project, while making sure that the question we were trying to answer was not getting 'out of sync' with our understanding of the topic.

However, it can be argued that settling on a final version of the question a bit earlier could have been preferable for focussing the efforts during the ideation of the project. This could have been achieved by working more intently with finalizing the question after the literature studies.

8.2 Process

8.2.1 Methodology

8.2.1.1 Literature studies

Finding and reading literature to form a sound base for the project, there were multiple challenges to tackle. The volume of material to work with proved problematic, both in that there were tremendous amounts of literature to read and tonnes of sidetracks to evaluate, while it was simultaneously difficult to find many sources that would prove truly valuable.

A large amount of time was spent searching and browsing for literature to use, and in the end it was the time allotted for literature studies that had to set the limit. Hard choices had to be made about which sidetrack topics that were discovered were worth exploring further.

The literature that we did end up using in the project heavily influenced the work conducted in every phase that followed. Because it felt like time was the limiting factor in our literature studies, and that there was probably a lot of material that we never even happened upon in our searching, one can only speculate around what would have been of the project if we had started searching with other keywords or explored different sidetrack topics. It could have very well led to the research question taking on other nuances.

With such amounts of literature to work with, it also came naturally to divide the reading effort. This created a challenge of sharing the findings. Our approach was to create summaries of the articles we read, which worked sufficiently well. But there were still slight discrepancies in familiarity with the different sources within the team, and it might have been preferable if all team members had read all the material.

8.2.1.2 Choice of methods and methodologies

With such a long project, which spanned over five months, it proved complicated to plan out the methodology that would be used throughout the different phases. The plan that was laid out for what methods to use was not followed to the point, but it provided a rough road map that we did not deviate radically from.

Some methods, however, were scrapped from the initial plan either because of time constraints or that the method was no longer deemed necessary. Other methods were added to the plan, often when a new need had been uncovered that we had not foreseen.

As both team members were unfamiliar with many methods that were planned, some methods turned out to be more successful, while others were poor matches for the team. As the project progressed, an iterative approach was adapted, and methods that had yielded useful outcomes earlier were incorporated repeatedly into the process (for example the concept maps for processing the outcomes of different methods or phases). This frequent reuse of the more successful methods was not something we had foreseen when planning the project.

8.2.1.3. Use of results

Some of the methods that were used yielded results that were not possible to use and had to be discarded from the process. These were detours where methods were attempted that were simply not fit for the job that we intended. One example is the matrix (chapter 5.4.3) that was created to try analyze the results of the workshop with the UX team at the Company.

In some cases, there were timing issues in regards to making use of the results of a method as input for going forward. The results of certain methods were processed later, when the

next phase had already started, making it difficult to decide how to take the results and make use of it for the already started phase.

8.2.1.4 Common understanding

In a team can be hard to interpret things in the same way when working on the same project.

To tackle this challenge, the method of creating concept maps for collecting findings from different phases and methods was used repeatedly throughout the project. This was not a planned effort, but rather a discovery that was made when working with the findings from literature studies and attempting to boil all that information down into a workable format. While time consuming to create, these visual aids proved invaluable for communication both within the team and with outside stakeholders.

However, in some cases there were issues of common understanding within the team regarding certain topics. This usually did not concern the outcomes from the project, but were rather smaller things connected to terminology, which would cause confusion about the step approaching in the project. One example was regarding the term *paper prototyping,* when one of the member of the team interpreted *paper prototyping as a* synonym for *sketching*, another interpreted as a way to make a quick physical cut paper and sketches prototype. During the actual execution of the project this was not much of a miscommunication problem, but it would sometimes be a problem during writing, when four hands using different words for the same thing can confuse the reader of the thesis.

8.2.1.5 Choice of tools for building the prototype

The use of InVision for developing the prototype proved to be a factor that clearly affected the user experience during user testing. The prototype had a much lower level of interactivity, which would frustrate the user's when trying to find the correct action among all the graphical elements that were not interactive in the prototype. InVision also could not really be used to create any truly adaptable personalization, and this behavior would rather have to be faked.

When choosing the tools that were used for developing the final prototype, many different aspects had to be taken into consideration, and while other tools might have been more suitable for testing personalization in depth, InVision was a good match for the scope and limitations in the project. Two of the most important factors for choosing InVision was that (1) we possessed little to no programming knowledge on the team, and (2) the prototype had to be easy to test remotely. In addition to this, we already had some experience using InVision, so the prototype could be created within the time limit of the project without requiring any training, and the trial version could be used free of charge.

If some of these factors been different, a different set of tools and a different concept might have been selected for testing personalization, and this could have led to different results than the ones presented.

8.2.2 Evaluation

An important question to consider when looking back at the testing and evaluation of the prototype, is how to distinguish between what one can draw conclusions about from the evaluation. What can be concluded about personalization in general, the personalization guidelines that were suggested and used to design the prototype, and what results are simply down to the design of the prototype itself?

Clearly, a different concept and design could have been conceived of, based on the same guidelines for personalization. And clearly, the evaluation of the test results pointed to the fact that the design had many usability issues, generally related to the fact that it was not noticeable and clear enough for the testers to explore and make use of the personalized assistance that was designed.

In many cases, this was evident enough in the results for us to make the distinction that the design itself was at fault. For us, noticing this shed light on the fact that there are a large number of factors at play when testing the application of a concept like personalization, all of which influence the experience of the tester.

Using a prototype which limited the experience of the user to a more narrow view of the product, in order to implement a design that applies personalization, also meant introducing many limitations that could negatively affect the user's ability to properly evaluate the product. This is an interesting balance to try and strike, when evaluating how to facilitate the evaluation of a product for the user.

8.3 Future work

The concept of personalization guidelines were tested with an analytic cloud service only. It would be interesting to apply the same personalization guidelines to other products or to test them with more experienced users, and try to identify what are more general positive effects of personalization. Would a test with more experienced users affect the perception of the personalization features? Would applying the personalization guidelines to a different type of product have a similar outcome?

Other interesting tests could be run by testing the guidelines with a similar product and target user of a competitor of the Company's service. How could other systems within cloud-based analytics services be affected by using the guidelines in the personalization of their trial services?

9 Conclusion

This thesis project was conducted in order to answer to the research question "*How can personalization be used in the user trial of a cloud-based analytics service, to facilitate the evaluation of the system for the user?*".

A part of the research and analysis was conducted on **free trials in cloud software** and mapped as in Appendix 1, in order to identify which area would be more impactful to use personalization.

Focus was also put on studying what are different **qualities** that make **personalization** in a software good and balanced for the user. After researching, condensing, iterating and testing ideas and design concepts on how to use personalization on a trial cloud analytics service we can answer to our initial research question as following.

The creation of concept maps to condense the above concepts in a workable format, was a very useful way to communicate with people outside the team and to use as an ideation starting point.

One promising way to use personalization during the trial experience, is to attempting reduce information overload. By filtering away, or positioning visualizations and actions that were not relevant for a beginner user in our case in a secondary position, the user would have less information to process.

Providing relevant templates in the actual analysis by using recommended visualisations, seemed to have made the process of understanding the benefits of the Company's service quicker for the subject being tested.

The most promising application of personalization that could be identified, is to provide a relevant starting point for the user. In the example of a cloud-based analytics service, this starting point could be sample data or example files to use, that are related to the user's field of work. This seems to make it easier for the user to quickly form an understanding of the product and conceptualize what the benefit of the service could be for her.

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Appendixes:

Appendix 1: *The concept map of free software trials research*

Appendix 2: *The concept map of personalization research*

Appendix 3: Interview guide

Appendix 4: A concept map visualizing issues with the trial of the Company's service

Appendix 5: A/B testing test scenario

Appendix 6: Heuristic evaluation template

Before reaching the service

SOCIAL INFLUENCE

PRE KNOWLEDGE

SECOND HAND INFORMATION

On the service websi-te/information provider

FIRST HAND INFORMATION

Influences

Influences

Influences

Influences

USER'S EXPECTATIONS

Perceived RISK

Perceived EASE OF USE

Perceived USEFULNESS

Decisional node
pre-trial

INTENT

for TAM a system use is determined by a person's behavioural intention to use

Not signing
up for trial

The trial zone

NEGATIVE NETWORK EFFECT

POSITIVE NETWORK EFFECT

FIRST HAND EXPERIENCE

EVALUATE AGAINST EXPECTATIONS

USABILITY
-ease of use
-usefulness

no COMPLEXITY
-frustrate the user
-effects rate of use
-lead to purchase delay

LEARNING COST
cognitive effort and energy are required to accumulate the knowledge necessary for effective usage

Influences

FIRST HAND EXPERIENCE

EVALUATE AGAINST EXPECTATIONS

USABILITY
-ease of use
-usefulness

no COMPLEXITY
-frustrate the user
-effects rate of use
-lead to purchase delay

LEARNING COST
cognitive effort and energy are required to accumulate the knowledge necessary for effective usage

PERCEIVED PRICE

+

Influences

Exit the trial

Leave the service

INTENT
to buy the service

CANNIBALIZATION

+

+

++

109

Appendix 2: *The concept map of personalization research*

USER

Social Aspects

Context

Concerns — Privacy

Knowledge

Interest

Goals

Needs

Mood

SYSTEM

Approaches — Adaptable / Adaptive / Mixed approach

Profile types — Static profile / Dynamic profile

Appearance — How do you present personalization?

Data gathering — Explicit data gathering / Implicit data gathering / Mixed data gathering

Managing results — Filter away information / Adding information / Sorting / Ranking / Highlighting / Grouping

Results — Direct result: System propose one specific result / Indirect result: System propose several results to choose from

Personalization tuning — Granularity (Coarse / Fine) / Frequency (Often / Seldom)

QUALITIES

What makes personalization good?

Unobtrusiveness
The personalization measures should not disrupt the user from her tasks.

Predictability
The behavior of the personalization should be understandable and predictable. The occasions as well as effects of personalization should be predictable. The occasions should not be unwelcome surprises to the user.

Controllability
The user should feel in control of the system.

Transparency
It should be clear to the user what information is collected, how it is being put to use and for what purpose.

Flexibility
The system should adapt to changes in the needs and habits of the user. No person is static and meaning that the personalization gives the opportunity to answer to this fact.

Accuracy
The system's estimations about the user's needs should be accurate, meaning that the personalized content should be perceived as relevant by the user.

Lightness of use
The personalization features should not add unnecessary burden of use to the experience.

Breath of experience
The system should promote and highlight new experiences, features etc. to the user, and not lock her up in a "personalized bubble"

General suggestion
Ask for examples

Intro
Could you describe your role here at "The company"?
What kind of contact do you have with your customers?

Customer contact
What customers do you have contact with? At what stages of their "journey" (new customers, long-time users, potential customers?)

What type of customers do you have? Does the contact you keep with them changes according to them? How do you do so?

Can you give an example of what is an usual small customer using the cloud(or the desktop) service? How were they onboarded?
Can you give an example of a big customer using the cloud?

What do you feel is the impression customers have of "the Company's product" before they onboard?

General questions
What do you perceive your customers value the most of "the Company's product"?

What do you currently think is the weakest point about "the Company's product"?

Onboarding
How do you work with getting the word out to potential customers about "the Company's product"? What is the message you want to communicate?

Do you have some ideas on how customers get onboarded? What is the relation between direct contact with customers to onboard and independent approach to the service? (percentage)

How long it takes to make clear for a future customer, that the product fits her needs? How long it takes? (ONLY FOR SALES)

Do you have any experience you would like to share about new customers during their first period using "the Company's product"?

What do you think is the key factor that keeps customers using Spotfire?

Sales

How do you prepare for an encounter with a customer? What information do you need and how do you use it?

How do you reach out to different customers? How does the contact differ?

How do you make potential customers see the value in "the Company's product"? What tools, means of communication do you use?

What is the first thing you highlight about "the Company's product", to raise a customer's interest?

For Presales

We have heard you used or thought to use social data for a demo, can you describe what did you do and what was about?

What was the reaction of your customers on using social data to demo?

How they currently work with tailoring the product for certain customers if you do?

For Support

What, according to your experience, is the most common problem that customers run into with the cloud service? What are the most severe problems they run into?

What are the most common problems that NEW customers have?

How does new customers contact with you differ from long-time users? Frequency, types of problems etc…

Appendix 4: A concept map visualizing issues with the trial of the Company's service

THE TRIAL PROBLEMS

From Think-aloud test with potential users

The Website Prior to Signup

NAVIGATION

There is not a clear workflow to learn about Spotfire.

LANGUAGE

At times the jargon used is to complex for potential Asad users.

Language incoherency appears when the website is switched to different languages.

MESSAGE

From the content the user has an hard time understanding the use of the service and its value to her.

The products is TOO ADVANCED for me

The products is TOO SIMPLE for me

Sign up WALL OF INFORMATION !!!

Lack of guidance

Lack of INTRODUCTION

After sign up there is not enough guidance to introduce the program. What can one do, what would be the next action to perform?

Lack/scattered HELP RESOURCES

The resources that the user can use as support to get started (example data, instructions etc) are either scattered, hidden or missing.

Lack of ANALYSIS GUIDANCE

First steps in analysing data could be guided more for new users that lack certain pre-knowledge.

Impressions after use

Use case sets EXPECTATIONS for product potential

In this case too simple
The guided example determined the perceived potential of the program. The example used was very simple and this guided users to think the program could not do more advanced actions.

Need for DATA CLOSER TO THE USER in order to evaluate product

Users want to use data they can relate with more easily so that they can better understand the personal utility of the tools. Many want to use their own data for the guided examples.

Starting point:
(The Company login page)

Preparation:
Please download the Excel file with data from this link to your desktop before starting the test, it will be used in the tasks:
(The Company sample data)

Scenario:
You are working in retail for a large store chain. You are trying out analytics solutions for your business and have just signed up for a trial period of "The Company", an analytics tool for visualizing and interacting with data in order to extract actionable insights. You will now start to use it.

1. Sign in using the username:
2. Start a new analysis and load the data file you just downloaded.
3. Select the columns "Profit" and "Product category 4" and add a bar chart. It will show how profitable all individual products are. When you have added the chart, click close.
4. What is your initial perception of this product (what can you do with it)?
5. "The Company product" allows you to filter the data. Please filter to see only products within the product category "Office supplies". Which is the most profitable item in this category?
6. Create a new, blank page in your analysis by clicking the + by the tabs in the upper left corner. Add a treemap chart.
7. Locate the hierarchy dropdown of the treemap (found by the legend to the right of the chart). Add the columns "Product category 1", "Product category 2", and "Product category 3". The chart should now be sizing and colouring the different product categories according to their sales price.
8. In "The Company Product", you can drill down into highlighted portions of data in a chart, by creating a detailed visualization. Create a detailed visualization, a pie chart, of your treemap chart.
9. At the top right of the chart, by the legend, remove the current color by columns and make the chart colored by the column "Ship method". Interacting with the treemap will now show the highlighted data in pie chart. How are items in the most profitable product segment commonly shipped?

Post test questionnaire:
1. What is now your perception of the product? How could you use it?
2. Was the product easy or complicated to use and understand? Please motivate your answer.
3. How much effort do you think it would take for you to learn to use the product effectively? What would your next step using it be?
4. What did you like about the product?

Custom heuristic evaluation

Goal

To evaluate what quality/usability implications that personalization features added to the design of "The Company Product" might have.

Introduction

The design you will be testing is an exploration of applying personalization to help users evaluate a complex software during the course of a free trial period. The aim is to facilitate and speed up the process of making the user understand whether the product fits their requirements.

We would like you to evaluate the design according to a set of different qualities, that relate to the usability of the personalization. More general usability issues are not to be evaluated in this test.

The design is a low fidelity prototype and merely a simulation of how the concepts presented would work. Thus it does not have the same rich level of interactivity as the real product. Please take this in consideration and try to imagine the prototype as a real implementation.

Instructions

We would like you to go through a scenario of defined tasks in the prototype and evaluate it based on 7 different criteria/qualities. These are described below and we want you to rate (on a 1-5 scale) and describe how you think the prototype fulfills them all individually. The description could contain general comments and examples of things in the prototype that influence the quality either negatively or positively.

The features that differentiate this design from the real product are an added element of personalization. Generally, they will be indicated with a light bulb icon. These are the parts of the design that we would like you to look more closely at.

Some qualities will be more difficult to evaluate in depth (because of the low fidelity nature of the prototype), but try your best to make some assessment of them all to the extent possible.

Feel free to go through the scenario multiple times and inspect relevant parts more closely.

Personalization qualities

Unobtrusiveness
The level to which the personalization demands the attention of the user. An unobtrusive system does not disturb the workflow of the user, by requiring action, distracting or annoying her from the main task.

Controllability
The level of control that the user has over the system and the personalization features. A controllable personalized system should allow the user to carry through the action she wants to influence the personalization and its behaviour.

Predictability
The level to which an user can understand how her actions will affect the system. An adaptive system reacts not only directly to actions of the user, but also make interpretations of her behavior and adapt accordingly. Thus, for a personalized system the user needs to be able to predict not only the direct consequences of what she does but also how her behavior will affect the system.

Transparency
The level to which the user can understand the actions and changes of the system. For a personalized system, certain elements will adapt according to the user and the user should be able to understand why the system adapts in a certain way.

Accuracy
The level to which the personalized adaptations (recommendations, suggestions etc) matches the user's intent, taste and interests. An accurate system should personalize in a manner that feels relevant to the user.

Lightness of use
The level to which the personalizing process requires upkeep and input from the user, adding cognitive effort. An appropriate light personalized system should not be perceived by the user as a burden. The tasks required from the user to personalize different aspects of the system should feel effortless and fast flowing.

Breadth of experience
To which degree is the user made aware of features and options of the system? Is she boxed in and encouraged only to use a limited portion of the product (low breadth of experience)? Or is she introduced to new features and encouraged to explore (high breadth of experience)?

SCENARIO

Starting point :
(prototype link)

Scenario:
You are working in retail for a large store chain. You are trying out analytics solutions for your business and have just signed up for a trial period of "The Company Product", an analytics tool for visualizing and interacting with data in order to extract actionable insights. You will now start to use it.

1. Sign in with the pre-filled username and password.
2. Start a new analysis and choose the recommended data file "Product range sales data".
3. We now want you to add a bar chart showing how profitable all individual products are. Use the columns "product category 4" and "profit". When you have added the chart, close the recommended visualizations window.
4. What is your initial perception of this product (what can you do with it, does it seem easy to use)?
5. Spotfire allows you to filter the data. Please filter to see only products within the product category "Office supplies". Which is the most profitable item in this category?
6. Create a new, blank page in your analysis by clicking the + by the tabs in the upper left corner. Add a treemap chart.
7. Locate the hierarchy dropdown of the treemap (found by the legend to the right of the chart). Add the columns "Product category 1", "Product category 2", and "Product category 3". The chart should now be sizing and colouring the different product categories according to their sales price.
8. In "The Company Product", you can drill down into highlighted portions of data in a chart, by creating a detailed visualization. Create a detailed visualization, a pie chart, of your treemap chart. *(If you cannot find the "detailed visualization" option, please move on to the next question for further instructions.)*
9. (*If you haven't created the detailed visualization, do so now by right clicking the treemap chart and navigate to "create details visualization" and choose "pie chart".)* At the top right of your pie chart, by the legend, remove the current color by columns and make the chart colored by the column "Ship method". Interacting with the treemap will now show the highlighted data in pie chart. How are items in the most profitable product segment commonly shipped?

Evaluation sheet

_____

Please evaluate the design in relation to the following qualities. First score the quality from 1-5, where 1=Does not support at all and 5=Completely supports, and then motivate with comments below.

Unobtrusiveness
Score: 1   2   3   4   5
Comments:

_____
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Predictability
Score: 1   2   3   4   5
Comments:

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Controllability
Score: 1   2   3   4   5
Comments:

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Transparency
Score: 1   2   3   4   5
Comments:

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Accuracy
Score: 1   2   3   4   5
Comments:

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Lightness of use

Score: 1   2   3   4   5

Comments:

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Breadth of experience

Score: 1   2   3   4   5

Comments:

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