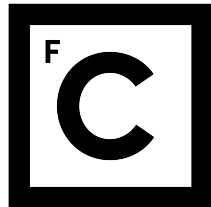


UNIVERSIDADE DE LISBOA
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Ciências
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Restructuring the Web Application Interface - Meta-design

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2024

Acknowledgments

Agradeço primeiramente à minha família por todo o apoio que me deram ao longo do meu percurso académico. Pelos valores que me transmitiram durante toda a minha vida, sem os quais não tinha chegado onde estou hoje.

Agradeço ao meu orientador Dr. Pedro Antunes pela orientação durante o desenvolvimento do trabalho na sua componente teórica e por todo o apoio durante a realização da tese.

Agradeço também às pessoas da Acro Companion que permitiram a realização deste projeto em parceria com a Universidade de Lisboa e que contribuíram para o meu crescimento a nível profissional e pessoal. Um agradecimento especial ao Guilherme Borges da Acro Companion, pelo acompanhamento mais próximo da minha passagem pela Acro e pela orientação do projeto dentro da Acro, pela sua paciência e ajuda na componente de desenvolvimento do projeto e no meu desenvolvimento profissional.

Por fim quero agradecer a todos os meus amigos que de uma forma ou outra me apoiaram durante todo o meu percurso académico. Foram eles que tornaram estes anos na experiência magnífica que guardarei para sempre comigo.

Muito obrigado.

Miguel Melo

Para os meus pais e avós que sempre me ensinaram o valor do trabalho árduo e da perseverança.

Resumo

Esta tese explora a integração de princípios de meta-design no desenvolvimento de um projeto realizado em colaboração com a Acro Companion, com o objetivo de automatizar o processo de vendas. À medida que as empresas reconhecem cada vez mais a importância de produtos digitais customizáveis, a utilização de meta-design torna-se crucial para permitir aos utilizadores finais participarem ativamente na criação das suas soluções desejadas.

O conceito de meta-design envolve a criação de ambientes e ferramentas que permitem aos utilizadores co-criar e modificar seus próprios produtos, promovendo uma maior flexibilidade e adaptação às necessidades individuais. No contexto deste projeto, a aplicação do meta-design visa proporcionar uma plataforma onde os utilizadores podem personalizar competências, através de um artefacto de compra autónoma e garantir a transparência de preços durante todo o processo de compra. Estes elementos são essenciais para uma experiência de utilizador enriquecedora e para a otimização do processo de vendas.

O projeto abordou três problemas principais. Primeiro, foi necessário conceder aos utilizadores a capacidade de personalizar competências, permitindo uma maior individualização e adequação às suas necessidades específicas. A personalização é um aspeto crucial em ambientes digitais modernos, pois permite que os utilizadores moldem as ferramentas e plataformas de acordo com suas preferências e objetivos. No contexto do projeto com a Acro Companion, isso significou desenvolver uma interface que permitisse aos utilizadores ajustar parâmetros e escolher entre os diferentes módulos disponíveis para cada tipo de competência, de modo a criar uma experiência mais envolvente e personalizada.

Segundo, a criação de um artefacto de compra autónomo foi crucial para facilitar o processo de aquisição, tornando-o mais eficiente e menos dependente de intervenções manuais. Um artefacto de compra autónomo é um sistema que pode executar automaticamente tarefas associadas ao processo de compra, como seleção de produtos, cálculo de preços, geração de faturas e processamento de pagamentos. Este nível de automação reduz significativamente a carga de trabalho manual, diminui a possibilidade de erros humanos e acelera o tempo de resposta. Para a Acro Companion, a implementação desse sistema significou que os clientes poderiam completar suas compras de forma rápida e sem obstáculos, melhorando a experiência geral do utilizador e aumen-

tando a eficiência operacional da empresa.

Terceiro, garantir a transparência de preços durante todo o processo de compra com base nas escolhas do utilizador foi fundamental para promover a confiança e a satisfação do cliente. A transparência de preços assegura que os utilizadores entendam claramente os custos associados às suas escolhas, evitando surpresas desagradáveis e aumentando a percepção de valor. No contexto do projeto, isso foi alcançado através de uma interface que exibia de forma clara e intuitiva todas as variáveis que influenciavam o preço final, permitindo que os utilizadores vissem em tempo real como suas seleções impactavam o custo total. A clareza e honestidade nos preços não só aumentaram a confiança dos utilizadores no sistema, mas também reduziram as dúvidas e incertezas que poderiam levar ao abandono da compra.

O projeto seguiu a metodologia de Design Science Research Methodology (DSRM), que combina a criação de artefactos inovadores com uma abordagem científica rigorosa. A DSRM foi escolhida devido às suas semelhanças com o método de desenvolvimento seguido pela Acro Companion.

A metodologia de DSRM é composta por várias etapas estruturadas que garantem um desenvolvimento meticuloso e fundamentado em princípios teóricos sólidos. A primeira etapa desta metodologia é a identificação do problema e motivação, onde é possível compreender o problema em profundidade e reconhecer o valor da solução proposta.

A seguir, entramos na parte iterativa da metodologia, que é composta por cinco etapas principais:

- **Definição de Objetivos:** Nesta etapa, são propostos os objetivos específicos da iteração, detalhando o que se pretende alcançar em termos de desenvolvimento e melhorias.
- **Design e Desenvolvimento:** Nesta fase, são criadas e desenvolvidas todas as funcionalidades, componentes e a arquitetura da solução.
- **Demonstração:** Após o desenvolvimento, o artefato criado é apresentado para mostrar o seu funcionamento na prática. Esta etapa visa validar o design e identificar possíveis ajustes necessários através da demonstração das capacidades do artefato num cenário real ou simulado.
- **Avaliação:** Nesta fase, é avaliado o quão bem o artefato desenvolvido contribui para a solução do problema identificado inicialmente.
- **Comunicação:** A última etapa envolve a comunicação de todo o processo, incluindo os resultados e possíveis tópicos de discussão. Esta documentação é essencial para partilhar os insights e as contribuições do projeto, e no caso desta tese, corresponde ao próprio

documento da tese, que detalha cada fase do desenvolvimento, os métodos utilizados, os resultados obtidos e a relevância da pesquisa.

O desenvolvimento do projeto passou por três fases iterativas. A primeira fase, a iteração de design da solução, focou-se na concepção inicial e no planejamento do artefato. Durante esta fase, foram identificados os requisitos e as funcionalidades principais do sistema. Foi um momento de intensa pesquisa e brainstorming, onde foram delineadas as principais características que o sistema deveria incorporar. Esta fase envolveu a junção de feedback inicial de pessoas ligadas à componente de negócio da Acro Companion, a análise de sistemas semelhantes e a definição dos critérios de sucesso para o projeto.

A segunda fase, a iteração do MVP (Produto Mínimo Viável), envolveu a criação de um protótipo funcional que poderia ser testado e refinado. Esta fase foi crucial para validar as hipóteses iniciais e fazer ajustes necessários. O MVP serviu como uma versão simplificada do produto final, que garantiu a funcionalidade do mesmo e viabilidade dos designs e da estrutura do componente.

A terceira e última fase, a iteração final, culminou no primeiro lançamento do projeto, integrando todas as melhorias e feedbacks recebidos durante as fases anteriores. Esta fase final envolveu a polimento do sistema, a adição de funcionalidades complementares e a garantia de que todas as partes do artefacto funcionassem de maneira coesa e eficiente.

Em resumo, cada fase do desenvolvimento foi cuidadosamente planejada e executada para assegurar que o produto final não apenas atendesse aos requisitos iniciais, mas também excedesse as expectativas dos utilizadores, incorporando princípios de meta-design para uma experiência de utilizador enriquecedora e eficiente.

O artefato produzido não só alcançou os objetivos estratégicos da Acro Companion, mas também entregou valor tangível, exemplificando a incorporação eficaz de princípios de meta-design na automação do processo de vendas da empresa. A personalização permitida pelo sistema aumentou a satisfação do utilizador, enquanto a automação reduziu os custos operacionais e melhorou a eficiência. A transparência de preços, por sua vez, aumentou a confiança dos clientes.

Esta realização tem importância significativa do ponto de vista acadêmico, servindo como uma aplicação prática de meta-design dentro de um estudo de caso abrangente. Além disso, o projeto suscitou questões acadêmicas instigantes, especialmente em relação à transparência e sua correlação com os princípios de meta-design. A pesquisa destaca a importância de continuar a investigação de aspetos como a transparência que podem ser relevantes não só para os utilizadores como para a pesquisa da framework de meta-design, sendo que em muitas questões desta framework a pesquisa sobre a transparência pode ajudar a encontrar algumas respostas.

Em conclusão, o projeto não só atingiu seus objetivos práticos, mas também contribuiu para o avanço do conhecimento na área de meta-design, oferecendo insights valiosos para futuras aplicações e pesquisas. A colaboração com a Acro Companion demonstrou como a teoria do meta-design pode ser traduzida em prática, resultando em melhorias substanciais tanto para os utilizadores finais quanto para a empresa. A tese sugere que a aplicação de princípios de meta-design pode ser uma estratégia eficaz para empresas que procuram inovar e adaptar-se ao atual mercado digital.

Palavras-chave: Meta-design, Transparência, Aplicação Web, Experiência de Utilizador, Interface do Utilizador

Abstract

This thesis explores the integration of **meta-design** principles in the development of a project undertaken in collaboration with Acro Companion, aiming to automate the sales process. As businesses increasingly recognize the significance of customizable digital products, the application of meta-design becomes pivotal in empowering end-users to actively participate in the creation and refinement of their desired solutions.

The project addressed three main problems: granting users the ability to customize competitions, creating an autonomous purchasing artifact, and ensuring price **transparency** throughout the purchase process based on user choices. The project followed the **Design Science Research Methodology** and underwent three **iterative** development phases: a solution design iteration, an MVP iteration, and a final iteration culminating in the project's first release.

The produced artifact not only achieved Acro Companion's strategic goals but also delivered tangible value, exemplifying the effective incorporation of meta-design principles in the automation of the company's sales process. This accomplishment holds significance from an academic standpoint, serving as a practical application of meta-design within a comprehensive **case study**. Additionally, the project spurred thought-provoking academic inquiries, particularly concerning transparency and its correlation with meta-design principles.

Keywords: Meta-design, Transparency, Web Application, User Experience, User Interface

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Chapter 1

Introduction

In a world where technology plays a central role in our daily lives, the demand for customizable software products has never been greater. Users expect to be able to personalize their digital experiences and have freedom to modify and adapt the technologies they use to fit their unique needs and preferences. By giving users the ability to shape the product to their needs, software developers can increase user engagement and satisfaction, ultimately leading to greater adoption and success in the market.

Meta-design can be seen as a framework that views both expert designers and potential users as co-creators of artifacts. In this project, I will delve deeper into the concept of meta-design and its benefits for both software developers and users. I will explore the ways in which meta-design can enhance the user experience and drive product use, as well as the challenges and considerations from the development point of view when implementing this approach in the context of a company.

For a better understanding of the document I will be using the concepts of *configurability* as a property of artifacts created by developers, and *customization* as the actions users perform to shape artifacts to their needs.

Creating a configurable artifact involves addressing two key design aspects. Firstly, *flexibility* is required to provide options for users to customize the artifact according to their needs, enabling them to make changes and adaptations as required. Secondly, *stability* and *reliability* are required to ensure that the artifact continues to serve its intended purpose seamlessly, regardless of the configurations made by users.

1.1 Organizational context

The problem will be dealt within a concret organization, Acro Companion (Acro). Acro is a software development company specializing in the gymnastics industry. Despite being a relatively new company, it has experienced rapid growth in recent years and has established itself as a lead-

ing player in the digital transformation of the gymnastics world. Based in Belgium, Acro serves clients globally and has become one of the largest companies in the field.

The company utilizes the capabilities of Azure DevOps to manage the entire software development life cycle, including automation tools. Azure DevOps acts as a secure code repository, facilitating peer reviews during the development process, as well as a platform for task creation and planning via work items. Additionally, Azure gives the business the ability to perform thorough code testing while it is still in the development stage.

1.2 Methodology

The methodology that I will be following is the Design Science Research Methodology (DSRM)[13]. This methodology was chosen due to the similarities between its steps and the steps followed by the development team of Acro Companion when developing new artifacts. The DSRM consists of six different activities in nominal order, being:

1. **Problem Identification and motivation:** This step is crucial in order to understand the problem and give value to the solution. Both the researcher and the research's audience are motivated to pursue a solution and accept the findings when the worth of a solution is justified. Understanding the reasons behind the researcher's analysis of the problem is beneficial. Knowledge of the problem's current status and the significance of finding a solution is one of the resources needed for this task.
2. **Define the objectives for a solution:** Using the problem definition and the understanding of what is feasible and desirable, determine the goals of a solution. The goals can be qualitative, (e.g., how a new artifact enables answers to problems not previously addressed), or quantitative, (e.g., the terms in which a new solution would be better than present ones). The goals should be logically deduced from the problem description and the resources needed is the context in which the solution will be developed.
3. **Design and development:** The artifact must be created. In this process, the internal (architecture and components) and external (functionality) aspects of the artifact are determined and the artifact is built. The ability to apply theory to a problem is one of the resources needed to move from objectives to design and development.
4. **Demonstration:** The artifact developed and the solution it provides must be demonstrated. For this task, understanding of how to use the artifact is needed.

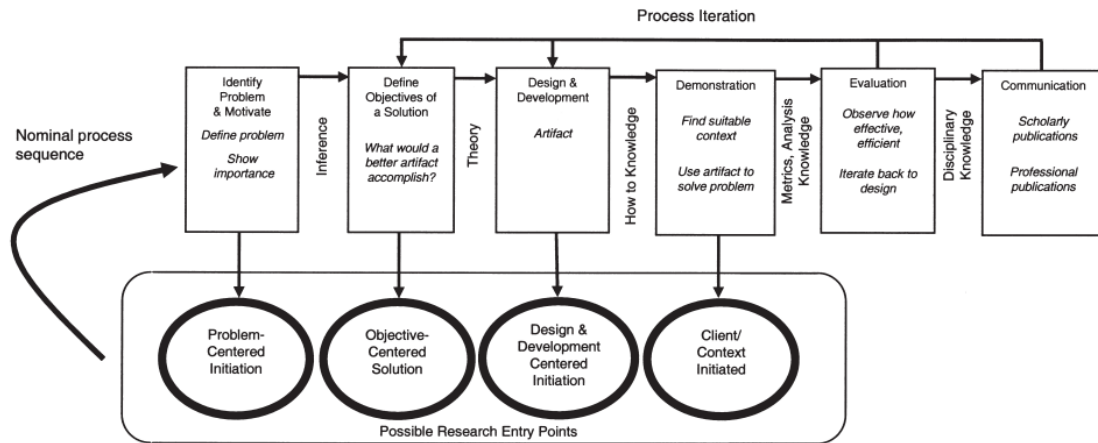


Figure 1.1: Schematic of the different activities of DSRM [13]

5. **Evaluation:** Study and evaluate how well the artifact contributes to a solution to the problem. Comparing the objectives of a solution to the results obtained when using the artifact is the focus of this activity.

6. **Communication:** Explain the problem and its significance, the artifact, its use and innovation, the meticulousness with which it was designed, and its efficiency. Researchers often use this activity to structure research publications.

A schematic of the DSRM and all its activities is presented in figure 1.1 .

1.3 Document structure

This report's remaining sections will be organized as follows: In the "Background" section, I provide context regarding the configurability of digital products and introduce the concept of meta-design. Moving on to the "Problem Definition" section, I outline both the abstract problem and its contextualization within the company's specific environment. Furthermore, I discuss the problem's significance, highlighting its relevance not only within the company but also to the broader research community.

Following this, I present three distinct sections, each dedicated to one of the project's iterations. The iterations will follow the methodology presented in the section above with the communication step being the document itself.

After the sections dedicated to the project's iterations, there is a discussion section where topics like the usage of meta-design within the company and the different types of transparency will be discussed. In this section I will also present and discuss the project's limitations and possible

directions for future work.

Finally, in the concluding section, I present the contributions of the work to the meta-design field and elaborate on the impact my work has had on the company.

Chapter 2

Background

2.1 Digital products configurability

The configurability of digital products has grown in importance among users over time in many different commercial sectors. The rise of configurable cars and fashion in recent decades is proof of this change [8].

With the introduction of Software as a Service (SaaS), this preference for configurable products has also permeated the software sector. The single-instance, multi-tenant model is made possible in this case thanks in large part to software configurability, which gives users the freedom to customize the product to meet their unique needs [12].

WordPress stands as a prime example of the growing demand for customizable digital products. It serves as a versatile platform for configuring and selling websites, equipping users with a powerful toolkit to personalize their offerings according to specific needs. Boasting an extensive library of plugins and themes, WordPress facilitates easy customization of digital products. Users can seamlessly tailor their websites, thanks to the platform's user-friendly interface and a diverse array of tools that enhance flexibility and creativity [10].

2.2 Meta-design

A wide range of computer users, from skilled software engineers to regular users, are shown in figure 2.1. Users depend on computers for their work and, since they have their own needs, users should be able to customize and ultimately develop their own solutions, even though they may not produce high-quality tools on par with professional developers [7].

Meta-design can be seen as a framework that views both expert designers and potential users as co-creators of artifacts. Potential users do, however, participate in the design process at different time-space moments. Professional designers establish the foundation for the subsequent design-

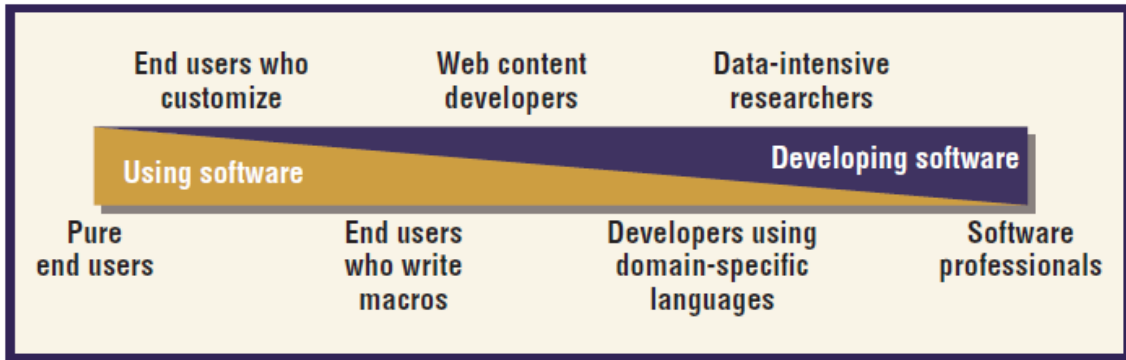


Figure 2.1: Software activities and the different types of users and software developers [7]

at-use time, where users contribute to the design's finalization. This framework can be applied to a wide range of design fields, including graphic design, industrial design, architecture, and software design [4, 6].

Meta-design expands configurability by involving users in the design decision-making process, which fosters a collaborative environment, leading to a more adaptive approach that closely aligns with the evolving needs and preferences of the user community [4, 6].

In a more practical sense, and in the optic of software design, meta-design allows users to customize a generic design to fit their specific needs. In the view of the meta-design framework it is wrong to have the designers create artifacts as they think it is best. Instead, designers should create generic artifacts, anticipating the needs and goals of users, and confer configurability to the artifact, so that users can finish the design. Meta-design addresses the technical and social infrastructures required for users to actively participate as co-designers of artifacts [7, 5].

Chapter 3

Problem definition

3.1 Abstract problem

The problem faced in this work can be divided into three main topics. Firstly, users want the ability to customize their digital experiences and to change and adjust the software they use to suit their own requirements and tastes. The Meta-design framework can be used to give users the ability to customize digital artifacts. The problem presents itself in the incorporation of the framework and its guidelines in the customization process [5].

Secondly, in the pursuit of growth and sustainability, companies should pursue operational efficiency, agility, and flexibility. A company can more quickly adapt to shifting market dynamics and better position itself for long-term success by continuously evaluating and optimizing its processes. Implementing agility presents a problem, as it requires a thorough examination of previously implemented processes to quickly find the best ways to improve them while avoiding disrupting interconnected processes that may depend on the ones targeted for improvement. It also requires the adoption of flexible processes, which users can configure to specific contexts. [14, 3].

Finally, when trying to comprehend information, it is common for users to analyze their actions and the circumstances surrounding them to determine their reasoning. This method of analysis is useful in understanding how providing transparent guidelines can assist people in making favorable decisions about the services they utilize. The problem, in this case, revolves around finding the best ways to equip users with the information they require, thus enabling them to make knowledgeable choices that are advantageous to them [2, 9].

3.2 Problem contextualization

The product offered by Acro is a comprehensive competition management system that includes features such as membership, registration, and scoring. Currently, the product is sold through direct contact with Acro's business department, and only after several meetings can users fully

Abstract problem	Contextualized problem
Customization of software by users to fit their needs	Giving users the capacity to customize competitions
Improvement of efficiency, agility and flexibility in a company's processes	Creating an artifact that allows users to make their purchases autonomously
Equipping users with knowledge about their choices by improving transparency	Providing price transparency during the purchase process, depending on user's choices

Table 3.1: Table summarizing the abstract problems and their contextualized counterparts

understand the available features and the cost of the product. Besides, the price of a competition is calculated by filling in a customized Excel sheet with the options the user wants or, in some cases, simply done manually.

Acro Companion wants to implement a solution that would enable users to personalize and buy products autonomously, while still offering the choice of regular sales. Moreover, they place great importance on maintaining and improving transparency in the pricing aspect of this process [11].

Table 3.1 presents a summary of the problem definition in an abstract manner on the left column, as well as the problem contextualized within the work in the right column.

3.3 Relevance to the target organization

Giving the users the ability to independently customize and purchase competitions would make the sales process go faster while also saving a lot of the company's resources, thus making the process more efficient. The transparency in pricing is important because when customers have access to transparent pricing information, they're more likely to complete their purchases since they have confidence and a clear understanding of the costs involved related with their choices [14, 3, 11, 1].

The rapid growth experienced by Acro Companion in recent years has generated increased demand for its products. With the solution presented, the company can maintain customization flexibility while also ensuring future scalability by incorporating meta-design into this framework, which makes it easier to add new customization options as new features are released.

3.4 Relevance to the research community

To the research community, this work discusses meta-design in a study case. The work is relevant due to the need for more literature about meta-design, especially in case studies. The role of transparency in meta-design will also be explored in this work.

Chapter 4

First iteration

After the problem identification, the first development iteration started. Following the DSRM, we now enter into the iterative part of design.

4.1 Objectives

In the first iteration, an analysis was conducted on the sales process and all components related to competition creation. This analysis helped to define the configurable and non-configurable parts of the competitions, which enabled us to create a flow chart that focused on the price-influencing features. As a result, an idea for the solution was delineated.

All the previously mentioned steps helped us achieve the main goal of this iteration, which consisted of creating a design solution. The solution is meant to allow users to independently purchase Acro Companion's, supporting customization, and giving price transparency.

4.2 Design

4.2.1 Flow Chart

When starting the development of the online competition purchase solution, it was crucial to understand the various factors that influence the price of a competition. The analysis of the company's price calculator, as depicted in figure 4.1, served as the first step in this process. This analysis provided valuable insights into the diverse features and their associated costs.

Given the importance of incorporating opinions from people who have a thorough understanding of Acro Companion's business operations, meetings with important stakeholders knowledgeable in this area were held.

These discussions had the goal of ensuring that all relevant information was carefully considered. A thorough list outlining the features and their associated costs was the result of this dual

strategy, which combined data analysis and stakeholder consultations. The foundation for informing the solution was then complete.

A flow chart outlining the user journey during the competition purchase process was created using the information gathered on the various features affecting competition costs and their relationships, as seen in figure 4.2. This flowchart included actions like choosing features, figuring out costs, and completing the purchase. The development of this flow chart made it easier to visualize the user experience and identify potential opportunities for process improvement or streamlining.

The flow chart will be an important tool in the ongoing creation and development of the online competition purchase solution.

4.2.2 Old Competition Creation Widget

In addition to considering price-related features, several options that were necessary for the creation of competition, such as the name of the competition, the type, the start and end date, among other things were also taken into account.

An analysis of the software artifact used by the company's developers to include competitions in the application, figure 4.3, was done to address the missing features. In-depth analysis of the source code and conversations with experts in the company's technical aspects also resulted in insightful information. This allowed for a deeper understanding of the competition creation process and the underlying data storage mechanisms.

The price calculator component and the previously mentioned competition creation widget were also compared and evaluated as part of this analytical process. This was crucial because it forced the creation of precise names to be presented to end users because some attributes had different names.

4.2.3 Solution Structure

After gathering all the necessary information and consulting with Acro's technical sector and designers, an idea for the solution structure for the competition customization page emerged. The idea was to create a single page with multiple tabs that communicate with each other. This way, users can personalize the competition to their liking.

The communication between tabs is crucial, especially since the type of competition has a significant impact on the user options available. Moreover, the competition level is dependent on both the selected country and the type of competition chosen.

PRICING CALCULATOR 2022-2023



Acrobatic Gymnastics

Max amount of sheets per competition: 100

How many competitions: 3

Select your country: United States

Cost of living index	69.91
----------------------	-------

Package 1

OPTIONS:

- Scoring Select
- Tariff Sheets Select
- Competition organization select
- Music management ** Select
- RTJ - difficulty * Selecti
- RTJ - AJ+EJ ** Selecti
- Upgrade existing tariff sheets Select

Do you want AC to support/train your competition managers ? Select 5.7 (max hours of support)

Would you like AC to handle the administration and support the coach? Select 0.0 (max hours of support)

Support during your competition from AC member, please select the days and AC members below:

Off-site during competition days	0	200.00	euro/da	Persons:	0
On-site during competition days	0	320.00	euro/da	Persons:	0
On-site on traveling / non-competition days	0	180.00	euro/da	Persons:	0

Final Price	950.73	euro	excl. VAT
	1,150.38	euro	incl. VAT

Figure 4.1: Acrobatic competition price calculator

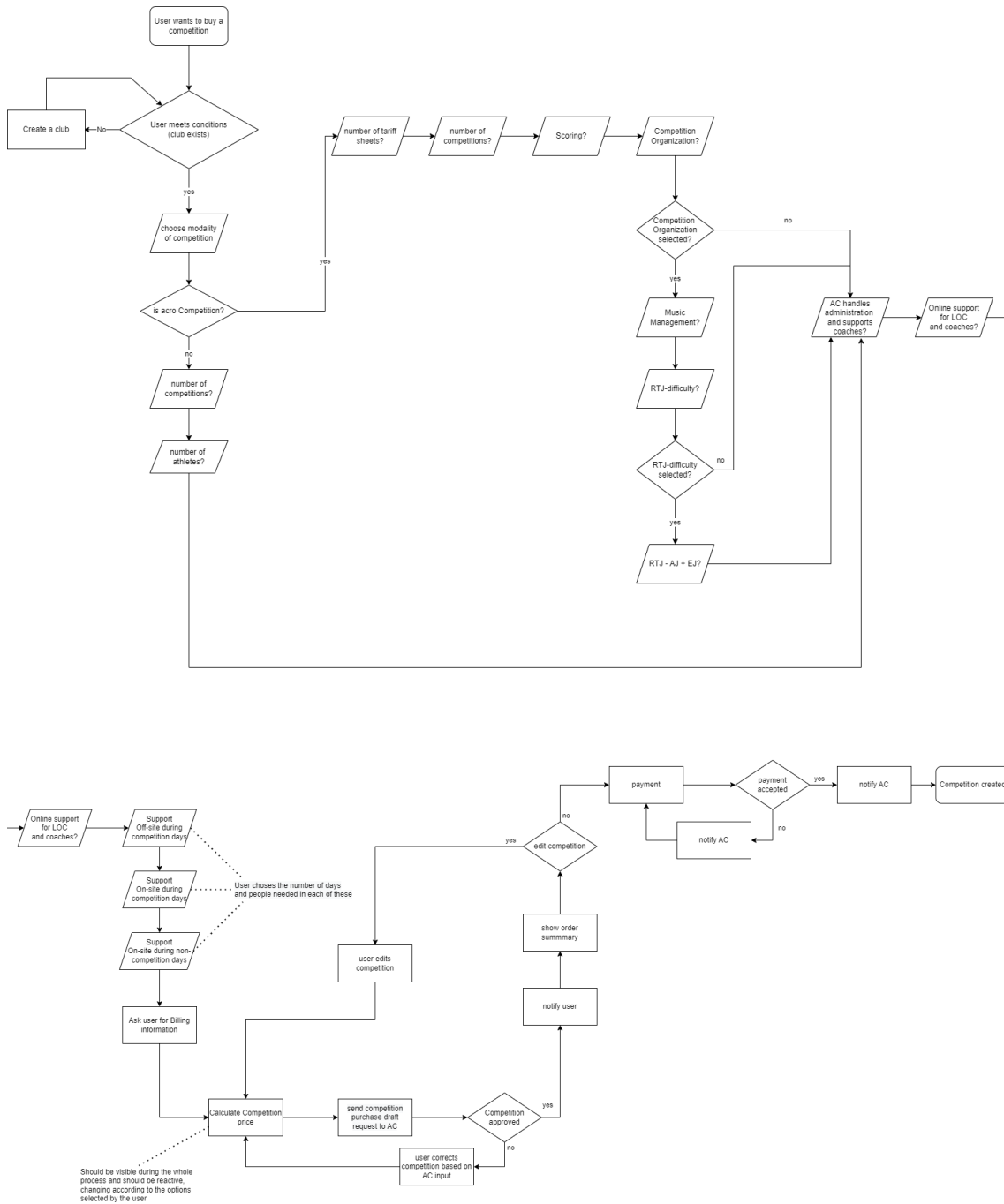


Figure 4.2: Competition purchase flow chart

The screenshot shows a web form titled "Create an organisation". The form is divided into several sections:

- Name ***: A text input field with a note "Fixed after creation. Minimal length 6."
- Organisation type ***: A dropdown menu with "Competition" selected.
- Discipline ***: A dropdown menu with "Acrobatic" selected.
- Country**: A dropdown menu.
- Start Date ***: A date input field with "03/01/2023" and a calendar icon. A note "Format (DD/MM/YYYY)" is below it.
- End Date ***: A date input field with "03/01/2024" and a calendar icon. A note "Format (DD/MM/YYYY)" is below it.
- Levels ***: A dropdown menu.
- Competition type ***: A dropdown menu with "National" selected.
- Competition State**: Two toggle switches: "competition is running" and "competition is visible from outside".
- Competition Varia**: Three toggle switches: "Is competition administration functionality enabled (starting order & judges panels)", "Is online competition", and "Is generic competition".
- Scoring**: Three toggle switches: "competition is integrated with Score Express", "Competition will use Acro Companion scoring.", and "Competition has livestreams.".
- Acrobatic**: A section header with a dropdown arrow.

At the bottom right, there are two buttons: "Cancel" (blue) and "Create" (grey).

Figure 4.3: Old competition creation widget

To better illustrate the idea for the solution a BPMN diagram was created, figure 4.4. This diagram showcases the general layout of the page with all the tabs and a generic diagram of a tab. The generic tab diagram includes mandatory and non-mandatory options. Users must complete the mandatory options to complete their purchase, while the non-mandatory ones are optional.

4.2.4 Different experiences for different users

Having all the requirements allowed for the designs of the solution to be made. The first problem faced was what users would have access to the competitions purchasing solution, what features they had access to, and how the solution was presented to them. Identification of 3 possible use cases was then done, each corresponding to a different type of user:

- Logged-in users who are club managers
- Logged-in users who are **not** club managers
- Non-logged-in users

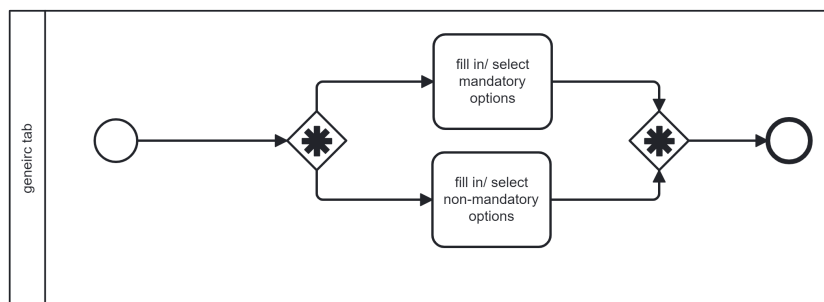
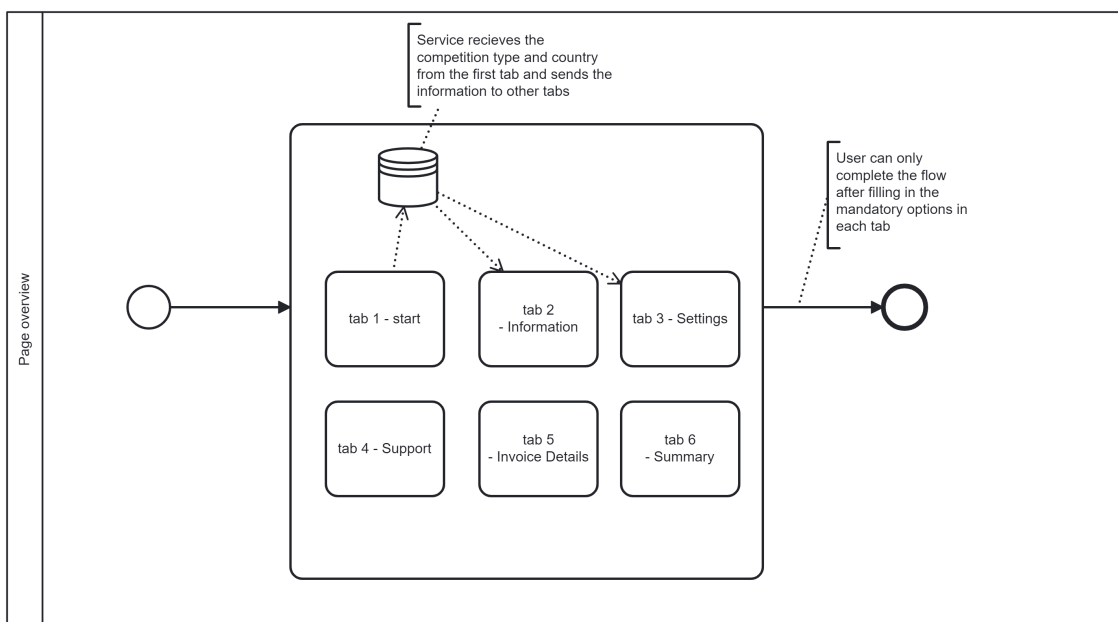


Figure 4.4: BPMN diagrams

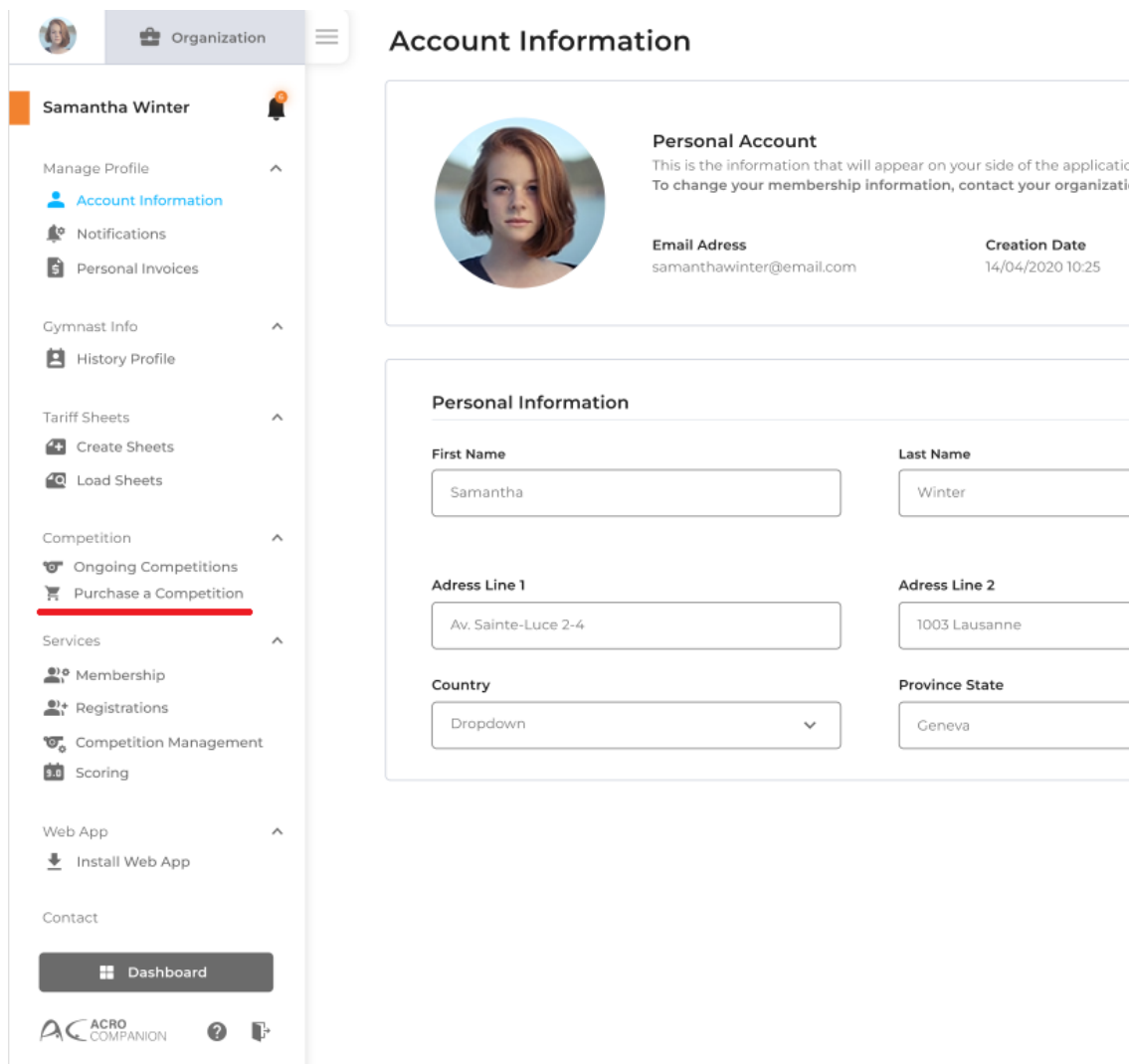


Figure 4.5: Side-bar button to access competition purchase

The first one is the optimal use case since only club managers are allowed to purchase a competition. This user will have all the features available and will access the competition purchase solution through a button on the side-bar, figure 4.5.

Next, there are users who are logged in but are not club managers. This type of user will access the solution the same way as the first case and will have all the features available besides the final purchasing request button. Although they can not send in the purchase request they are able to save it to their profile and can later edit it.

Finally, there are users that are not logged in. These users will access the solution in a different manner. In the web-application there is a titlebar that is only shown to the non-logged-in user. In order to attract the attention of these users a button was placed on this titlebar so that it would be visible and attention-calling to users. These users will also not be able to purchase competitions

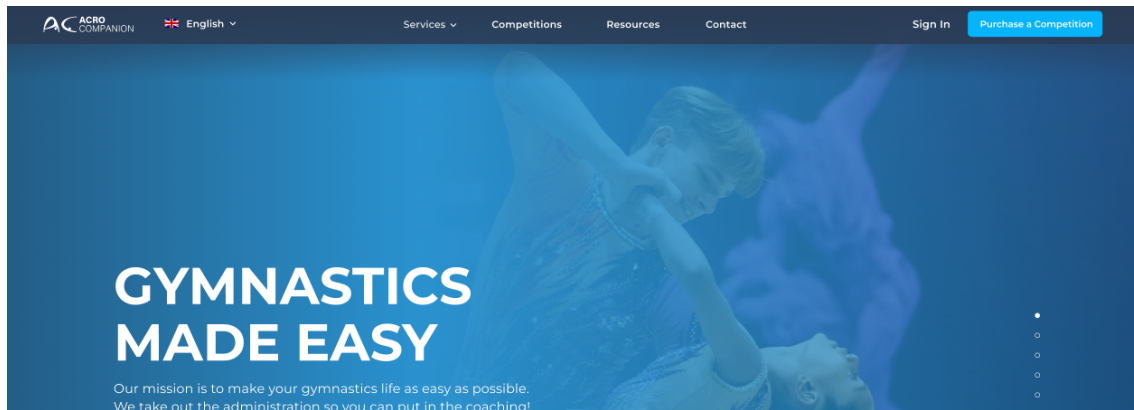


Figure 4.6: Title-bar button to access competition purchase

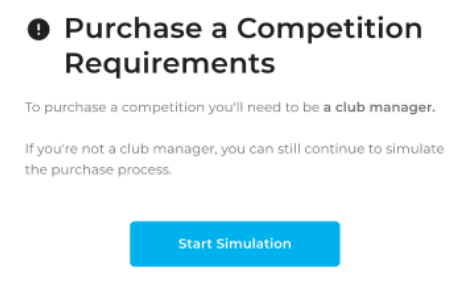


Figure 4.7: Pop-up for logged-in users who are not managers of a club

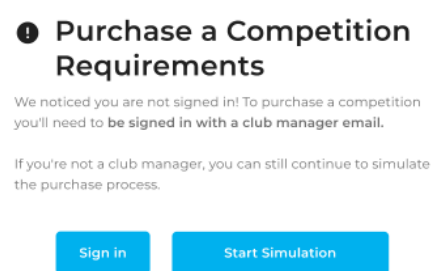


Figure 4.8: Pop-up for non-logged-in users

as well as not be able to use the save feature.

At this point, it became apparent how beneficial it would be to implement pop-up warnings in the two non-optimal use cases. These pop-ups inform users of the sub-optimal conditions under which they must access this section of the website and make it clear that, if they are not club managers, they will be redirected to a simulation of the purchase process, figure. Non-logged-in users are also presented with a button that redirects them to the sign-in page.

The pop-ups played a role in addressing the transparency issue by providing users with information about their options. While they differ from the pricing component, which is the primary solution for transparency and will be discussed in the following section, the pop-ups address the abstract problem of equipping users with knowledge about their choices.

4.3 Demonstration

After finalizing the design, a design walk-through, together with the company's designer, was made to both the business and technological sectors of the company to showcase the solution.

As mentioned in the section above, the solution involves a single page that contains various

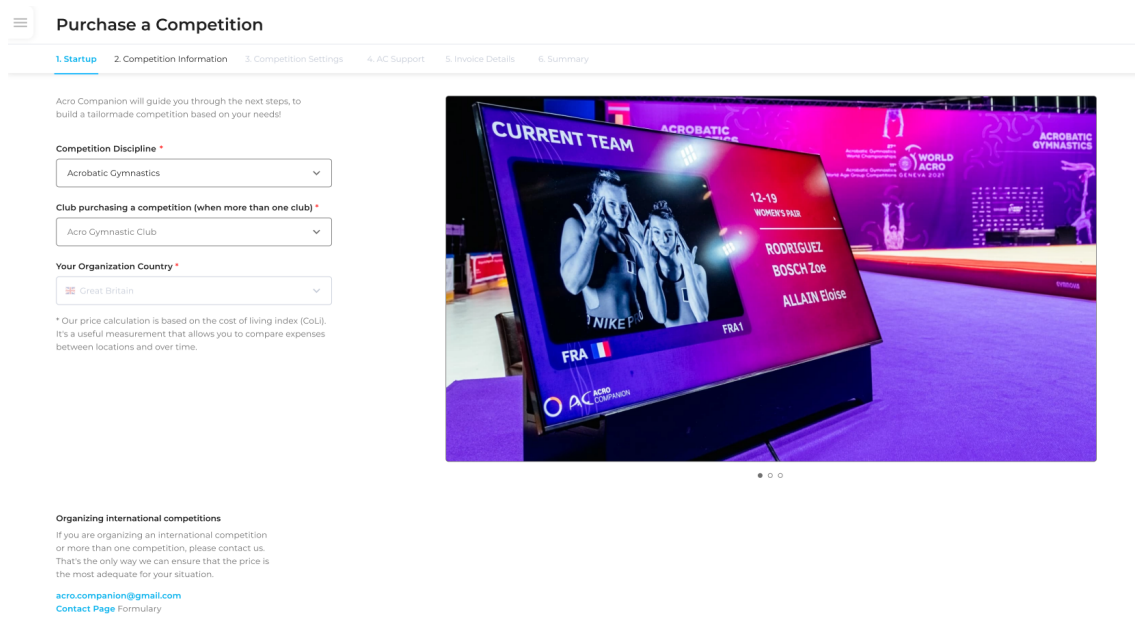


Figure 4.9: First tab

tabs for users to customize a competition. Examples of these tabs can be seen in figures 4.9, 4.10, and 4.11. To ensure that users are able to focus on each option, a decision was made to have multiple tabs with limited customization options on each. In tabs where there is a larger number of options, like in the third tab, the options were organized in cards that are openable in order to keep the user's focus. A small red asterisk has been included beside the option name to ensure that users are notified about the mandatory selections

In order to address the problem of transparency a price component was created. This component updates the price and displays the selected options according to the user's choices. The price component is included in all tabs except for the first one. The price component is absent in the first tab since this was the introductory tab, and none of the options selected here affected the price.

4.4 Evaluation

From the demonstration, the presented designs closely aligned with Acro's desired solution. However, there were a few issues about option naming and some instances of repeated or slightly inaccurate information.

Additionally, the discussion touched upon potential enhancements, including the future incorporation of a communication tab to facilitate user-company messaging.

Another noteworthy topic of conversation centred around the design considerations for mobile

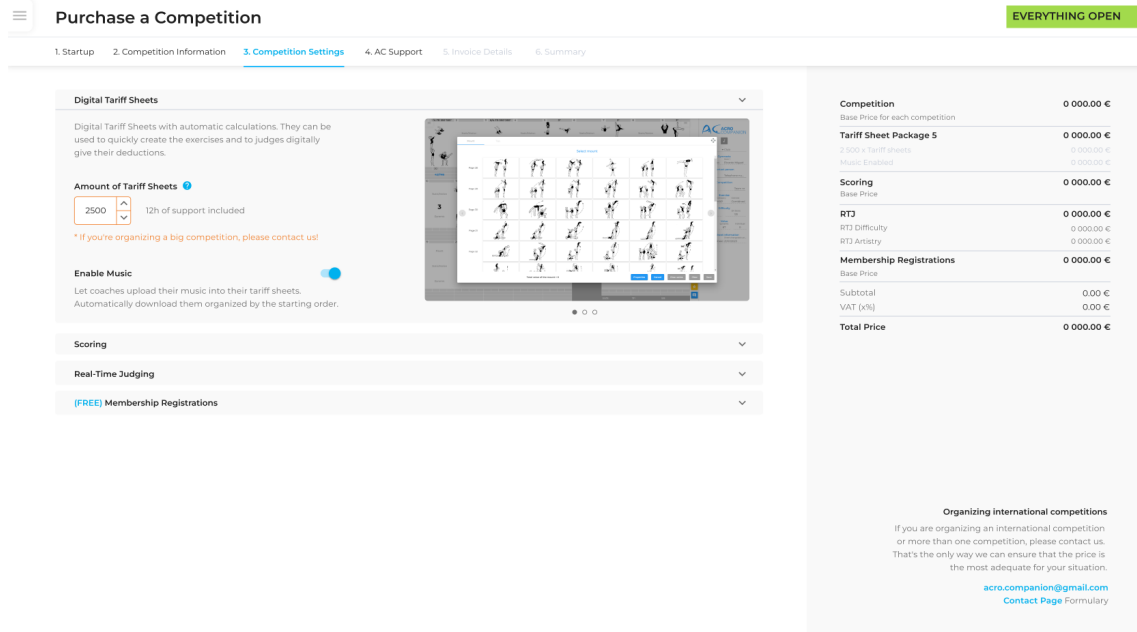


Figure 4.10: Third tab

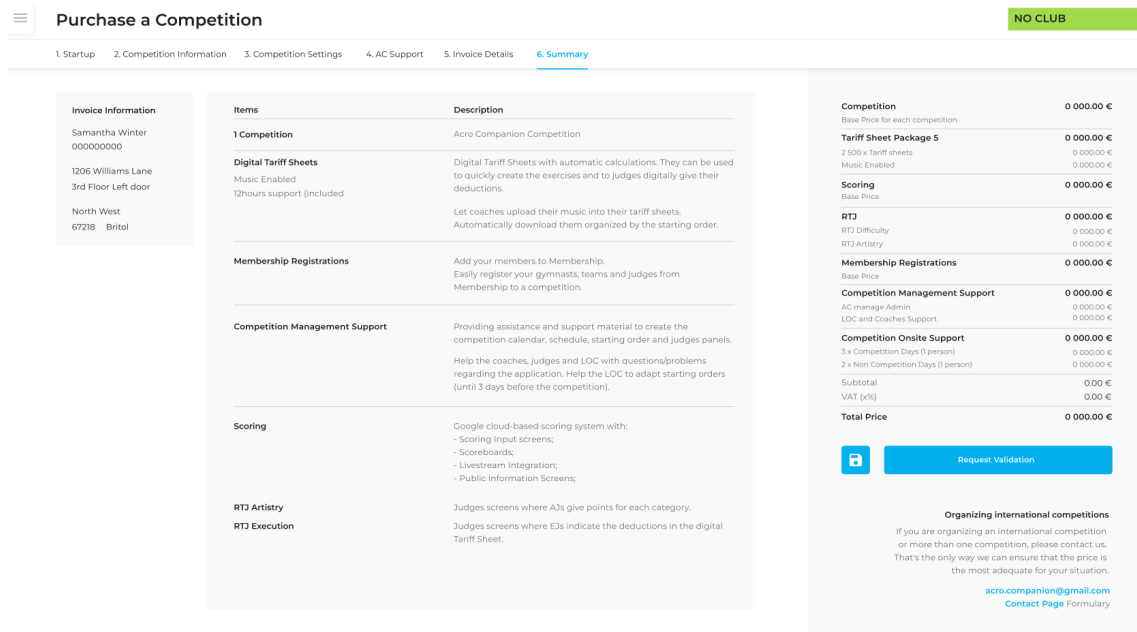


Figure 4.11: Final tab

devices, even though the mobile version had yet to be developed. Some guidelines were provided to steer the solution's development in this direction. For example, regarding the way the price component would be presented to users on smaller devices.

Chapter 5

Second iteration

After the designs for the solution were approved by the technical and business people in the company, the development of the solution began.

5.1 Objectives

Due to time constraints and the need to quickly provide a functional product, we have decided to prioritize the implementation of a Minimum Viable Product (MVP) for this iteration.

After careful consideration, the decision was made to exclude Acrobatic competitions from this iteration. This type of competition involves a significant number of options and combinations, making it the most complex. Additionally, tariff sheets, which are required for this type of competition, are challenging to code and have a complex pricing system.

To inform users that Acrobatic competitions were still on offer but not accessible through the Competition purchase component, a warning was included in the price component advising users that it was unavailable and encouraging them to contact Acro directly.

A comprehensive review of the designs was conducted in collaboration with the technical experts of the company, which enabled the identification of the most suitable features for the MVP iteration. The guidelines for the implementation were:

- **Tab 1 - Start:** Everything was to be implemented, so no changes from the design.
- **Tab 2 - Competition Information:** Implement everything except for "Enable National Program".
- **Tab 3 - Competition Settings:** Implement Scoring and Membership cards and remove Tariff Sheets cards and Real-Time Judging cards.
- **Tab 4 - Support:** Remove this tab entirely.

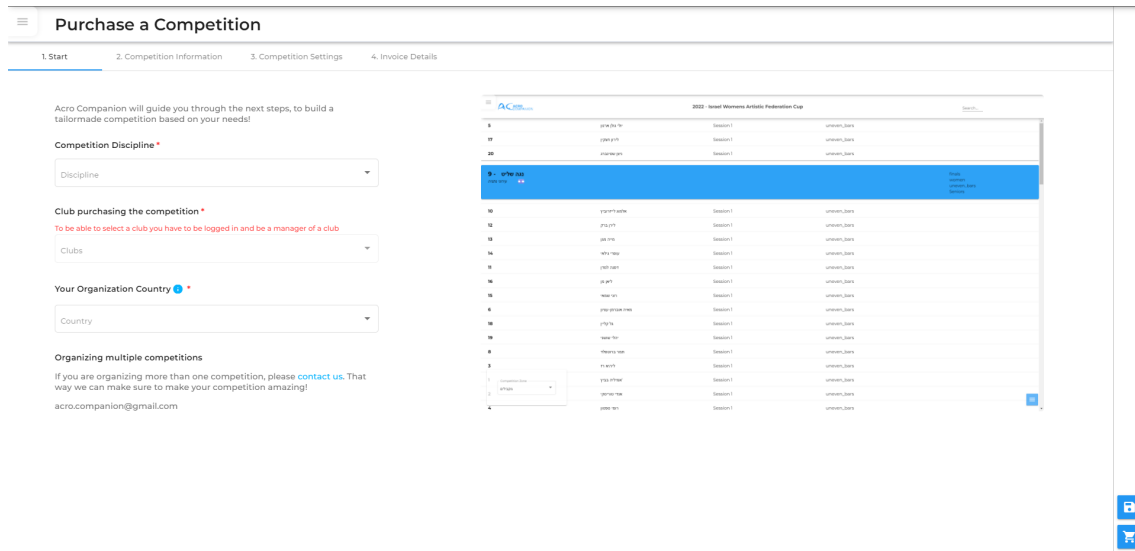


Figure 5.1: Start tab implemented with button bar

- **Tab 5/6 - Invoice Details/Summary:** Merge this two tabs by removing the summary part and placing the "Send to Review" and "Save" buttons on the price component.

5.2 Development

Expanding on the structure and designs established in the previous iteration, the implementation centered around the creation of a central component for the entire page. This encompassing component housed another one that included all the tabs and content specific to the selected tab. Additionally, a distinct component was crafted to enumerate the selected features with associated costs, alongside the overall competition cost. For streamlined code organization, each tab's content was isolated within separate components.

Harnessing Angular's capabilities, a service was introduced to act as the backbone for the entire competition purchase component. This service facilitated communication among different tabs and, between tabs and the price component. It also handled price calculations and interactions with the company's NoSQL database.

An additional element, not originally featured in the designs, was incorporated into the interface. A vertical button bar was added to the right-hand side of the page to remain consistent with other sections of the Acro website, figure 5.1. This was a pre-existing generic component developed by the company. By using this component, the "save competition" button was removed from the price component in the last tab. This change made it possible for users to view the button at all times during the customization process. Furthermore, a new button was introduced on the button bar, redirecting users to a page displaying their saved competitions.

```
createForm() { @ melo
  this.startForm = this.formBuilder.group( controlsConfig: {
    discipline: [this.editObject?.partialOrg.discipline, [Validators.required]],
    club: [this.editObject?.club, [Validators.required]],
    country: [this.editObject?.partialOrg.country, [Validators.required]],
  });
}
```

Figure 5.2: Angular form implementation example

```
this.startForm.valueChanges
  .pipe(
    map( project: _ => this.startForm.getRawValue()),
    untilDestroyed(this),
  )
  .subscribe( observerOrNext: value => {
    this.competitionPurchaseService.setDynamicCompetitionStart(value);
  });
```

Figure 5.3: Angular ValueChanges function implementation example

5.2.1 Competition customization tabs

Inline with previously developed code in other parts of the company's application, and again using the angular features, the component of each tab had an UntypedForm with all the options of the page. Each option was then a field in these forms.

Angular forms offer numerous valuable features, which is why they were used. By using Angular forms, user input can be handled in a reactive manner, which provides several advantages in terms of scalability, form control, and input validation. Angular forms can handle complex form scenarios and large forms efficiently, making them highly scalable. Additionally, they allow for control over the form logic, and synchronous access to both input values and validation status. An example of the implementation of the forms can be seen in figure 5.2

The valueChanges function of the forms, figure 5.3 returns an observable that gets updated whenever there's a modification in the fields of the form. By subscribing to this observable, the values of each form field are retrieved. Subsequently, these values are then forwarded to the service, which acts as a temporary repository for all the form information while the user customizes their competition.

```
private _dynamicCompetitionStart$$: BehaviorSubject<Partial<Organisation>> = new BehaviorSubject<Partial<Organisation>>(_value: null);
private _dynamicCompetitionInformation$$: BehaviorSubject<Partial<Organisation>> = new BehaviorSubject<Partial<Organisation>>(_value: null);
private _dynamicCompetitionSettings$$: BehaviorSubject<Partial<Organisation>> = new BehaviorSubject<Partial<Organisation>>(_value: null);
private _dynamicCompetitionInvoice$$: BehaviorSubject<InvoiceDetails> = new BehaviorSubject<InvoiceDetails>(_value: null);
private _dynamicCompetitionPrice$$: BehaviorSubject<string> = new BehaviorSubject<string>(_value: null);
```

Figure 5.4: BehaviourSubjects of each tab

```
public setDynamicCompetitionStart(competitionData: CompetitionPurchaseRequestModel | any) {
  this._dynamicCompetitionStart$$._next(competitionData);
}
```

Figure 5.5: BehaviourSubject setter

5.2.2 Competition purchase service

As previously mentioned, a service was implemented as the backbone for the competition purchase component. Within this service, individual behaviour subjects correspond to each tab of the component 5.4, serving as temporary repositories for the information from each tab.

Whenever there is a change in a form, as explained in the previous section, the information is stored in the corresponding behaviour subject using a setter 5.5. Additionally, the service includes an observable for each behaviour subject, facilitating communication between tabs. For instance, in the settings tab, there may be options that depend on the competition's discipline, chosen in the first tab. To achieve this seamless interaction, a subscription is established to the observable of the behaviour subject containing the information from the first tab. This ensures real-time adjustments in the tabs when an option is selected.

The previously discussed communication between tabs is also crucial for the price component, as it relies on this communication to access information about the user's selected customization options. This enables the price component to dynamically display the chosen options alongside their corresponding prices in real-time.

Beyond facilitating communication between tabs, this service also handles database communication. This interaction occurs when the user triggers the Request Validation button or the save button. Upon pressing either of these buttons, an object of a new type is instantiated. The interface created for this object, figure 5.6 encapsulates information from the behavior subjects of all tabs, the pricing details, and relevant user information. Subsequently, this object is inserted in the company's database for storage. In case of a validation request, an email with relevant information is sent to the company's email address.

```
export interface CompetitionPurchaseRequestModel {
  $key?: string;
  $path?: string;
  documentVersion?: number;
  modelVersion?: number;

  competitionPrice: string;
  status: PurchaseStatus;
  clubOrganizingCompetition: string;

  userPurchasingCompetitionContactEmail: string;

  created_on?: Timestamp;
  created_by?: string;
  created_by_id?: string;

  commentThreadHistory: ThreadComment[];

  updated_on?: Timestamp;
  updated_by?: string;

  organisationType: OrganisationType;
  discipline: DisciplineType;
  country: string;
  competitionName: string;
  competitionType: CompetitionType;
  levels: string[];
  startDate: Timestamp | Date;
  endDate: Timestamp | Date;

  isRtDjEnabled: boolean;
  isRtAjEjEnabled: boolean;

  hasRegistrations: boolean;
  hasAdvancedRegistrations: boolean;
  isAcScoringEnabled: boolean;
  isCompetitionAdministrationEnabled: boolean;

  gymnastsAmount: number;

  isTariffSheetsEnabled: boolean;
  tariffSheetsAmount: number;
  isMusicEnabled: boolean;

  isAcManageAdministrationEnabled: boolean;
  isOnlineSupportLocAndCoachesEnabled: boolean;

  invoiceDetails: InvoiceDetails;
}

export interface InvoiceDetails {
  invoiceClientName: string;
  vat?: number;
  isVatEnabled: boolean;
  address1: string;
  address2?: string;
  province?: string;
  postalCode: string;
  city: string;
}

export interface ThreadComment {
  text: string;
  created_on: Timestamp;
  created_by: string;
}

export type PurchaseStatus = 'Saved' | 'In review' | 'Completed';
```

Figure 5.6: Interface for new type of objects

5.2.3 Purchases overview page

Besides the button bar another essential feature not initially part of the designs was a dedicated section within the application for users to view their saved competitions and purchases. Following the guidance of Acro's technical team, this was accomplished by introducing a new tab within the user's profile, aptly named "Purchase Requests." Within this tab, a structured table was implemented, with each row representing a customized and saved competition or a competition submitted for approval and subsequent purchase.

Each row featured several columns including the date of the last modification to the request, competition name, competition discipline, request status, request price, and a final column for the competition invoice. The invoice column will be completed by the company after the purchase request is approved. Additionally, each row has two buttons that allow users to edit or delete their purchase requests.

For the administrators of the website, a similar page was added in the administration part of the website to allow them to see all the purchase requests sent in by users.

5.2.4 Mobile adaptation

Several minor adjustments were implemented for the mobile adaptation of the competition purchase component. As shown in figure 5.7, the single-page structure with multiple tabs was retained, with some adjustments to the organization of the components of each tab, and a modification was made specifically to the price component.

Maintaining visibility for the competition's price on the reduced space available in the mobile view required changes to the price component. In the mobile version, the price component is presented as a compact bar at the bottom of the screen that can be expanded. In its minimized state, the component displays only the total price and buttons mirrored from the desktop version's button bar. Upon expansion, as shown in figure 5.8, the component occupies the entire screen, showcasing the user's selected options in the same detailed manner as its desktop counterpart.

5.3 Demonstration and Evaluation

Following the implementation, a meeting was held with the company's business and technology leaders. During the session, a comprehensive walk-through showcased the developed component, including a simulated purchase that highlighted all the intricacies of the developed elements.

The previously mentioned demonstration resulted in two important conclusions that should be kept in mind.

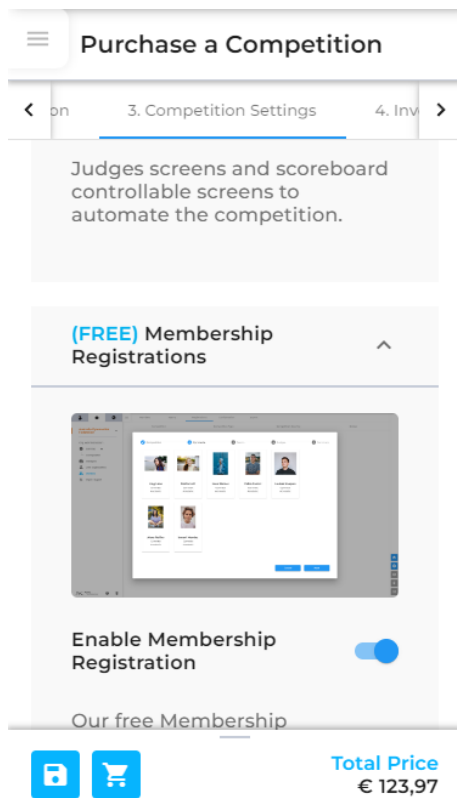


Figure 5.7: Mobile adaption

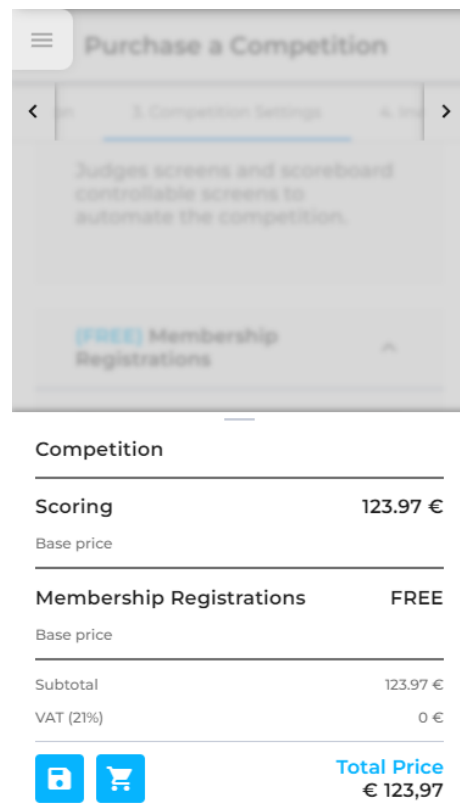


Figure 5.8: Expanded price component in mobile view

The first conclusion was related to the component's state. It was concluded that the component was functional and had achieved all the objectives of the iteration. However, despite being a significant step towards the final solution, it was also agreed that there was still room for improvement.

The second conclusion was that even though the primary goal was to develop a component for release to users, it was decided after thorough consideration that the component should not be released at this time. The main reason was that acrobatic competitions, which were the company's main selling point and had the most customization, were not yet implemented. Another factor that influenced this decision was the development of Advanced Registrations, a new registration mechanism that was completed during the development of this iteration. The company wanted to present this new registration mechanism to users, and some changes were required to accommodate it.

Chapter 6

Third iteration

After the decisions taken at the end of the second iteration development, the third iteration of development began.

6.1 Objectives

In this iteration, the objective is to enhance the existing solution by incorporating the remaining components omitted in the MVP iteration and integrating additional features discussed earlier.

Specifically, the focus for this iteration is on incorporating the following features that were excluded in the previous iteration:

- Acrobatic competitions
- Tariff sheets and all the options related to them
- The support tab

In addition to the previously listed features, the following new features also needed to be implemented:

- A new tab called registrations where the user could choose between the default membership registrations or the advanced registrations
- A new communication tab, that was discussed at the end of the first iteration. This tab will allow users to chat with the company and clarify doubts they might have in the purchase process or special requests they might have for their competition

Finally, in addition to incorporating various features, one of the main objectives was to improve the overall quality of life for users within the solution.

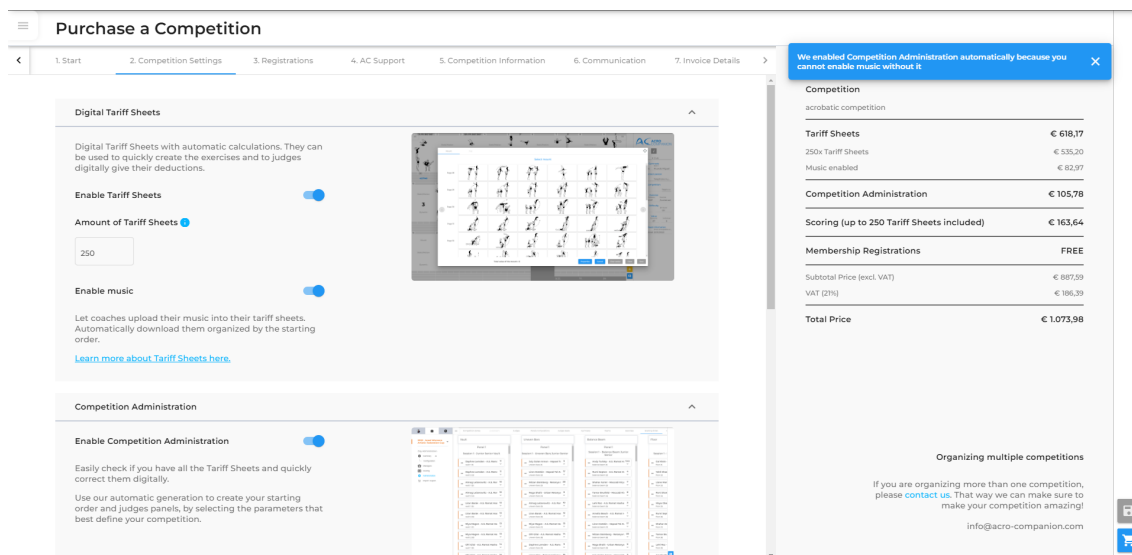


Figure 6.1: Tariff Sheets card and Competition Administration cards

6.2 Design and Development

In this iteration, there were no significant changes to the structure of the solution, specifically the single page with multiple tabs and the service serving as the backbone.

The newly added features and customization options operated seamlessly, mirroring the functionality of the previously developed code. The angular forms, as explained earlier, provided a simple way to incorporate new fields for the newly developed features.

6.2.1 Acrobatic Competitions

Adding acrobatic competitions, in a practical sense, meant the addition of the tariff sheets card within the settings tab and the inclusion of other cards for sheet customization. Consequently, the settings tab evolved into a dynamic tab, adapting its cards based on the chosen discipline.

For acrobatic competitions, the initial card displayed was the tariff sheets card, figure 6.1. Within this card, users were presented with an option to choose whether they wanted tariff sheets. If selected, a field would unlock to input the number of tariff sheets for the competition. Enabling tariff sheets would also unlock the music option which was a complementary add-on the the tariff sheets.

Enabling tariff sheets further unlocked two additional cards related to tariff sheets add-ons. The first, Competition Management, featured a simple toggle button to enable or disable it, accompanied by its own dedicated card, figure 6.1. The second add-on, Real-time Judging, required both tariff sheets and Competition Management to be enabled. Within the Real-time Judging card, two checkboxes allowed users to select modules associated with this feature, along with an addi-

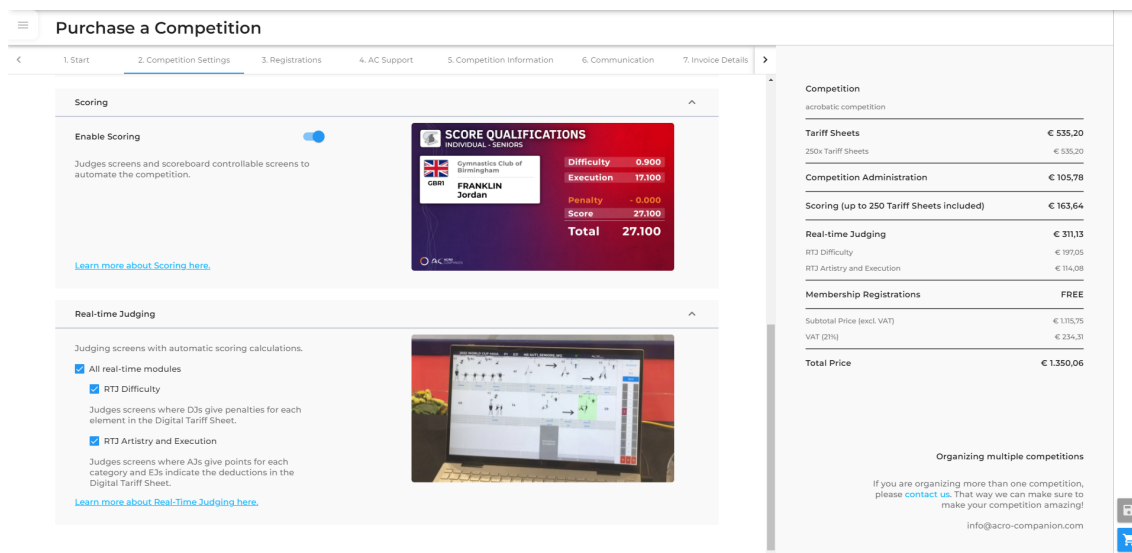


Figure 6.2: Real-time Judging card

tional checkbox to enable or disable all of them, figure 6.2.

6.2.2 Support tab

The support tab, already planned since the beginning of the project development, was a simple tab but a necessary feature of the competitions sale process.

The support function plays a crucial role in Acro's business operations. Aside from selling their competition management software, as previously discussed, Acro also offers support and training services for this software. This support can be provided either remotely or on-site, serving two primary purposes. Firstly, it involves training and explaining the software to judges and other individuals involved in using the competition management system during events. Secondly, it encompasses organizing and managing administrative aspects of the competition, including creating schedules, starting orders, and judges' panels.

The tab is simple, presenting users with only two selectable options. These options are related to the different support services Acro offers. Besides the two buttons, there is also a section of the tab detailing the available modes of support delivery and the corresponding rates that the user will be charged, figure 6.3.

6.2.3 Registrations tab

As highlighted during the evaluation phase in the previous iteration, the introduction of Advanced Registration prompted the decision to allocate Registrations to their own tab instead of remaining

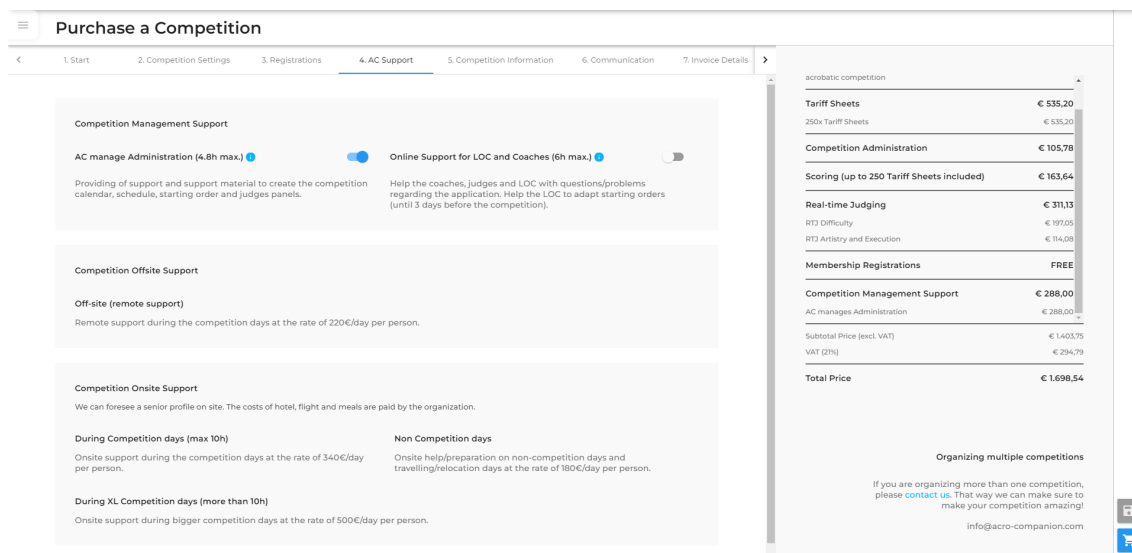


Figure 6.3: Support tab

within the Settings tab. This adjustment was particularly important with the inclusion of Acrobatic competitions, which expanded the number of cards in the settings tab. The segregation aimed to streamline user interaction by reducing the options within a tab, allowing for a more focused user experience.

The dedicated tab, figure 6.4, comprised two cards-one for the simpler Membership Registrations and another for the Advanced Registrations. The only noteworthy feature about this tab was the fact that both types of registrations could not be selected simultaneously and selecting one of them would automatically deselect the other.

6.2.4 Communication tab

The idea for the Communication tab emerged during the design evaluation stage, providing a valuable solution to a common issue encountered in the purchase process. Frequently, users had specific requests for their competitions or questions about Acro's services during this stage.

Implementing this feature was made easier by using a pre-existing component on the website. The tariff sheets creation screen, figure 6.5, already allowed users to send text messages to the company if they had any inquiries. Building on this, the implementation of the Communication tab, figure 6.6, began by transforming this messaging component into a generic one. Subsequently, it was integrated into both the tariff sheets creation and the competition purchase components.

This generalization not only streamlined the process but also made it adaptable for potential implementation in other parts of the website.

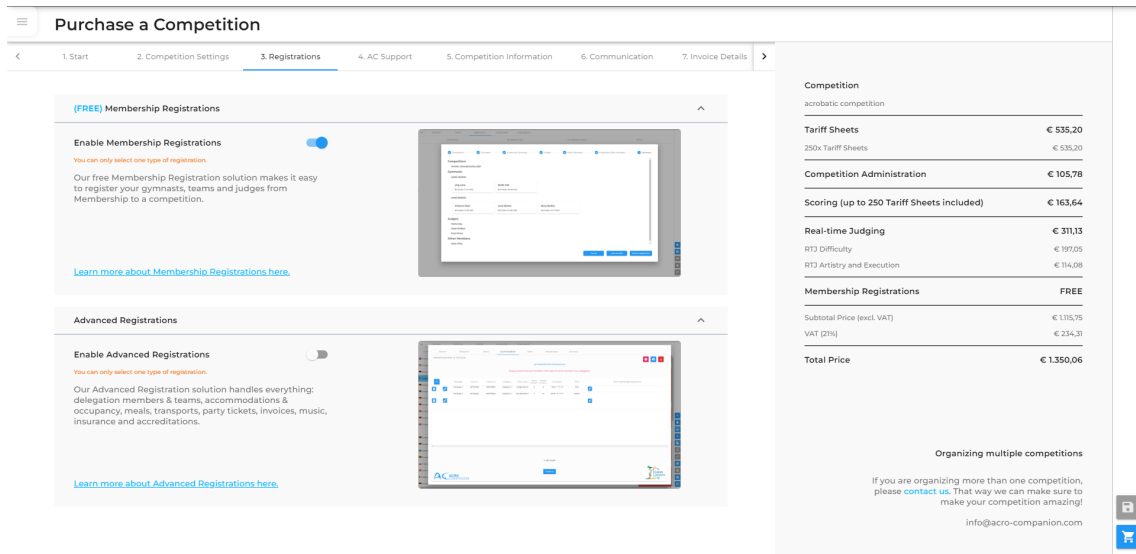


Figure 6.4: Registrations tab

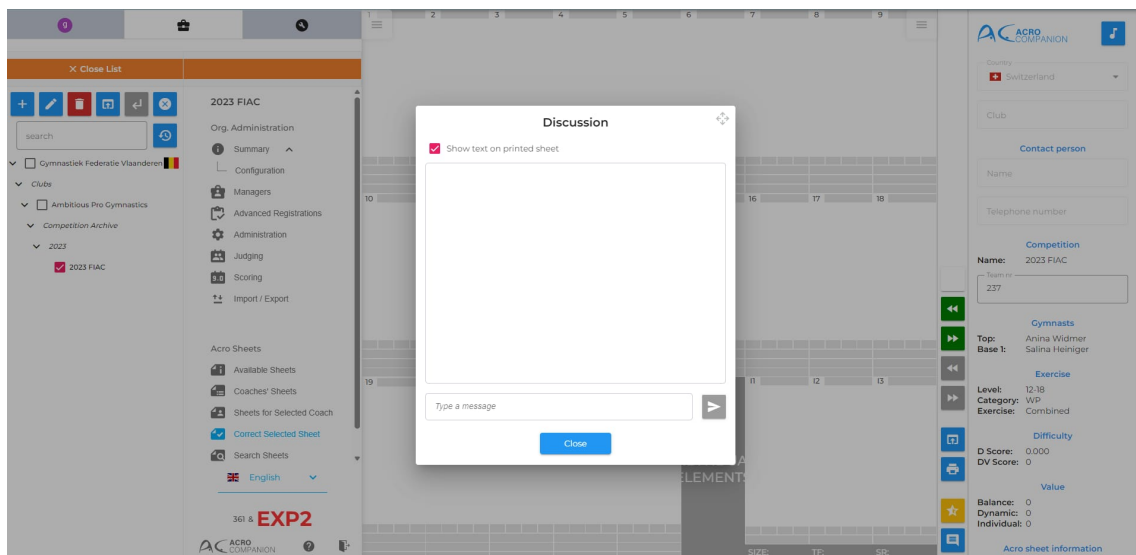


Figure 6.5: Communication component in the tariff sheet creation component

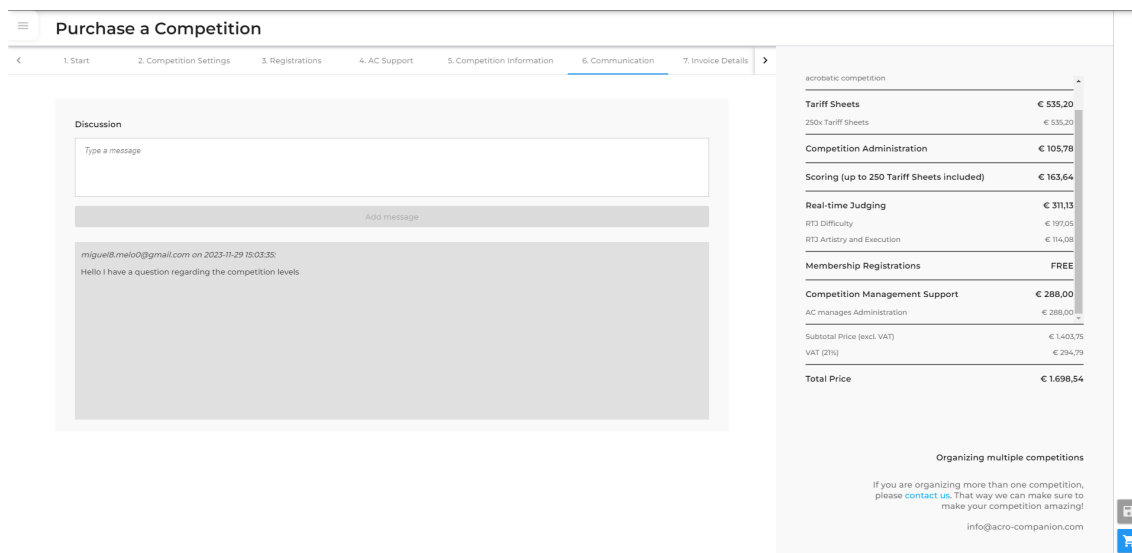


Figure 6.6: Communication tab

6.2.5 Quality of Life improvements

Enhancing user experience for a smoother and easier purchase process was a key focus in this iteration.

Automatic option fill-in and selection

The first improvement involved automatically populating billing information with the details associated with the user's club, as can be seen in figure 6.7. This contributed to a more streamlined experience.

Additionally, to further simplify the process, certain options were designed to be automatically selected when another option requiring them was chosen. For instance, the music feature of tariff sheets necessitates the enabling of competition administration. Consequently, selecting the music option automatically triggers the selection of competition administration for the user. This dynamic relationship works both ways; deselecting competition administration leads to the automatic deselection of the music option, as it relies on the former for functionality.

Additional information

An additional feature involved the inclusion of informational links within the cards, implemented in both the settings tab cards and the registrations tab cards, figures 6.1, 6.2 and 6.4. These links direct users to specific pages on Acro's website, offering more detailed information about the services provided.

Purchase a Competition

1. Start 2. Competition Settings 3. Registrations 4. AC Support 5. Competition Information 6. Communication 7. Invoice Details

Invoice Details Date 29/11/2023

The invoice fields were automatically filled with the selected club information. You can change this information in the respective field.

Name * Miguel Melo **VAT number**

Select only if you want to add a VAT number.

Address Line 1 * Rua do Cruzeiro, nº 9 Vendas de Santana **Province/Region** Lisboa

Address Line 2 **Postal code *** 3025-624 **City *** Coimbra

acrobatice competition	
Tariff Sheets	€ 535,20
250x Tariff Sheets	€ 535,20
Competition Administration	€ 105,78
Scoring (up to 250 Tariff Sheets included)	€ 163,64
Real-time Judging	€ 311,13
RTJ Difficulty	€ 197,05
RTJ Anality and Execution	€ 114,08
Membership Registrations	FREE
Competition Management Support	€ 288,00
AC manages Administration	€ 288,00
Subtotal Price (incl. VAT)	€ 1.403,75
VAT (21%)	€ 294,79
Total Price	€ 1.698,54

[Request Validation](#)

Organizing multiple competitions

If you are organizing more than one competition, please [contact us](#). That way we can make sure to make your competition amazing!

info@acro-companion.com

Figure 6.7: Information tab with fields filled in automatically

Digital Tariff Sheets

Digital Tariff Sheets with automatic calculations. They can be used to quickly create the exercises and to judges digitally give their deductions.

Enable Tariff Sheets

Amount of Tariff Sheets 250

Enable music

Let coaches upload their music. Automatically download the order.

[Learn more about Tariff Sheets](#)

Amount of Tariff Sheets

Depending on the number of tariff sheets there might be a discount associated:

Tariff Sheet Amount	Discount
100 - 199	1%
200 - 299	2%
300 - 399	3%
400 - 499	4%
500 - 999	5%
1000 - 1999	6%
2000 - 3499	7,5%
3500 - 4999	10%
5000 - ...	12.5%

Figure 6.8: Tariff sheets discount information pop-up

Furthermore, small information icons were introduced in select options, such as the tariff sheets, figure 6.8, allowing users to access additional details by hovering over the icon. This approach aimed to maintain a more concise display of information. For instance, in the tariff sheets card, the displayed information pertained to discounts based on the selected number of sheets. Since this information is only temporarily relevant, presenting it in this manner served to keep the interface more compact.

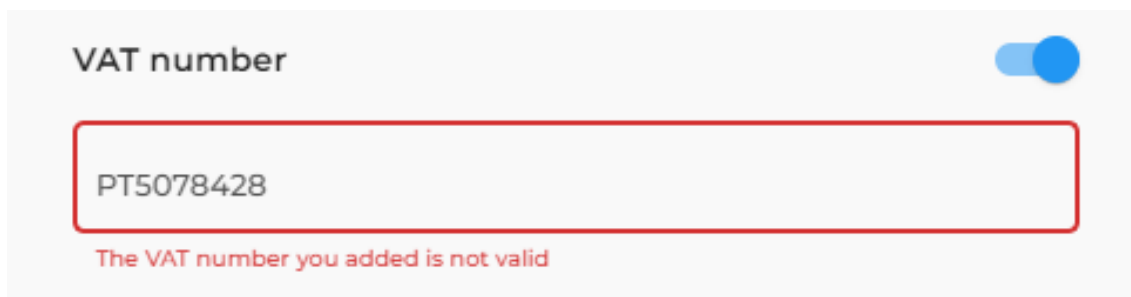


Figure 6.9: VAT field warning

Warnings

In addition to the automatic selection of options mentioned earlier, pop-up alerts were introduced in the top-right corner to notify users whenever such selections occurred, this can be seen in figure 6.1.

Furthermore, a different category of warnings was implemented. For options like the VAT number, which required a specific format, text warnings were placed beneath the corresponding fields to inform users about the correctness of their input or to indicate missing information, figure 6.9. This implementation was achieved using Angular forms validators to ensure accuracy and ease of implementation.

6.3 Demonstration and Evaluation

As in the previous iteration, following the completion of the implementation, a meeting convened with Acro's business and technology leaders, along with select members of the technology team.

The meeting featured a walk-through that comprised a presentation and a simulated use case demonstration of the developed component. This demonstration showcased both the newly implemented features and those developed earlier, exploring various combinations and relationships among the customization options.

Following the comprehensive presentation and demonstration of the component, a unanimous consensus was reached. The component had successfully achieved all the objectives for this iteration and contributed significantly to the overall goals of the project.

With this in mind, a collective decision was made to make the first public release of the component. The successful development marked an important milestone, positioning the component as a valuable asset ready to be shared with the wider public audience.

Chapter 7

Discussion

Acro's initial proposal for the project focused solely on automating and simplifying the sales process. However, after discussions, we recognized the potential value of integrating the meta-design framework into the project. This decision was driven by the realization that the purchase process heavily involved customizing the final product, effectively allowing users to finalize the product design.

We consider the implementation of the meta-design framework successful. Although the customization process has some limitations, offering users a degree of flexibility ensures their input is essential to completing the final product. As discussed in meta-design literature, these limitations emphasize the importance of designers providing users with freedom within predefined boundaries.

One notable enhancement to the meta-design aspect of the project was the introduction of the communication tab. Originally intended for users to seek clarification on features, it also became a channel for users to request new features for competitions. Reflecting on figure 2.1 and considering the various user levels depicted, this implies that users would move beyond the category of "End users who customize" and find themselves in a transitional space, occupying an intermediate position that lies between this level and that of "Web content developers".

The transparency aspect of the solution also raised interesting discussion topics, leading to the identification and exploration of two distinct types of transparency. The first, denoted as operational transparency, revolves around effectively communicating to users what will unfold in the system, notably by providing comprehensive explanations of various customization options. This type of transparency not only enhances user understanding but also promotes a sense of clarity in the decision-making process. The second type, consequential transparency, takes shape by presenting users with a transparent showcase of the repercussions of their actions. A prime example of this is the real-time display of prices associated with selected options, enabling users to make informed decisions based on the financial implications of their choices.

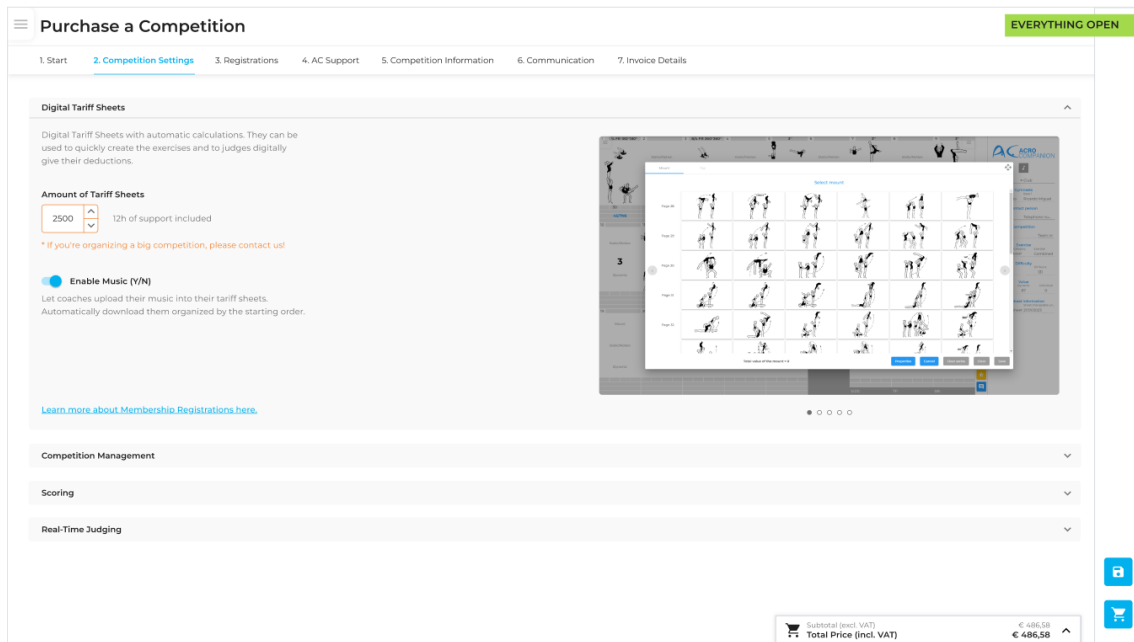


Figure 7.1: Designs of future iterations

7.1 Limitations and Future work

Regarding limitations, there were initial challenges in learning and adapting to the technologies employed in the project, along with adjusting to the internal processes and work environment of the company.

Another constraint was the number of customization options within a competition, which aligns with potential future improvements. Expanding the range of customization and adopting a more deconstructed service could facilitate a broader array of combinations, resulting in a more comprehensive product.

For future iterations, two key enhancements were identified. Firstly, implementing a payment system that allows users to autonomously pay once Acro approves the request. Although the utilization of Stripe was considered in the project's early stages, it was temporarily set aside in favor of prioritizing essential features necessary for the public release.

Secondly, improvements in the design solutions were suggested, particularly in how the price component was presented in the desktop version. Rather than consistently occupying a large portion of the screen, it would be condensed into a small component in the bottom right, overlapping the main component when open, figures 7.1 and 7.2. This adjustment aimed to provide the main component with more screen space, enhancing the user experience, particularly on smaller screens.

When it comes to future work in a more research-oriented perspective, there is still much

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Music Enabled	€ 22,67
Competition Administration	€ 28,90
Scoring (up to 180 Tariff Sheets Included)	€ 123,97
Real-Time Judging	€ 85,01
RTJ Difficulty	€ 53,84
RTJ Artistry and Execution	€ 31,17
Membership Registrations	FREE
Subtotal (excluding VAT)	€ 486,58
Total Price (incl. VAT)	€ 486,58

[Close Purchase Summary](#)

Figure 7.2: Designs of future iterations with price component open

to be done and improved regarding the main topics of this document - meta-design and transparency. Once again looking at figure 2.1, how can we make the users shift closer to the category of software professionals and, taking into account previous literature on meta-design and all of this framework's intricacies, where do we want users to stand in this scale between "Pure end users" and "Software professionals".

The topic of transparency is relevant to the previously mentioned questions and is a topic that should be heavily considered in further research of meta-design. This is because transparency addresses a spectrum of crucial considerations within meta-design research, including the disclosure of process or decision-related information, effective communication of complex concepts, the delicate balance between openness and security, and also challenges associated with cultural and organizational resistance.

Chapter 8

Conclusions

8.1 Contributions to meta-design

This project makes noteworthy contributions to the meta-design framework, particularly from a research-oriented perspective, by implementing a component that adheres to the principles of the framework. This practical application in a business context serves as a valuable example for the community.

In alignment with the meta-design literature, the project emphasizes providing configurability to a generic artifact, allowing users to customize the competitions to meet their specific needs. By creating the flow chart 4.2 and thoroughly analyzing the sales process, a structured workflow with a certain level of configurability was identified. Consequently, the customization performed by users on their competitions stems from the configurability incorporated by developers into the artifact.

Another valuable contribution to the research community arises from the two types of transparency referenced earlier in the discussion chapter. This exploration of transparency adds a significant dimension to the meta-design framework, since it contributes to user understanding, empowerment and usability, ultimately enhancing the overall effectiveness of the design framework.

8.2 Organizational impact

The project had a significant impact on Acro's business organizationally. The implementation of the component on their website transformed the entire sales process.

Now, users could easily explore and understand Acro's products for sale on the website without needing to contact the company for detailed information. They could customize their competition, view different options, understand associated costs, and see the final prices-all in one place.

Moreover, the developed component streamlined interactions between business personnel and customers. For instance, when a customer wanted a budget for organizing a competition, a representative from Acro could swiftly provide one by using the component. This was exemplified in a real scenario where a representative from a gymnastics federation, interested in the product, customized the competition using the component and quickly received a budget. Such instances not only facilitated negotiations but also paved the way for potential new clients for the company.

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