Remote Online Competition System in Rhythmic Gymnastics

Abstract

The start of the global COVID-19 pandemic was a big hit for all sports communities around the world in March 2020. As the virus spread around the globe, sports halls began closing, all competitions, tournaments and even regular trainings had to be cancelled. The gymnastics community quickly assessed the situation and virtual training sessions became the new norm around the world. The virtual world was then utilised to arrange online competitions for gymnasts to compete in. The online competitions were either held with pre-filmed videos sent to the competition or with live online performances through an application like Zoom.

This master's thesis presents the results from a study on how usable a Finnish system for online competitions was according to the systems users, as well as a redesigned version of the system based on user input. The original system is based on a web application with a scoring system on one web page, a live stream on another and a Zoom application open on the same or a on another device. The redesigned system utilises only a scoring system and Zoom, removing the live stream completely.

The results show that most of the users were overall happy with the original system and especially liked the scoring system of the application. The study also showed that more than half of the participants wished for it to be possible to use the system with only one device or monitor, or at least for the scoring and live stream to work on the same page. The redesigned system removed the need for a live stream by using preloaded videos, which was seen as a positive change by the users.

Keywords: remote competition, rhythmic gymnastics

Tiivistelmä

Maailmanlaajuisen COVID-19-pandemian alkaminen maaliskuussa 2020 oli suuri isku kaikille urheiluyhteisöille ympäri maailmaa. Viruksen levitessä ympäri maailmaa urheiluhallit alkoivat sulkeutua, kaikki kilpailut, turnaukset ja jopa säännölliset harjoitukset jouduttiin perumaan. Voimisteluyhteisö reagoi tilanteeseen nopeasti ja virtuaaliharjoitteluista tuli uusi arki ympäri maailmaa. Virtuaaliympäristöä käytettiin myöhemmin järjestämään online-kilpailuja, joissa voimistelijat voivat kilpailla. Virtuaaliset online-kilpailut pidettiin joko etukäteen kuvatuilla videoilla, jotka lähetettiin kilpailuun tai Zoomin kaltaisen sovelluksen kautta reaaliajassa kilpaillen.

Tässä pro gradu -tutkielmassa esitellään tulokset tutkimuksesta, jossa selvitettiin kuinka käyttökelpoinen suomalainen virtuaalikilpailujärjestelmä oli järjestelmän käyttäjien mielestä, sekä käyttäjäpalautteen perusteella uusittu versio järjestelmästä. Alkuperäinen järjestelmä perustuu verkkosovellukseen, jossa yhdellä sivulla on pisteytysjärjestelmä, toisella suoratoisto ja samalla tai toisella laitteella avoinna oleva Zoom-sovellus. Uudelleen suunniteltu järjestelmä käyttää vain pisteytysjärjestelmää ja Zoomia, poistaen suoratoistolähetyksen kokonaan.

Tulokset osoittavat, että suurin osa käyttäjistä oli yleisesti ottaen tyytyväisiä järjestelmään ja käyttäjät pitivät erityisesti sovelluksen pisteytysjärjestelmästä. Tutkimus osoitti myös, että yli puolet osallistujista toivoi, että järjestelmää voitaisiin käyttää vain yhdellä laitteella tai näytöllä. Tai vähintäänkin, että pisteytys ja suoratoisto toimisivat saman sivun kautta. Uudistettu järjestelmä poisti suoran lähetyksen tarpeen käyttämällä esiladattuja videoita, mikä käyttäjien mielestä oli positiivinen muutos.

Avainsanat: etäkilpailu, rytminen voimistelu

Content

1. Introduction

In December 2019 a new coronavirus, COVID-19, presented itself in the most populated city in central China, in the city of Wuhan in the Hubei Providence. From this city of over 11 million people, COVID-19 started to rapidly spread around the globe causing the infected severe respiratory infections. [1]

The COVID-19 disease is caused by a pathogen called "severe acute respiratory syndrome coronavirus 2", or in short "SARS-CoV-2". The symptoms of COVID-19 include high fever, fatigue, dry cough and a loss of taste and smell. Studies also estimate that up to 80% of the people infected with COVID-19 are asymptomatic, meaning they show few or no symptoms at all.

The disease spread so rapidly across the globe as it is easily passed on from one person to another, who are in close contact, via respiratory droplets or aerosols in the air. By the beginning on March 2020, the disease had spread to over 90 countries with over a 100,000 cases reported. At this point, on March 11th 2020, The World Health Organisation (WHO) declared the novel coronavirus, COVID-19, outbreak a global pandemic. The disease continued to spread and and lead to an estimated of at least 3 million deaths during 2020. [2] [3]

The spread of the COVID-19 disease caused not only health issues but political issues all over the world. Leaders and governments from different countries

introduced many kinds of restrictions in order to contain the spread of this disease. In many countries these restrictions meant the closing of all public spaces, cancelling all non-essential events and in some cases a nation wide lockdown where citizens were forbidden to leave their houses unless for a "valid" reason, such as a medical need, travel for work or essential food shopping. These restrictions also meant the closing of sports schools and organisations, like gyms and swimming pools. [2]

Sports have always existed as mainly live events with not a lot of online possibilities and thus when COVID-19 spread all over the world with rapid speed in 2020, many athletes were left with nothing. Sporting events were being cancelled and postponed and even regular training sessions had to be suspended due to all the rising restrictions of social distancing. Major sporting events, like the Tokyo Olympics, were postponed and many of them, like the Tour de France, were cancelled completely. While sports and other activities labelled as hobbies being cancelled might have seemed trivial and unimportant when considering all the loss of jobs, sickness and death happening globally, it was still a pressing issue as watching and participating in sport offers people a powerful cultural experience. An experience which was highly needed to get people through the long and difficult times of multiple lockdowns and social distancing restrictions. [2] [4]

Especially young athletes experienced an abrupt interruption in their regular routines when adult-led practises and competitions stopped. This disruption had the potential to influence the developmental trajectories of these young athletes. Many sports communities wanted to continue providing trainings and competitions for their athletes despite of the government imposed restrictions. As traditional, coach-led, practise in training halls was not allowed, online activities began to gain more

popularity. Team meetings, weekly trainings, skill challenges and even competitions started to be held through various online platforms. Methods for engaging the athletes during the restricted times was constantly evolving and the use of virtual tools for these kind of activities was still at it's kickoff stages [5]

In this thesis I am focusing on a system used by the Finnish Gymnastics federation for Rhythmic Gymnastics competitions held in Finland. The system was used during the pandemic times to host the first ever online virtual competitions in Finland. The aim of this study is to evaluate how usable the Finnish system, Kisanet, was in its beginning stages for the purpose of remote online competitions.

In Chapter 2, theoretical background for online and remote work, and online platforms is presented. A view on how common remote work was before and during COVID-19 is presented to provide an understanding of how common doing work or anything work like, in this scenario judging, was like. In Chapter 2, the readers is also familiarised with the importance and principles of interaction design. In Chapter 3, the reader is familiarised with rhythmic gymnastics and in Chapter 4 with what the Finnish online competition system, Kisanet, was like. In Chapter 5, the results of a study conducted on Finnish rhythmic gymnastics judges about the usability of Kisanet are presented. In Chapter 6, redesigned model for the online judging system is demonstrated in detail. In Chapter 7, feedback on the improved model from users is presented. Chapter 8 provides the conclusion of the study.

2. Literature

Previous literature work on the topic of online competitions does not really exist, so instead in this chapter the reader will be presented with theoretical background for online and remote work, and online platforms. Also a view on how common remote work was before and during COVID-19 is presented to give readers an understanding of how common doing work or anything work like, in this scenario judging, was like. In the last part of this chapter the user is briefly introduced with the interaction design to give an understanding what it is and to underline the importance of UI design.

2.1 Remote work and COVID-19

For some time now, information technology has provided alternative ways for companies and employees to work. These new ways of working challenge the traditional management models in work places, and organisational structures within companies have started to evolve to provide more flexible options for work.

Remote working, teleworking, work from home (WFH) and work from anywhere (WFA) are all expressions for a practise that is increasingly and inexorably being used by companies and organisations all around the world. This is made possible by the innovations made in information and computer interceded communication technologies which make remote working possible. With the advancement of these tools that support remote working, its has been quickly growing over the last few decades. Workers are increasingly taking part in virtual sessions from their own homes or from satellite offices in order to avoid commuting.

These growing numbers of remote workers and the growth of this whole style for working derives from the assumption that remote working creates benefits both for the employers and the workers. It has been hypothesised that remote working would improve work-life for employees and consequentially make them more productive. This increased productivity would again be beneficial for companies and organisations. [6]

2.1.1 Remote work during COVID-19

The start of the COVID-19 pandemic in 2020 had a rapid transforming effect on where and how people work. As many countries announced lockdowns and in milder situations recommendations to avoid social contacts, a large number of people ended up staying in their homes instead of travelling to their place of work. Many businesses closed off entirely and laid off their workers, but many companies also started to shift to remote working. In the early months of the COVID-19 pandemic, between February and May 2020, over one third of working people in America made the switch to remote work. [7]

Many workplaces and employers were not adequately prepared for such big change to remote working. Luckily with all the available technology and innovation, the transition worked out well for many of the companies. As COVID-19 restrictions kept on continuing, more and more of the working population started to welcome the flexible schedules and work opportunities that the quickly forced age of remote working brought along. [7]

2.1.2 Remote work in 2019

The start of the COVID-19 pandemic undoubtedly forced many people to work from home. But what was the situation like with remote working before the pandemic started? Remote working had been slowly increasing its popularity in the decade before the COVID-19 pandemic started, although mostly as an occasional way of working. As can be seen from Figure 2.1, according to Eurostat 5.4% of the workers between the ages of 15-64 in the European Union (EU) worked remotely from home in 2019 before the start of the pandemic. [6] [8]
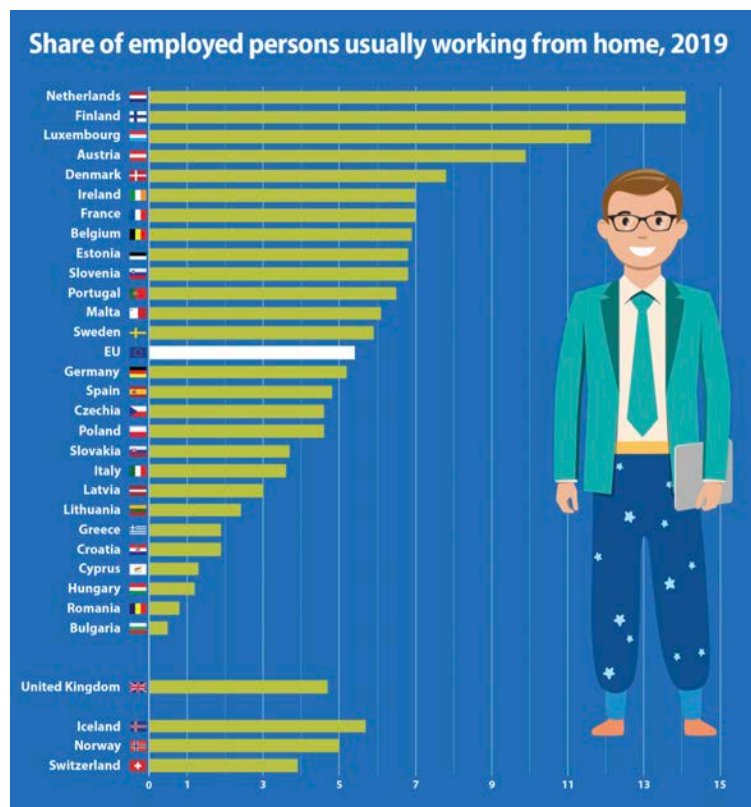

Figure 2.1. People working from home in 2019 [F1]

And comparing this number to results from the previous decade, it has remained at a constant value of around 5%. These numbers only account the workers who have

been working from home full time. If we also take a look at the workers who sometimes work from home, we can notice that the amount had been steadily rising with the amount of people sometimes working from home being 5.2% in 2009 and 9.0% in 2019. [6] [8]

The number of self-employed people sometimes or usually working from home was 30% in 2009 and 36% in 2019. The corresponding number for dependent workers was 7.5% in 2009 and just above 11% in 2019. We can clearly see that remote working from home was notably more common with self-employed people that dependent workers, but the increase for both type of workers is fairly similar. [6] [8]

2.1.3 Remote work inside the EU

While the average amount of people working remotely in the European Union in 2019 was 5.4%, there were major differences in how common remote work was across the Member States of the EU, see Figure 2.2.
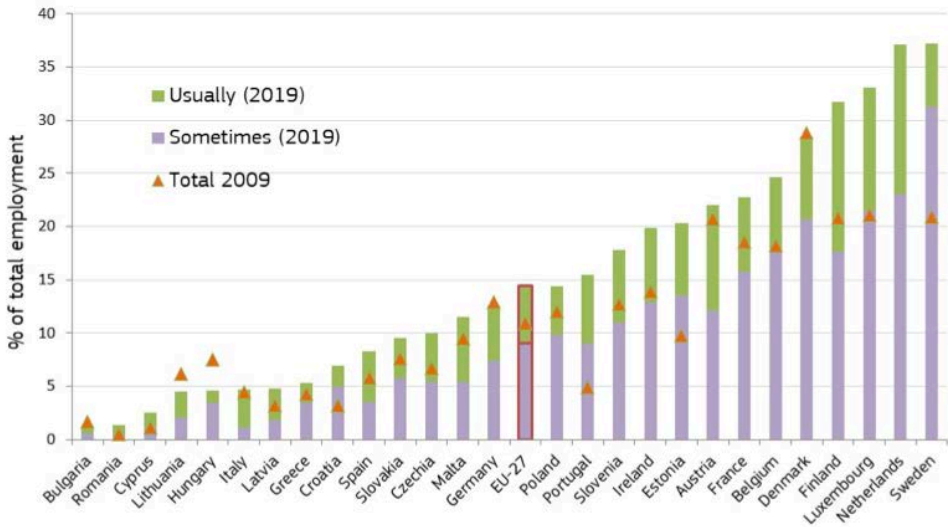

Figure 2.2. People working from home in 2019 and 2009 [F2]

In 2019 there were only a handful of countries in the European Union where the amount of employees working from home, sometimes or regularly, was over 30%. These countries included Finland, Sweden and The Netherlands. In half of the other EU Member States, the amount of employees working remotely was below 10%. [8]

The forced rapid movement from traditional work to remote work during the start of the COVID-19 pandemic revealed that there were big differences in the readiness and preparedness between different nations and between different professions for remote work. Different fields had drastically different prior experiences of remote work and the switch from traditional ways of work to remote working may have been a big challenge for some workers, countries and fields of work. While ICT- and knowledge-intensive fields were naturally more prepared and ready for the switch, many companies, who for example lacked the needed ICT infrastructures, might have found it difficult to make adjustments to the way their employees worked.

It has been estimated by Eurofund in 2020 that nearly 40% of the European working population began to work remotely as a result of the global pandemic. In many countries in the European Union, over half of the people who made the switch to remote working had no prior experience with any kind of remote work. While in the previous decade remote working was believed to improve the work-life balance and employee productivity, it might have been a different case during the start of the pandemic as new teleworkers faced difficulties like inadequate ICT tools, unsuitable work spaces and lack of childcare. [8]

2.1.4 Benefits and the reality of remote work

While many countries and employers were not prepared for such a drastic change, the available technology and innovations enabled many companies to successfully transition to remote work.

Owl labs conducted a survey in 2021 in which they found that since the start on 2020, people had been using video calls for meetings 50% more than before the start of the COVID-19 pandemic. According to the Owl Labs study, during COVID-19 almost 70% of workers transitioned to work remotely from home.

In their survey Owl Labs presented following benefits for remote working:
• employees working from home save 40 minutes average on a daily basis from not having to commute to work, and
• people were saving an average of 500 dollars a month by working from home

Results from the survey also show that people were expecting to work from home also after COVID-19 restrictions ended. 92% of those who were a part of the survey expected to work remotely from home at least 1 day a week and 80% were expecting to work from home remotely at least 3 days a week. 59% of the surveyed people declared that they would be more likely to choose an employer who offers the possibility of remote working.

These results are echoed by a survey conducted on 1200 US office workers and 120 executives by PwC in 2020. In their study, PwC found that 73% of the surveyed executives found that remote work has been going well. 72% of the surveyed workers would have liked to continue to work remotely from home at least 2 days a

week even when full time office work would be possible. 32% of the workers said that they would prefer to work from home full time. [9]

A different study conducted by Slack consisted of 9000 workers in six different countries. This study showed that 72% of the respondents preferred a hybrid model of remote and office work as opposed to the 12% of respondents who would prefer to work full time from the office. 13% of the respondents said that they would prefer to work from home full time. [9]

2.2 Designing user interfaces

Most people can probably agree that not all technology they use and have used has been easy to understand. Some technologies and softwares seem more clear and are more easy to use while others just make the users struggle and suffer. In many cases the cause behind these struggles is poor user interface (UI) design. [10]

2.2.1 What is a UI?

A user interface is the part of computer systems that the user actively engages with. User interfaces are formed of two basic components: input and output. Input is the way a user relays and communicates their needs and wants to the machine. Different forms of input can be used in UI design which include, but are not limited to:

• A mouse
• A keyboard
• A trackpad
• Fingers, used in touch control

• Voice, used in voice control

Output is the way the machine relays the information it has produced in it's computations to the user. The most commonly used mechanism for output is a display screen. Other mechanism that can be used for output include for example voice and sound. [11]

2.2.2 Importance of UI design

User interfaces are of the utmost importance in computer systems. That is because a user interface is the part of the system that the user can see, hear and touch. It is the part through which they navigate the system while the code that runs the software is hidden behind the UI. On top of being taxing on the users as they struggle to use the systems, poorly design user interfaces can result in increased error rates, reduced performance output, higher training costs and even accidents and disasters. All of the aforementioned can lead to money loss for businesses and unnecessary stress for the users. [10] [11]

The main goal of user interface design is simply to create such UIs for computer systems that make using them productive, but also easy and enjoyable. A well designed UI should have both well-designed input and output mechanisms which cater to the user's capabilities, limitations and needs in the best way possible. The best user interfaces are those which do not draw attention to the UIs themselves but instead allow the user to focus on the task they are doing. [11]

A user interface should always be designed with the end user in mind, with the design focusing on the needs and capabilities of the intended users. If the user interface is designed without a clear goal of what the user will do with the system, the system might be usable in some ways. But if the system does not do what the user needs, then the system is not useful to the user. [10]

2.2.3 Jakob Nielsen's 10 usability heuristics

To simply put it, interaction design is a way to create a dialog between a person and a product, service or a system. Designing this dialog can be challenging as the UI designer is trying to guide the users to act with the UI in a certain way. [12]

One of the methods that can be used to avoid producing a poorly designed user interface, is to use Jakob Nielsen's 10 usability heuristics, see Figure 2.3, during the design process. Heuristics as a word originates from the Greek language and in this context is used to describe "a method or a process which aims to detect problems and inconsistencies and find solutions for them in a digital product".

Heuristic analysis can be used in the early stages of designing to detect potential problems in the design and evaluate the usability of a system. Nielsen's heuristics were developed in the 1990s to evaluate the usability of website interfaces. These 10 principles have become practical rules for human-computer interactions, and they serve as a basis to guide UI design. [13]
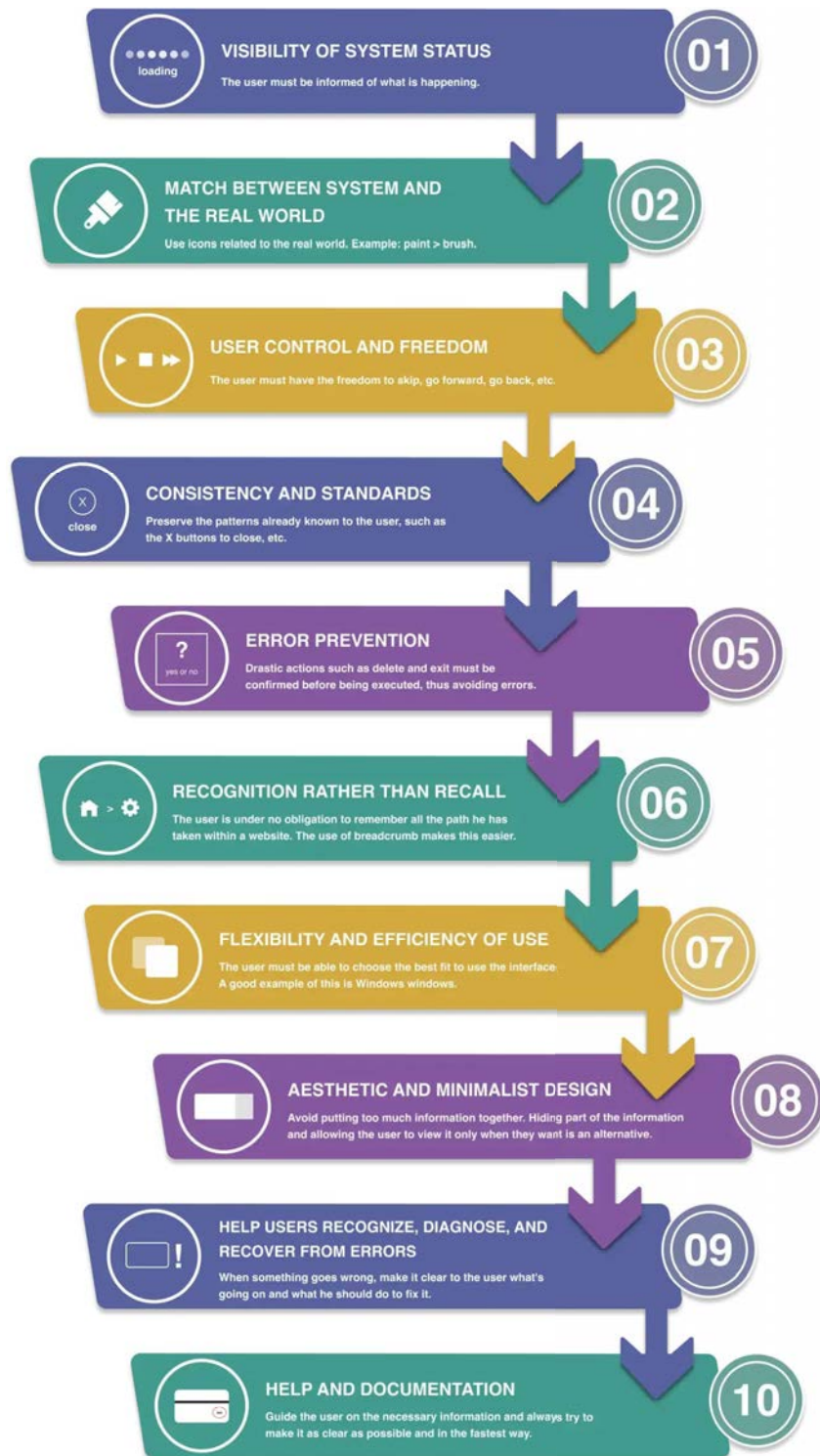
Figure 2.3 Nielsen's 10 heuristics [F3]

3. Rhythmic gymnastics overview

Rhythmic gymnastics is a sport discipline which is often described as the most beautiful sport in the world. The sport started in the Soviet Union in the 1940s and in its origin country the sport is called художественная гимнастика which can be translated to "art gymnastics" or "artistic gymnastics". Rhythmic gymnastics was recognised by the International Gymnastics federation (FIG) in 1961 and the first world championships were held in 1963. To Finland the sport came from the Soviet Union and the first Finnish Championships were held in 1971. [14] [15]

In rhythmic gymnastic gymnasts compete either as individuals or in groups of five. The sport requires the athletes to have immense amounts of strength, flexibility, speed and skill while also expecting them to be able to perform with grace and artistry. Individual gymnast perform four routines lasting 75 to 90 seconds with four different apparatuses which are ball, clubs, hoop and ribbon. Groups perform two routines lasting 2 minutes 15 seconds to 2 minutes 30 seconds using either five pieces of the same apparatus or three of one kind of apparatus and two of another. Both individuals and groups perform on a carpet measured 13 x 13 meters. [16]

In rhythmic gymnastics, scoring can be divided into two different categories: Difficulty and Execution. The scores from these two categories are added together to form the final score of the routine as can be seen in Figure 3.1 [17]

Figure 3.1: Forming the score in rhythmic gymnastics

In this chapter the scoring in rhythmic gymnastic will be explained in more detail through each category. A Code of Points is always valid for one Olympic cycle lasting four years. The rules explained here are from the 2017-2020 Olympic cycle, and the rules were extended to be valid until the end of 2021 due to the rescheduling of the Tokyo Olympic Games. The explanation will focus on the rules for individual gymnast. Group exercises have their own set of rules which mostly follow the individual rules but have a few differences.

3.1 Difficulty

For the first half of the four year Olympic cycle, difficulty score (D-score) was limited to maximum 10 points. Starting from February 2018 the D-score was changed to be open-ended meaning the gymnasts can pack us much difficulty into the routine as they can manage in the given time. [18]

When evaluating difficulty, judges are focusing on four different sections:

• Body difficulties

• Apparatus difficulties

• Dynamic elements with rotation

• Dance steps

There are four judges in total evaluating the D elements. D1 and D2 judges are in charge of evaluating body difficulties and dance steps. D3 and D4 judges evaluate apparatus difficulties and dynamic elements with rotations. All the judges watch the routine and evaluate it separately and after they have counted their score they check with the other judge, D1 and D2 together and D3 and D4 together, to see if they are in agreement. If the scores are too far apart the judges have a discussion and re-evaluate and change their scores so that they are closer together before sending them in. According to the FIG Code of Points the judging pairs send in on single common score. In competitions in Finland judges both send in their own scores after checking with the other judge and an average score is counted out of the two scores. [17]

3.1.1 Body difficulty

Body difficulty score consist of body difficulty elements performed in the routine. All the performed elements need to be from the body difficulty lists found in the code of points. Body difficulties are divided into three categories:

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1. Jumps or leaps

2. Pivots or rotations

3. Balances

Out of all the three categories at least one difficulty movement has to be performed in the routine.

Balances consist of different kinds of balances found in the code of points (Figure 3.2) performed on flat foot, on releve (on the toes), on the elbows, on the chest or on the knees. Gymnasts can also perform dynamic balances in which no stop position is required. All balance elements have a value between 0,1 and 0,6

Figure 3.2: Example from the table of balance difficulties

In the Code of Points table of jumps and leaps, there are 40 different jump/leap elements gymnasts can choose from (Figure 3.3). An element is considered a jump when the takeoff is from two feet and and a leap when the takeoff is from one foot. Gymnast are not allowed to repeat the same body elements twice but they can

choose to perform a series of jumps/leaps where two or more successive identical jumps/leaps are performed with or without an intermediary step. All jump/leap elements have a value between 0,1 and 0,7.

Figure 3.3: Example from the table of jump/leap difficulties

In rhythmic gymnastics there are two types of rotations: rotations on the foot on releve or flat foot and rotations on other parts of the body. All rotation elements have a base value between 0,1 and 0,6 for the first full rotation. Gymnasts can increase the value of a rotation element by spinning additional rotations, changing level during the element or by changing shape during the element. In Figure 3.4 we can see examples of both types of previously mentioned rotation difficulties.

Figure 3.4: Example from the table of rotation difficulties

Judges write down every body element they see during the routine and afterwards count together nine body difficulty elements with the highest value. For a difficulty to be valid and counted a gymnast must execute the difficulty correctly and perform a fundamental or other apparatus element at the same time. [17]

3.1.2 Apparatus difficulty

According to the code of points an apparatus difficulty (AD) can either be:

"A particularly technically difficult synchronization between apparatus and body consisting of a minimum 1 Base + a minimum 2 criteria or 2 Bases+ 1 criteria"

or

"An interesting or innovative use of the apparatus (not performed on a regular basis as standard apparatus movements for RG) consisting of a minimum 1 Base + a minimum 2 criteria or 2 Bases + 1 criteria"

Every routine needs to have at least one AD element and the maximum amount is unlimited. D3 and D4 judges mark down all AD elements they see that are valid and they are scored between 0,2 points and 0,4 points according to the table shown in Figure 3.5. [17]

Apparatus Base (Fundamental or Non-Fundamental Apparatus Group)	0.20
Specific Apparatus Bases: • Roll over a minimum of 2 large body segments • Small throw and catch of 2 unlocked clubs • Large throw • Transmission without the help of the hands with at least 2 different body parts (not the hands)	0.30
Catch or rebound from the floor or a part of the body from a Large Throw ↓	0.40

Figure 3.5: Apparatus difficulty values

3.1.3 Dynamic elements with rotation

Dynamic elements with rotation, more casually know as risk throws or just risks, are elements where the apparatus is thrown in the air and at least two rotations are done under the throw or during the throw or catch of the apparatus. Gymnasts need to perform at least one risk throw and the first five risk throws will be evaluated in chronological order. The base value of a risk is 0.2 points and that can be increased by performing additional criteria during the throw or catch or under the flight of the apparatus, example in Figure 3.6. All possible additional criteria are given in the code of points and an example of an additional criteria is throwing the apparatus without using hands or making an additional rotation on top of the two required rotations. Rotations used in risk throws can be around any axis, as long as they are a full 360 degrees. Same type of rotations can only be used in one risk throw. [17]
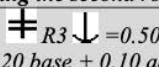
Explanation and Example: recording R elements
R2 ↓ ⊗ *=0.40* *Throw and two rotations (0.20), catch **during** the second rotation (0.10) outside the visual field (0.10)*
✚ *R3* ⚓ *=0.50* *Throw without the hands (0.10) and three rotations (0.20 base + 0.10 additional rotation), catch the ball with one hand (0.10)*

Figure 3.6: Example of how dynamic elements with rotation are evaluated

3.1.4 Dance steps

In rhythmic gymnastics each routine must have at least one dance step combination. Dance step combinations need to be a minimum eight seconds from the first dance movement and they need to contain at least two different varieties of movement, for example changes in rhythm or levels. Correctly executed dance step combinations have a value of 0.3 points. [17]

3.2 Execution

The execution Jury consists of six judges: two judges, E1 and E2, focusing on artistic faults and four judges, E3; E4; E5 and E6, focusing on technical faults. According to the code of points "The execution jury demands that the elements be performed with aesthetic and technical perfection". Just like with difficulty judges all the judges watch the routine and evaluate it separately and afterwards E1 and E2 judges check with the other judge to see if they are in agreement. E3, E4, E5 and E6 judges all send in their scores individually.

Execution score starts at 10.00 points and all execution faults made during the exercise will be deducted from this value. Execution judges do not concern themselves with the difficulty of the exercise and all faults are deducted equally regardless of the difficulty of the exercise. [17]

3.2.1 Technical faults

Technical deductions are given to gymnast for all movements not executed perfectly. Technical faults can be divided into to larger categories: Body movement faults and apparatus faults. Technical errors are categorised as small errors (-0.1), medium errors (-0.3), or large errors (-0.5 or more).

Body movement deductions include for example loss of balance, heavy landing and incorrectly held body segments during a body movement. The biggest body movement deduction is a total loss of balance with a fall costing the gymnast -0.7 points.

Apparatus fault deductions include, for example, incorrect handling of the apparatus with the ball squeezed by the fingers or arms held too far apart during mills with clubs. All losses and imprecise trajectories are also penalised costing the gymnast at the highest -1.0 for a loss and retrieval after three or more steps or for a loss outside the floor area or at the end of the exercise. [17]

3.2.2 Artistic faults

Artistic faults can be taken from a routine from eight different categories: Guiding idea (see Figure 3.7), connections, rhythm, dynamic changes, body expression, variety in directions and trajectories, variety in levels, variety in apparatus usage.

Some categories have different deductions which can be taken. For example in variety in directions and trajectories, judges can deduct the gymnasts for:

• performing movements in one place of the floor area for a long time

• insufficient variety in the use of directions and trajectories

• the entire floor area not being used

Rhythm and connection faults can be deducted up to 1,0 points and all other artistic deduction range from 0,1 to 0,7. [17]

5 Artistic Faults	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1,00
GUIDING IDEA: CHARACTER *A defined character of body and apparatus movement should guide all elements in the composition*	A defined character is present between or during the **majority** (but not all) of the connecting elements/movements and Dance Steps		A defined character or style is not fully developed in the Dance Steps; they are mainly walking, running or skipping to the accents without regard to the specific musical style. A defined character is present between or during **some** of the connecting elements and movements		There is no defined character of movement between the Difficulties, which are presented as only a series of Difficulties without a style of movement connected to the music. A defined character is only present during the Dance Steps Combination		The Dance Steps and connecting movements have no defined character			

Figure 3.7: Example of artistic deductions for character

3.3 Judges

Judging panels in rhythmic gymnastics consist of the following ten judges already mentioned previously: D1, D2, D3, D4, E1, E2, E3, E4, E5 and E6. In addition competitions also have a superior judge, two line judges responsible for determining any crossing of the carpet boundaries and a time judge responsible for timing the duration of the exercise.

All judges evaluate the routine independently but, as already explained previously, difficulty judges and artistic judges compare the scores they get with their partner before sending in the final scores. Technical execution judges all send in their scores separately.

If there is too big of a difference in the scores of the technical execution judges, a judge meeting will be called. During a judge meeting the technical execution judges discuss where the difference came from and change their scores before sending them in again. If the judges cannot agree on the score, the superior judge can step in to help.

3.3.1 Placement of the judges

All judges sit on the edges of the carpet in one long table. In official international competitions there might be more rows behind the judges, but the judges always sit closest to the carpet (Figure 3.8).

Figure 3.8: Example of how judges sit at the competition. Judges evaluating
the routine are placed closest to the carpet

The judges who have to be able to discuss their scores with their pair before sending them in are placed next to each other. Technical execution judges are placed

between the judge pairs in a way that technical execution judges never sit next to each other.

4. Online competitions

When the COVID-19 pandemic first emerged in 2020, it resulted in restrictions and lockdowns all over the world. This also meant that competitions and other events were cancelled and many gymnasts had their training facilities closed. Despite the difficult situation gymnasts continued their training at home trough different kinds of methods with online training through various conferencing applications being a big part. When it became clear that the end of the restrictions for organising big events, and thus gymnastics competitions, was nowhere in sight, alternative ways for arranging competitions started to appear.

In June 2020, The Russian gymnastic federation held an online rhythmic gymnastic competition in Moscow. In this event, the athletes from Russia, Kyrgyzstan and some athletes from Uzbekistan competed in person in Moscow. Other athletes from Uzbekistan and all athletes from Israel took part from their own gyms via the Internet. [19]

During the fall season of 2020 international level gymnast continued to compete in online events and more online competition event possibilities appeared for younger and lower level athletes as well. Many of the competitions for younger and national level gymnasts were held through the KSIS site (ksis.eu) which already offered a working system for downloading competition videos and judging them online. [20] [21]

4.1 Finnish system for online competitions

Finnish gymnasts like so many others in many countries had their competitions cancelled in spring 2020. After the summer, restrictions were lifted enough to allow live competitions during the fall season 2020. Unfortunately, in February 2021, competitions were cancelled again until further notice. Gymnastics clubs were offered the possibility to move the competitions that were scheduled for them to an online format. For these online competitions arranging clubs used a system developed by Maggia Finland Oy. [22]

Maggia Finland Oy is a partner of Finnish Gymnastics federation and had already previously developed the Kisanet site (see Figure 4.1) which is used to host all Finnish rhythmic gymnastic competitions and also the competitions of many other gymnastic disciplines.
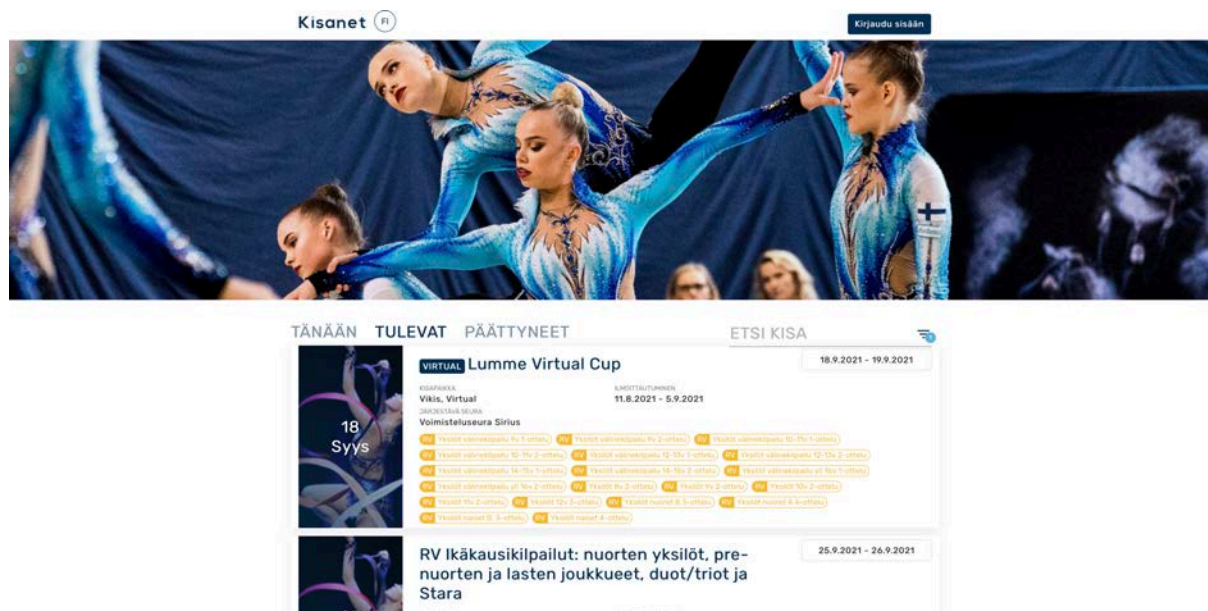

Figure 4.1: Front page view of Kisanet

Two systems were used for online competitions: Vikis (vikis.fi) and Points (points.kisanet.fi). Points is a scoring system which was developed as a part of the Kisanet system (see Figure 4.2). The system was tested out in artistic gymnastic and team gym competitions during the fall of 2020. In rhythmic gymnastic it was meant to be tested during a competition in March 2021. For traditional live competition, the Points system allows judges to enter their scores from their own devices and they are saved straight to the Kisanet system which calculates the results. For online competitions, Points was used in the same way. [23]
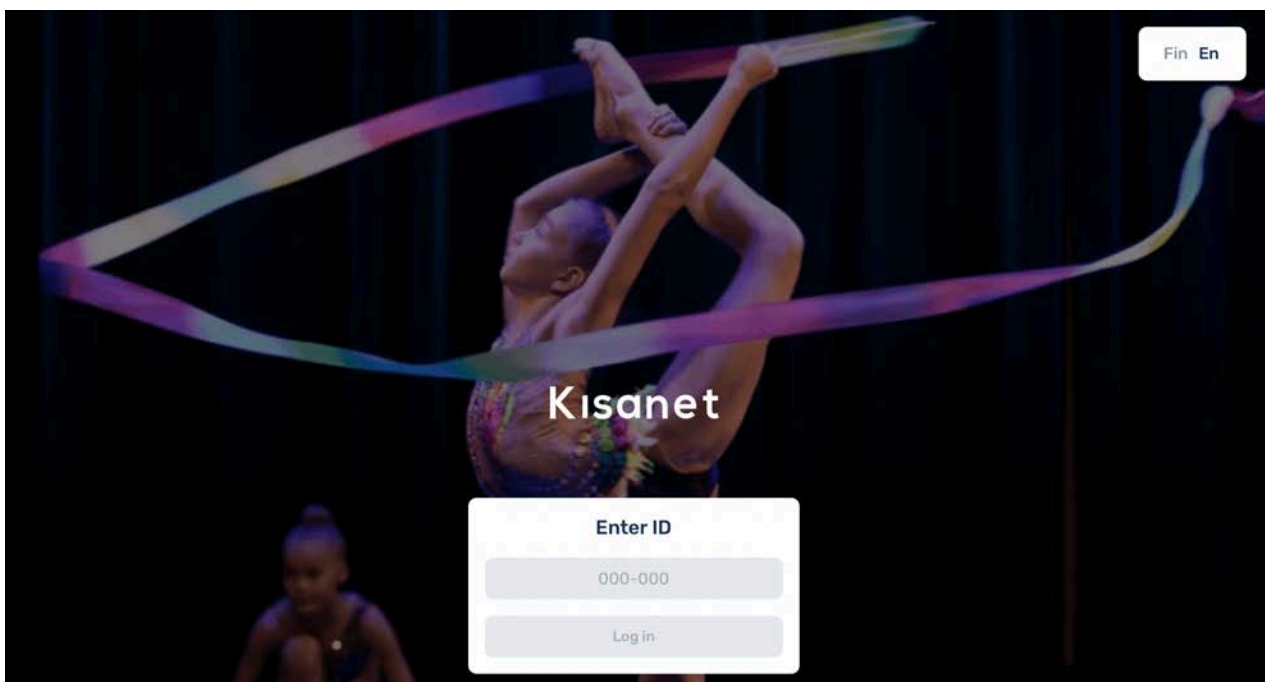

Figure 4.2: Front page view of Points

Vikis is a system to which the competition videos are filmed to and through which the videos are arranged and live-streamed to the audience and to the judges. Competitors download the Vikis app through which they can record their routines.

The competition organiser sets a timeframe, when the routines can be recorded, and sends a code to the participant which they have to use in the app to record their videos. The application will only allow the user to record one time for each entry which makes for a more fair and more live like competition.

4.1.1 Online competition day for judges

On a competition day the judges will need to be logged in to three systems: Points, Vikis and Zoom.

- In Vikis the judges will see the live stream of the competition. The organising club can either have two separate live streams, one for judges and one for spectators, or have just one stream for everyone. It is recommended that the Vikis stream is opened on a screen as big as possible.

- In Points judges give their scores for the gymnasts. The judges can also see a rotation list of the gymnasts they will be judging. If a judge meeting is called a pop up notification shows up on the screen and the called judges have to re-enter their points after their discussion despite if they need to change their score or not.

- Lastly judges will have to have a Zoom window open. In the Zoom window judges who would normally sit next to each other at a competition will be place in a breakout room so that they are able to discuss with each other. Execution judges stay in the main room with the superior judge and if there is something that the judges need to tell to the superior judge or vice versa that is handled through zoom.

The guideline for the judges is that they should have at leats two devices: one for watching the livestream and one for the Zoom meeting. The Points system for scoring can be open on the same device with the Zoom meeting or on a separate device. Cameras on Zoom need to be open for all the time the judging happens unless otherwise given permission to close them. [24]

5. Evaluation of the existing system

As the world of gymnastics moved from live competitions held in gymnasiums to online events held over the internet at a quite fast pace it raises a question of how well do the given tools actually serve their purpose?

5.1 Research aim and methods

The aim for this study is to find out how well the system developed for Finnish online competitions serves its purpose according to the Finnish rhythmic gymnastics judges and find out the areas where improvement could be made if a new system was built.

The study was done by analysing a questionnaire where Finnish rhythmic gymnastics judges got to answer 10 different questions about the usability and their user experience of the system. The questionnaire was answered by 25 people. Here is provided a translation of the original questions, which were in Finnish (see Appendix A). The first following three questions were answered on a fully disagree/fully agree scale ranging from 1 to 5 and question 4 had the answer options "yes", "no" and "I don't know":

1. The scoring has been smooth
2. Changing the score has been smooth
3. Watching the live stream has been smooth
4. In your opinion have the separate rooms for judges worked out well?

Questions five, six and seven had two predetermined answer choices out of which one could be chosen:

5. Do you think the virtual judging system should work with: One login / As it is now through multiple log ins

6. Do you think it would be better that all the windows needed(livestream, scoring, judging rooms) would: work as they do now with 2-3 devices / work smoothly on one device

7. Which one do you believe to be the best way to use the system: through a browser / with an app

The following question eight, nine and ten were open ended questions:

8. What in your opinion has worked well in the current system?

9. Is there something that you wish would work differently in the current system?

10. What would be an ideal system in your opinion? Would it be like the current system or something different? You do not have to consider technical limitations in your answer.

5.2 Results

In the following paragraphs the results of the questionnaire, answered by Finnish rhythmic gymnastics judges, are presented. In the first paragraph the results on closed questions are presented and after which the results of the open ended questions. Lastly a quick revision of the results is presented.

5.2.1 Closed questions

In regards to the first statement, "The scoring has been smooth", we can clearly see from Figure 5.1 that most of the judges, 84%, answered number four meaning that they fully agree with the given statement. The rest 16% of the judges answered number three which still puts them on the more positive site agreeing that giving out scores in the system works smoothly.
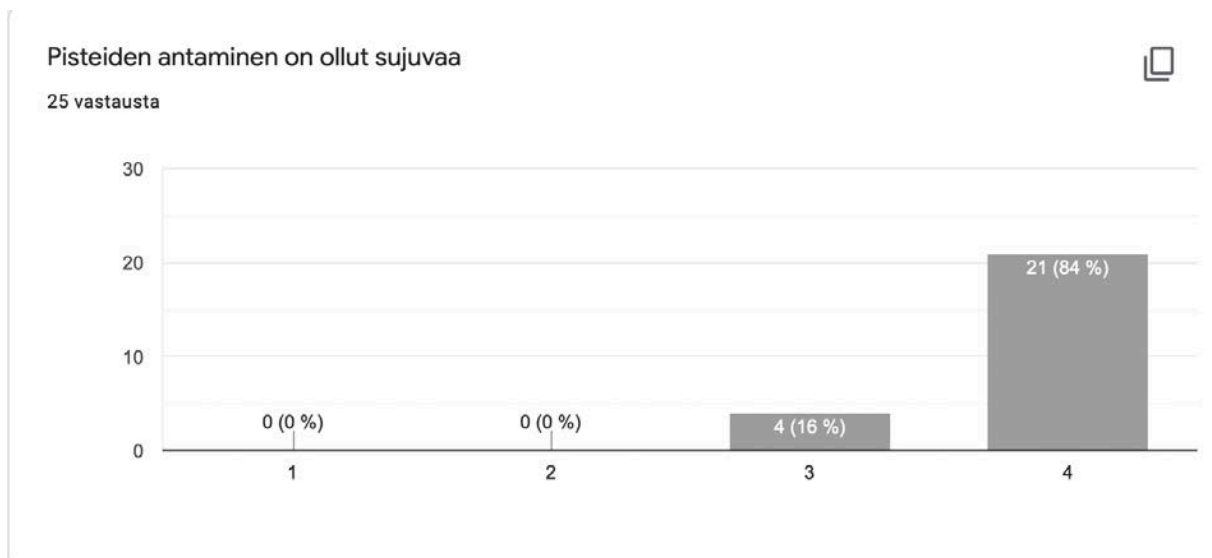
Pisteiden antaminen on ollut sujuvaa
25 vastausta

Figure 5.1: Questionnaire question 1 results, The scoring has been smooth

In answers to the second statement, "Changing the score has been smooth", we can detect more deviation than in the first statement. As can be seen from Figure 5.2 most of the judges, 88%, agree more than they disagree with the given statement. 3 people, 12% of respondents, feel that changing the score ones it has already been given is slightly inconvenient. When comparing these results with the first statement

we can clearly see that the average of the answers is more in the middle ground than fully agreeing like in the first statement.
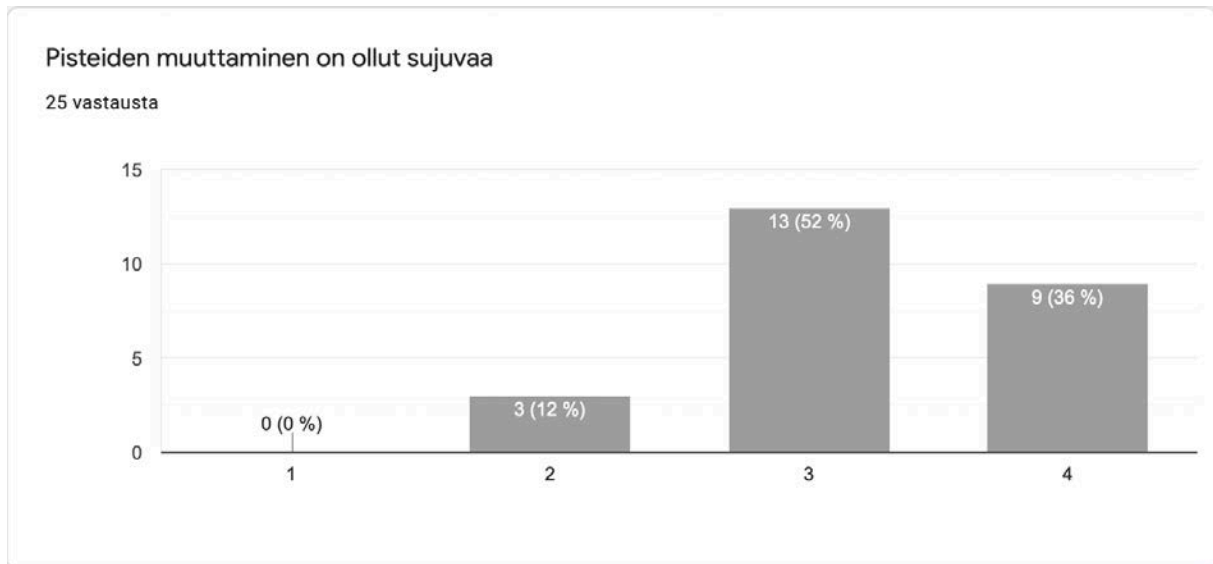

Figure 5.2: Questionnaire question 2 results, Changing the score has been smooth

In Figure 5.3 we can see the answers for the third statement of the questionnaire, "Watching the livestream has been smooth". Here the answers of the respondents are even further apart. Looking at the results we can see that 4% of respondents fully disagree with the statement and 28% disagree on some level. This leaves 32% of the respondents feeling that the live stream has not been working smoothly. A bigger part of the respondents, 68%, agreed with given statement with 48% agreeing on some level and 20% fully agreeing.

Figure 5.3: Questionnaire question 3 results, Watching the live stream has been smooth
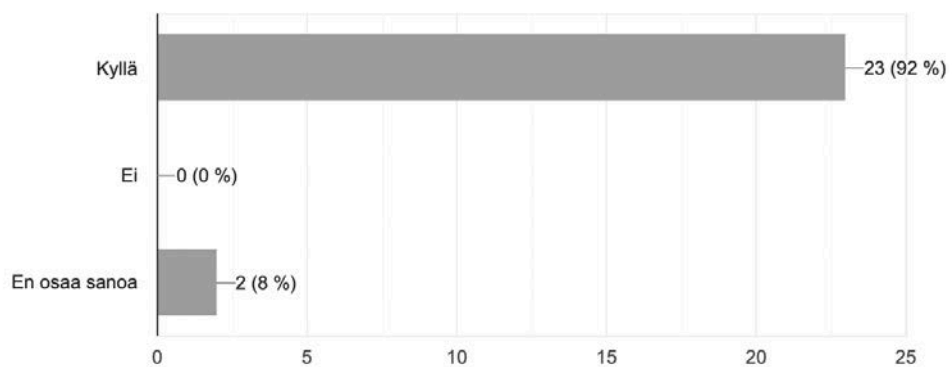

Figure 5.4: Questionnaire question 4 results: In your opinion have the separate rooms for judges worked out well?

In answers to question 4 of the questionnaire, "In your opinion have the separate rooms for judges worked out well?", we can see a very clear answer from Figure 5.4. 92% of the respondents felt like the separate rooms have worked well and the rest 8% responded with "I don't know".

In the next question in the questionnaire, the respondents had to answer whether they felt like the online judging system should work with just on log in credential or in multiple different sites with multiple log in credentials. From Figure 5.5 we can see that 76% of the respondents felt it would be better if the system would work with only one log in credential and 24% of the respondents felt that the system at its current form with multiple log in credentials works well.

Tulisiko virtuaalisen tuomarointijärjestelmän mielestäsi
25 vastausta

- Toimia yhden linkin/kirjautumisen kautta
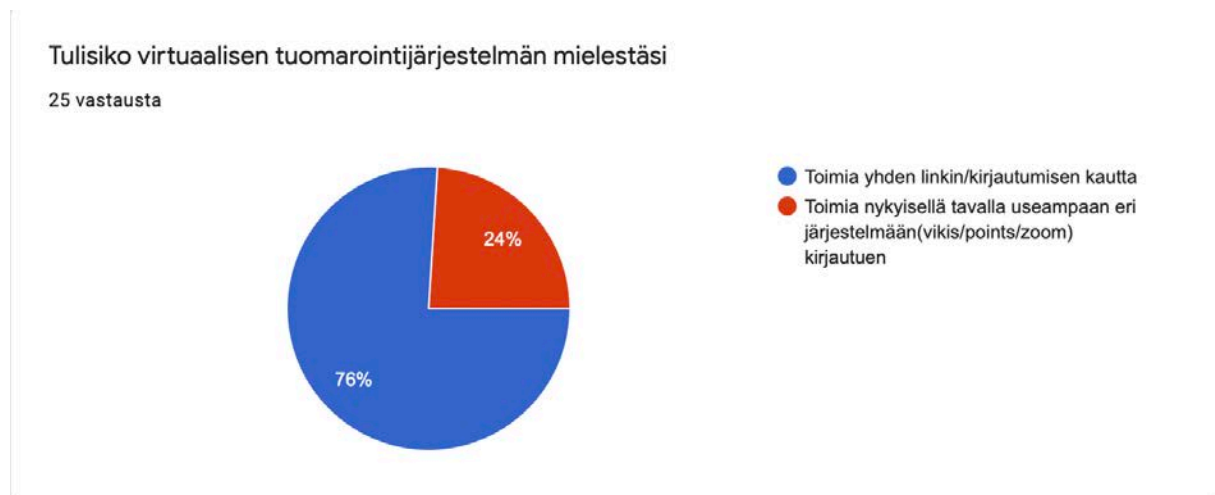- Toimia nykyisellä tavalla useampaan eri järjestelmään(vikis/points/zoom) kirjautuen

24%

76%

Figure 5.5: Questionnaire question 5 result: Do you think the virtual judging system should work with: One login / As it is now through multiple log ins

The next question in the questionnaire continued with the same topic from the previous question. Here the respondents had to answer whether they felt that the current way of having 2 or 3 devices open at the same time works well in their opinion or if they would rather prefer having the option of having all of the needed windows open on one device. From the results in Figure 5.6 we can see that a slightly larger amount of respondents (32%) felt that the way the current system works is good than did in the previous question (24%). 66% of the respondents would prefer to have the option of being able to have the whole system open on one device.
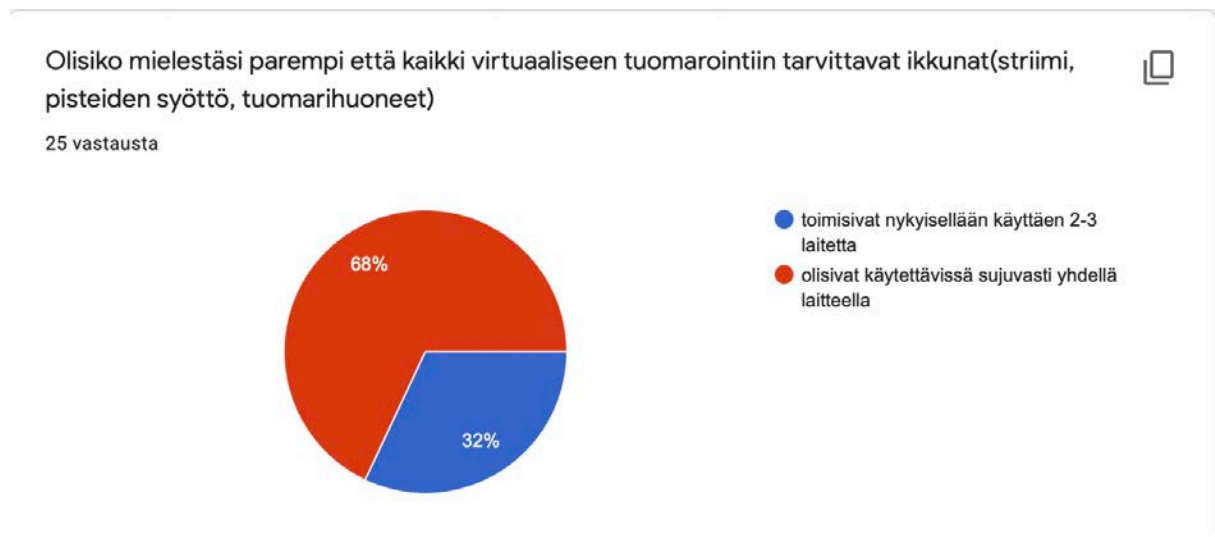

Figure 5.6: Questionnaire question 6 result: Do you think it would be better that all the windows needed(livestream, scoring, judging rooms) would: work as they do now with 2-3 devices / work smoothly on one device

In the last closed question of the questionnaire, the respondents had to answer whether they would prefer the online judging system to be used in a browser or through an app. From the results in Figure 5.7 we can see that 64% of the

respondents would prefer to use the system through a browser as it is currently working. 36% of the respondents would like to use the system through an application.
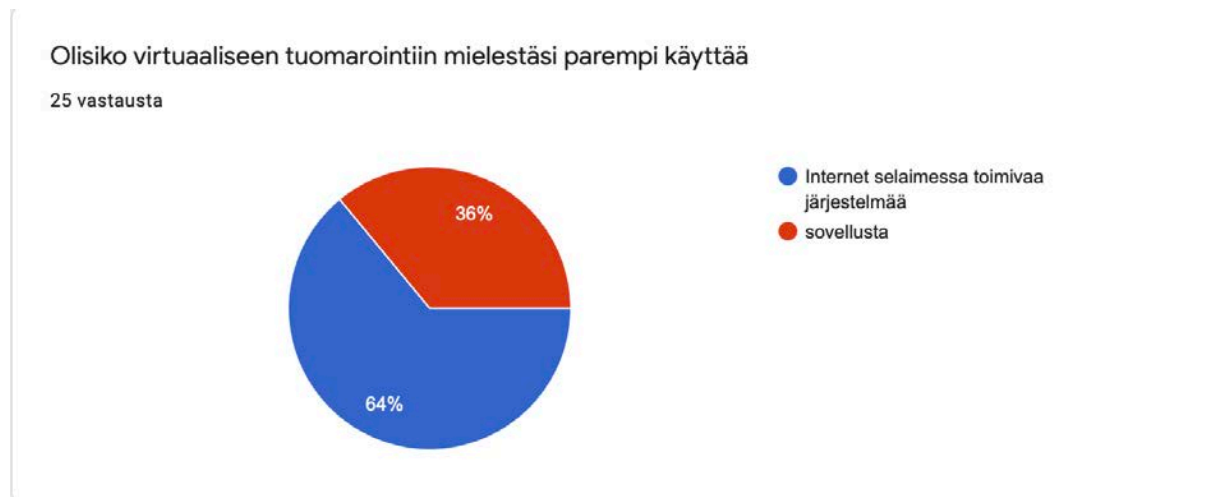

Figure 5.7: Questionnaire question 7 result: Which one do you believe to be the best way to use the system: through a browser / with an app

5.2.2 Open questions

The last three questions of the questionnaire were open questions. In the first questions respondents were asked what in their opinion has worked well in the current system. Here 64% of the respondents said that they feel that the Points system and giving the scores has worked well. 36% of those who mentioned Points or scoring as a positive also said that they have found it a positive addition to have the start list available for viewing in the Points system. 23% of respondents

mentioned that the new systems have worked fluently and it has been easy to learn how to use them.

In the next question respondents were asked if there is something they wish would work differently in the current system. 47% of the respondents mentioned using multiple screens as a negative. They either wished to have the option of having everything more easily on one screen or described problems or inconvenience they had experienced with using multiple screens. 32% of the respondents mentioned problems with the livestream, for example, the stream lagging and or cutting off. 16% of the respondents also mentioned that they wish they way the scores are change after they have been sent would be different.

In the last question respondents were asked to describe what would be an ideal system in their opinion. 23% of the respondents felt that the current systems works fine as it is. One of the biggest topics being mentioned here by the respondents was the use of multiple screens. 62% of the respondents felt that it would be better if the system worked on one device / one screen or that the user should at least have an option to use it more fluently on one screen. More precisely many felt that the livestream and the scoring system should somehow work from one open window instead of two but the Zoom call for judges could still be on a separate device. Some other things being mentioned by individual respondents were, for example, that the livestream should be separate for the audience and the judges so that the audience would not need to wait if the judges are having a meeting.

5.2.3 Revision of questionnaire results

25 Finnish rhythmic gymnastics judges answered a questionnaire concerning the Kisanet system, evaluating many aspect of its usability. Overall most of the users were happy with the system but certain topics arose from many respondents.

One of these was a slight dissatisfaction with the way scores were changed after they had been sent. Another topic that arose from the query answers, and one that was the most mentioned throughout all the answers, was the dissatisfaction with the use of multiple system. The user felt the need to have a possibility to judge the competitions through only one system and with only one device.

6. The redesigned model

In this chapter, I will present a redesigned version of the Kisanet system for online competitions. I will mostly go over the parts that have been changed from the original design of the system. The redesign was based on the user answers from the previous chapter. In the query of the existing system most of the user felt that the biggest need for improvement was with the use of multiple devices and logins. In the system currently in use, points for gymnasts are given with one device which has the points system open and another devices should be open for viewing the live stream of the competition. Another notable area for improvement that aroused from the query was the way that scores are changed after they have been already sent.

6.1 Basic functionality of the system

The basic functionality of how the system works and how the system looks has been kept very similar in this redesigned model as it was in the original design. The user will login with a code given to them on the competition day as illustrated in Figure 6.1.
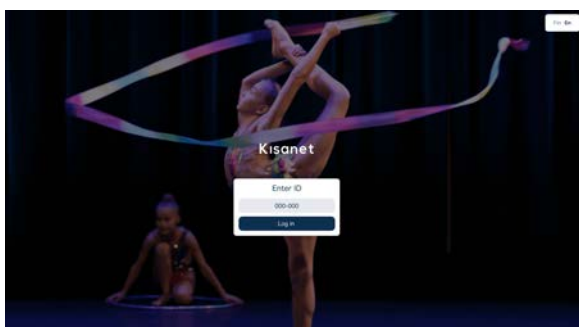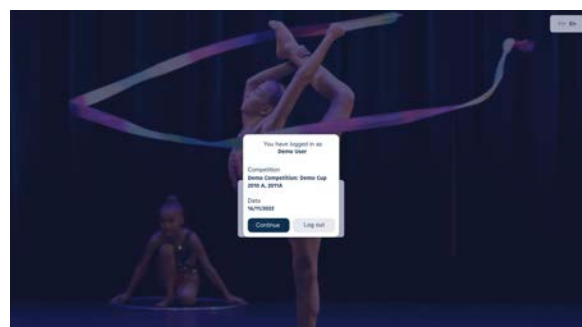

Figure 6.1: Log in screen

Figure 6.2: Log in screen, part

The user will be shown a name as which they will be logged in as, and what competition they are logging in for as illustrated in Figure 6.2. After logging in the user will be show the rotation list of the gymnast they will be judging for the day. Individual names and numbers of the gymnasts can be seen by using the dropdown menu on the right side of the category name. Gymnasts who have already been scored will be tinted in a light grey colour, see Figure 6.3, and gymnast yet to be judged are marked in white, see Figure 6.4.

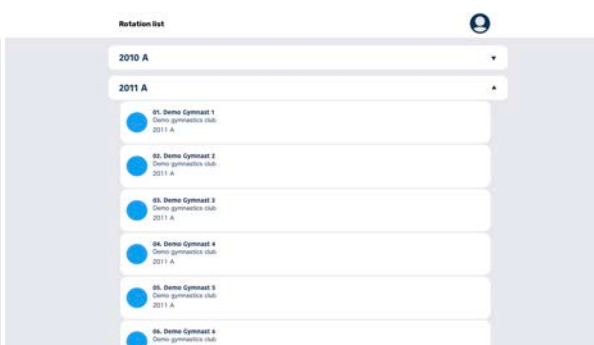

Figure 6.3: Gymnasts already scored   Figure 6.4: Gymnasts yet to be scored

6.2 Streaming the video

The approach for viewing the video would not be a live stream as it was in the original design of the system. Competitors would download their performance videos to the Vikis software as they have done for the previous competitions. These videos would be fetched from Vikis to the Kisanet system, and loaded to the correct gymnasts, where the videos would then be ready to be viewed without the need for live stream. The judges could start the video from then points system by themselves, see Figure 6.5 and 6.6. Once the video has been started it will play only once from beginning to end with no possibility to restart the video. After the video has been

finished, the judge will proceed to enter their score. In case of a technical malfunction, the judges can use the right side button seen on Figure 6.7 to signal a problem with the video to the head judge, who could then enable for the judge to rewatch the video.
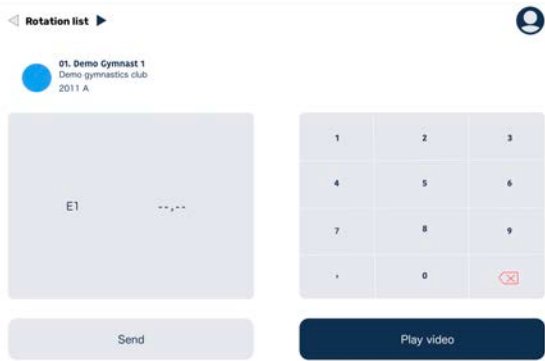

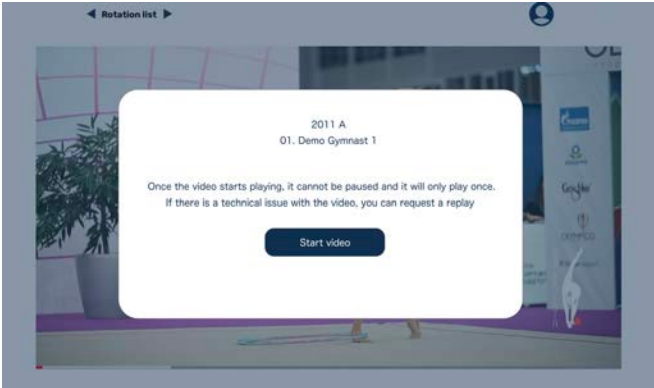Figure 6.5: Scoring screen for gymnast

Figure 6.6: After pressing "play video"
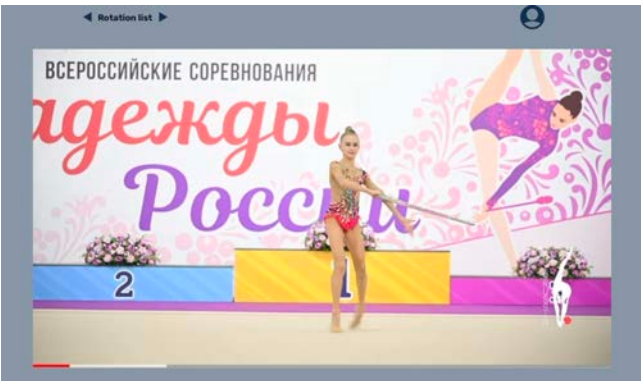
Button seen on Figure 18

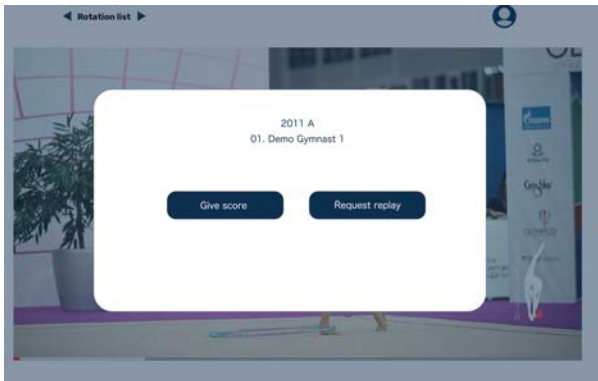

Figure 6.7: View while video is playing

Figure 6.8: View after video has ended

32% of the people who answered the query mentioned problems with the live stream. There were mentions of mainly connection issues with the video not playing or it

lagging or cutting off in the middle. There was also no established way of rewatching a routine is the live stream failed. Connection issues were reported through Zoom and video links to rewatch the routines were sent through Zoom chat. I feel like this altered way of viewing the videos straight from the points system and not through a live stream would address these connection issues.

To live stream approach kept the judges going at the same speed as every judge was seeing the same routine simultaneously. My suggestion to this would be to build the system in a way that all the scores from the judges would have to be registered in the system before the video for the next gymnast can be started. This could be handled automatically through the site or head judge could be given rights to unlock the next video when they see that all the previous scores have been entered.

Changing the format of viewing the videos from a live stream to preloaded videos not only reduced the risk of running into technical problems with live stream but also makes it possible to log in and use only one system instead of two. This also enables the possibility, which was also mentioned by respondents in the open question party of the query, to have a totally separate live stream just for the viewers. This way the viewers will not have to wait while the live stream is stopped because judges need more time to judge or there are technical issues with the judging.

6.3 Changing the score

In the original design, if the given scores were not accepted and a judges meeting was called, the user got a pop up notification that announced them that a judges meeting had been called. The issue with this was that the pop up did not let the user know which gymnast the judges meeting had been called for. The user then had to

proceed to check the rotation list and see if any of the gymnast they had already scored before was again showing in white colour, thus marking them as a gymnast yet to be scored. As schedules on competition days are tight for the judges, it was inconvenient and time consuming to start looking for the right gymnast to rescore after getting the announcement for a judges meeting. The only way not to have to search for the right gymnast was for the head judges to announce out loud for which gymnast they had called the meeting for. And even then the judge had to go through the rotation list and locate the right gymnast. After the score had been change they would have to locate their way back to the on going gymnast.

To address this issue they way the judges meetings are announced was changed in the new design shown in Figure 6.9.
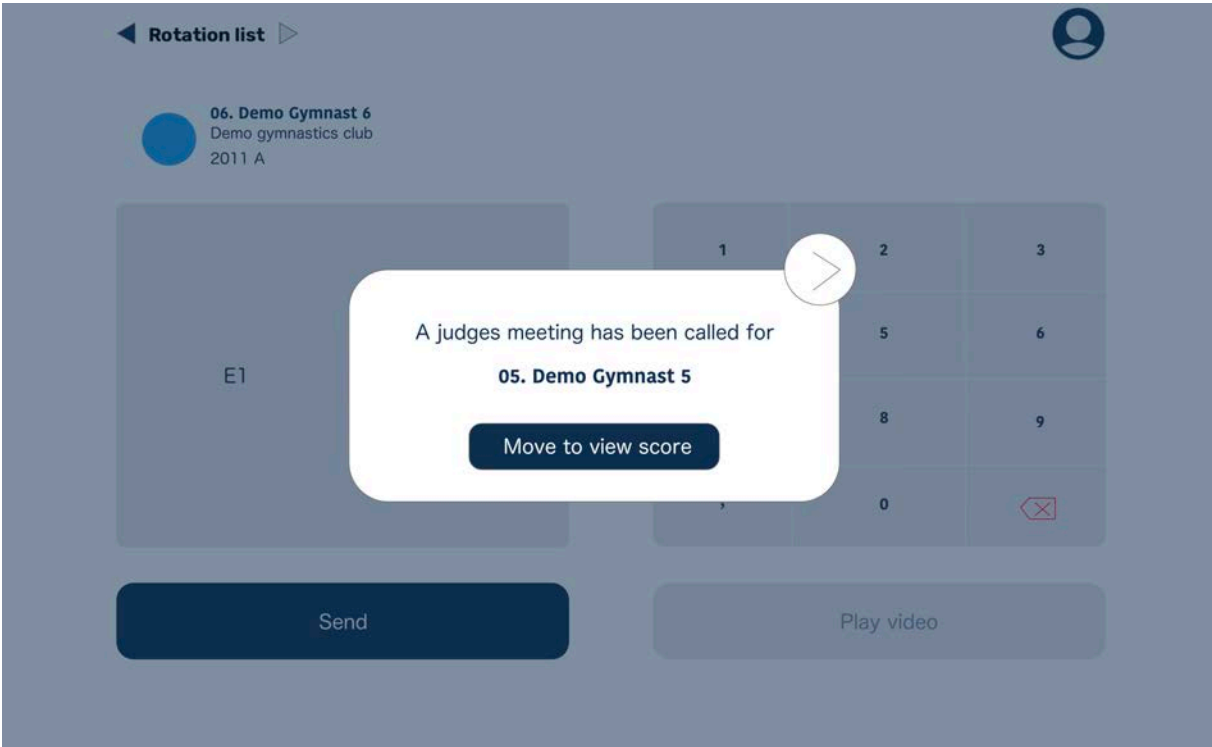

Figure 6.9: Pop up notification for a judges meeting

In the redesigned version, the pop up notification of a judges meeting will include the name and rotation number of the gymnast the judges meeting was called for. The judge will have the option to move to view the score or the notification can be collapsed to the side of the screen as illustrated in Figure 6.10.
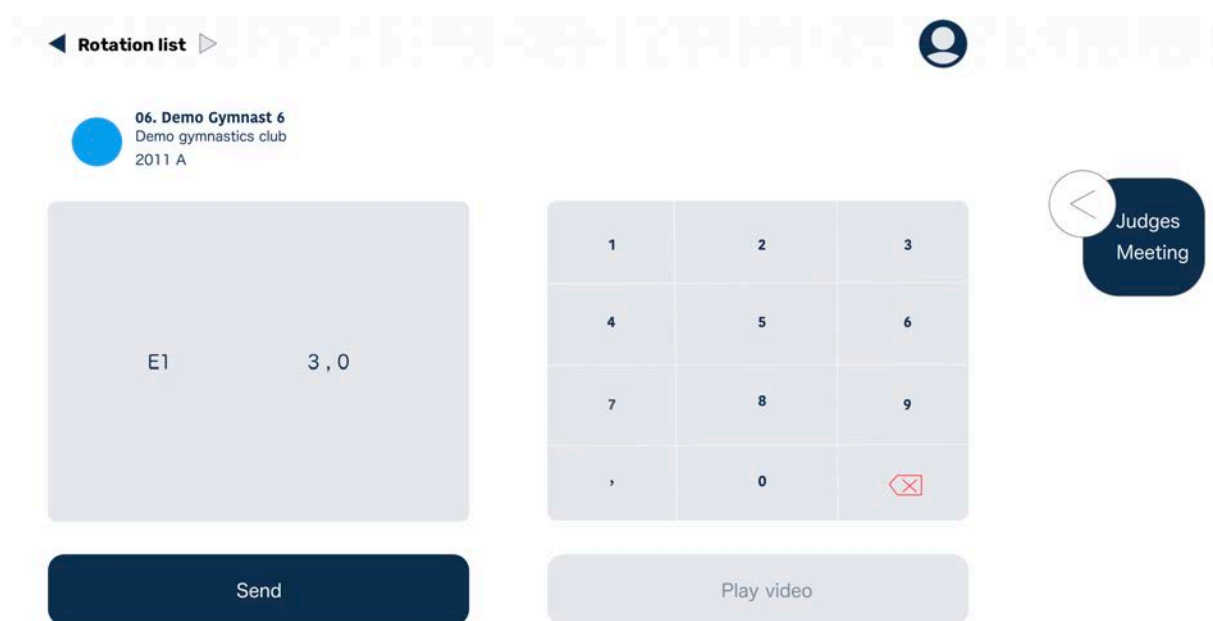
Figure 6.10: Judges meeting notification collapsed to the side

If the notification is collapsed to the side, it can be accessed at any time again to bring back the view from Figure 6.9. The notification will stay on the side of the screen until the score for the gymnast has been reviewed. If multiple judges meetings are called at the same time, they will appear in a row from top to bottom at the right side of the screen. When the judge proceeds to view the score for the gymnast who the judges meeting was called for, the "move to view score" button seen on figure 6.9 will take them straight to the right gymnast shown in Figure 6.11.

Figure 6.11: Judges meeting for gymnast 05. Demo Gymnast 5

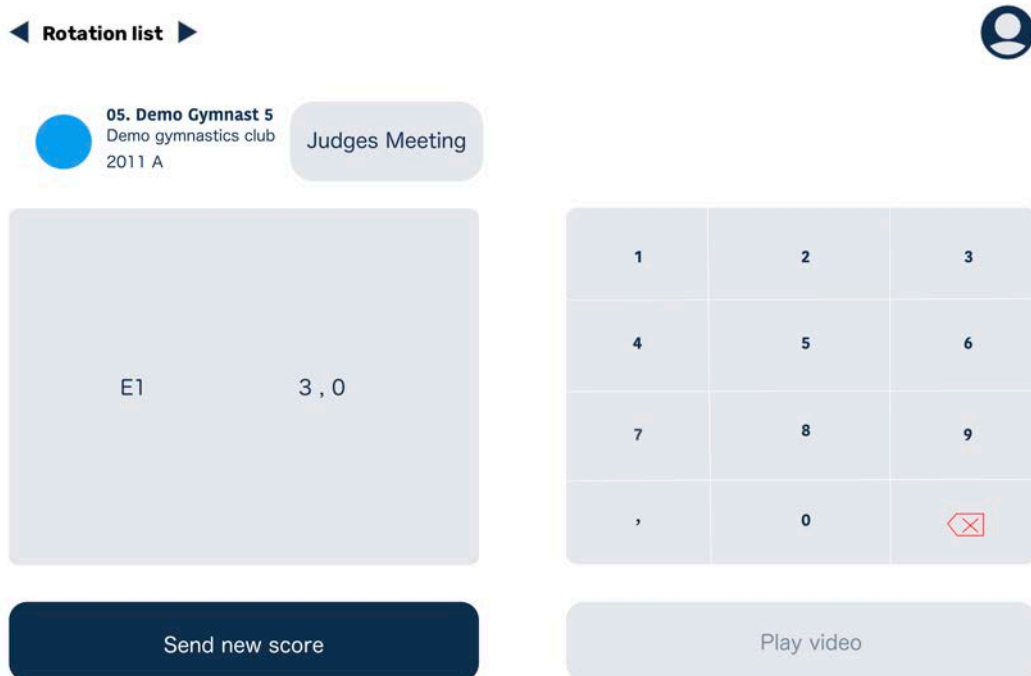After the score has been reviewed and resent, the judge will get a confirmation of the changed score and a "return to previous gymnast button" will shown, see Figure 6.12. This button will transfer the judges straight to the gymnast in which they were before accepting the call for the judges meeting.

New score sent

2011 A
05. Demo Gymnast 5
3.0 -> 3.0

Return to previous gymnast

Figure 6.12: View after the judge has rescored a gymnast in a judges meeting

By taking the judge from the judges meeting pop up notification straight to the right gymnast and then back again to where they were before, we eliminate the problem of the judge having to look for the right gymnast to rescore , and having to manually find their way back to the right gymnast.

6.4 Zoom

The redesigned system removed the need to have the Vikis site open for live streaming the competition by preloading the videos to the Kisanet site for judges to view. This removes one of the biggest issues most of the query respondents had with having to use two devices and be logged in to two different systems at the same time.

For having a live connection between the judges and enabling them to discuss their scores, a Zoom connection would still have to be open on a separate device.

When looking at the query results we actually saw that most of the respondents felt that the connection through Zoom had worked very well and they felt that it could still be used if the Vikis and Points system could juts be collapsed into one.

7. User test of the redesign

In this chapter, I will present the results of user testing of the redesign for the remote online competition system. Test users got to test out a working demo of the new design. Some testers had previous experience with the original design of the system and some had never used the original system for online competitions. The testers were given no instructions on how the systems worked, expect for the short text seen in Figure 7.1, which was provided to them at the start of their test use. Test user were instructed to "think out loud" while they were testing the redesigned system. This was done to allow observers to understand the actions of the users. The test users were also instructed to ask questions if any arose during their testing ,and freely discuss with the observers if they had any other ideas regarding the tested system.
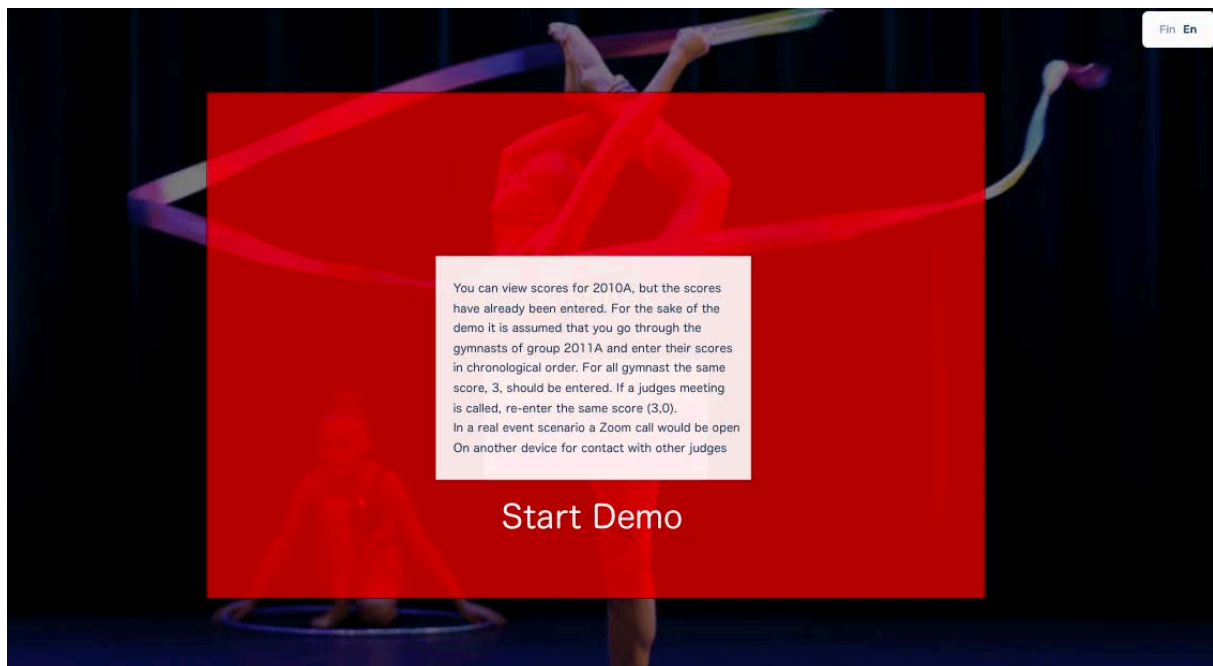

Figure 7.1: Instructions for test user before testing out the redesigned system

7.1 User results

During the testing of the redesign model, there were no technical issues with using the applications. Testers expressed mostly positive feelings and were happy with the changes that were made to the system

7.1.1 Positive feedback

Most of the test users mentioned that the redesign system was easy to use.

"Tätä on kätevä käyttää" Translation: this is convenient to use
"Oli aika hyvä, selkeä käyttää" Translation: It was quite good, clear to use

Most of the feedback was, as expected, focused on the fact that now a separate device for video wasn't needed. The test user found this only a positive thing.

"Video tulee kätevästi samasta paikasta kuin pisteet" Translation: the video is conveniently coming from the same place where the scores are.

Another focus of the feedback was the way the judges meetings are announced to judges in this new system. The test user mentioned it a positive thing that they do not have to manually find the gymnast after a judges meeting is called. The ability to click the announcement for a judge's meeting and instantly have the right gymnast open was seen as a positive thing.

"Jos tarvitaan palaveria niin kiva kun ei itse tarvitse kiiressä ruveta etsimään keneltä puuttuu pisteet. Tarvitsee vain klikkaa ja olet oikeassa paikassa" Translation: if a meeting is needed it is nice that when you are in a hurry you don't have to start looking who is missing a score. You can just click and you are in the right place.

7.1.2 Suggestions by test users

The redesigned version of the system was missing one element of the original design. In the original system when scores had been accepted by the head judge, a pop up showed on the screen announcing for the judge that the scores had been accepted. The judge then had to either click to move on to the next gymnast, or click to stay on the current gymnast.

In the redesigned version, after the user has sent their score they then have to click the arrow next to the rotation list to move on to the next gymnast, Figure 7.2.
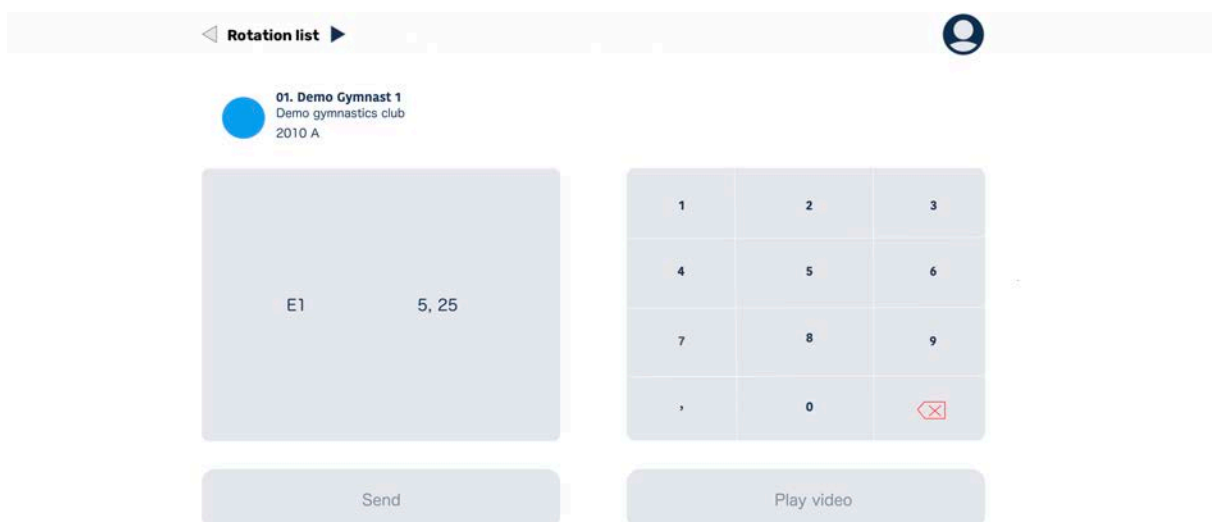

Figure 7.2: Arrow next to "Rotation list" is used to move the judge to the next gymnast

This seemed to be a confusing change for the test users as they seemed to be waiting for the pomp to appear and were confused for a second about what to do. A

suggestion from the test user was that the system would automatically move on to the next gymnast after the scores have been sent.

"Voisiko tähän aueta valmiiksi suoraan seuraava voimistelija" Translation: Could the next gymnast open here directly after

One of the user also suggested that if would be nice if there was a message or notification on the front page after you have finished all the gymnasts you needed to judge. The notification   could let the judge know that they have finished all the gymnasts they were assigned and thus confirm to the judge that they can now log off.

8. Conclusions

This thesis aimed to find out how usable the Finnish system, Kisanet, was in its beginning stages for the purpose of remote online competitions, and find out how it could be improved to make it more usable.

25 Finnish rhythmic gymnastics judges answered a query concerning the Kisanet system, evaluating many aspect of its usability. Overall most of the users were happy with the system but certain topics arose from many respondents. One of these was a dissatisfaction with the way scores were changed after they had been sent. Another topic that arose from the query answers, and one that was the most mentioned throughout all the answers, was the need for a possibility to judge the competitions through only one system and with only one device.

Based on the query answer a new redesigned systems was introduced to a few test users. These test users reported positive feelings towards changes made to the previously mentioned issues of changing scores and using two systems on two separate devices.The test users also gave their suggestions on how to further better the system, including the way the view changes after scores have been sent and after a judge has finished all their assigned gymnasts.

One aspect that the redesign of the system did not consider, was the need to have a Zoom call open on a separate device to have a live connection with the other judges. Most respondents of the query felt that having a separate device for the Zoom call was not a problem. Nonetheless if we wanted to try making the system for remote online competitions work with just one device and one login, it should be considered how the Zoom call could be replaced and brought to the same Points system.

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