

CSM RESEARCH REPORT

THE FUTURE OF WINTER SPORTS – A DELPHI STUDY

COMMISSIONED BY MASTERCARD

INTRODUCTION

Dear readers,

Skiing is more popular than ever before and has steadily expanded its base over the past five years (Schmidt et al., 2019). The latest developments sound very promising, but it is undeniable that the industry is also facing challenges. Therefore, we conducted a scientifically-based Delphi study on the future of skiing with the support of renowned winter sports experts. The study takes us on a journey through time and outlines skiing in the year 2025.

According to our experts, five years from now, despite huge environmental challenges, the skiing industry has managed to find technological solutions to sustain best skiing conditions for long periods of the year – both for professional and recreational skiers. Technology has not only helped to make resorts more climate-friendly, but digital innovations have also enabled an entirely new skiing experience. Cashless payments and seamless consumer interactions have become the new normal, making recreational skiing more fun and more secure. Security has similarly increased for professional skiers in 2025. With the enhancement of available technologies and an extended usage of advanced data analytics methods, athletes face less risk of severe injuries and, thus, can deliver record-breaking performances on the slopes. Moreover, digital technologies including virtual reality simulations have helped athletes to continuously improve their skills. At the same time, augmented reality applications guide both professional and recreational skiers through the fastest and/or safest route, based on weather and slope conditions.

While this all has happened in five years from now, some areas still require more focus. According to our experts, wage gaps between male and female athletes still exist, mainly because of more lucra-

tive endorsement deals for men. In 2025, gender parity in ski sports organizations has not yet been reached. The same holds true for the digitization in these organizations, which have made a lot of progress but still lack behind, despite a strong desire to catch up to digital frontrunners in other sports. The desire for the use of digital ski sports simulations is limited and might need more time to grow. Five years from now, there are far more skiers on the real slopes than in the digital world and video gaming has not yet proven to be a critical factor in getting young people excited about skiing.

Based on our experts' opinions, this is how skiing might look like in the year 2025. However, critics may object: Why should we care about future projections? Why should we be concerned today with the development of the skiing industry in five years' time? By then, the world will no longer be comparable to that of today, anyway. Does it, therefore, make any sense to think about long-term strategies? Our answer is yes! In the new realities of the digitized society and economy, future readiness is a core capability. It is important to think through future scenarios and to carefully deal with the consequences they might have. Projections help players in the skiing industry to identify trends early, reduce uncertainty, and increase their competitiveness. Decision makers are required to anticipate future changes and must learn to think counterfactually in order to shape the future of their beloved sports.

Our Delphi study is designed to help athletes, managers and decision makers to adapt their business model in a timely manner in order to build their own organization in a sustainable and future-oriented way. Our goal is not to make an exact prediction, but to initiate a productive debate about the future of skiing.

DELPHI STUDY WITH 13 PROJECTIONS AND 46 EXPERTS

The desire to predict the future is part of human nature. In ancient Greece, the Oracle of Delphi foretold the future and became one of the most famous cult sites in history (Häder, 2009). However, for our scientific "view into the crystal ball," we did not consult the Oracle of Delphi, but rather collected the opinions of leading minds in the skiing industry. These included FIS officials, former elite athletes, managing directors of ski resorts, technology experts, eSports developers, and media representatives.

With the help of a "real-time" version of the Delphi method (Dalkey & Helmer, 1963), originally developed by the US military in the 1960s for forecasting purposes, a total of 46 proven experts evaluated and commented on 13 projections on the future of ski sports. Each projection was assessed in terms of probability, impact, and desirability of its occurrence. For the year 2025, five different scenarios were analyzed and are presented on the following pages in more detail.

This study was conducted in close cooperation with Mastercard. We would like to take this opportunity to thank Nicole Krieg and Hannah Bruckner for their excellent collaboration. We would also like to thank the experts who participated in the study, as well as Marcus Höfl and Andreas Bergmann from MHM Majors GmbH for their support in identifying and contacting relevant stakeholders for this study.

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THE MOST IMPORTANT STUDY RESULTS

1 | *Climate focus is inevitable and the winter sports industry will master this existential challenge*

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2 | *Modern technologies can contribute significantly to the advancement of ski sports, but institutional support is needed*

P. 7

3 | *Recreational skiers will have a seamless experience in ski resorts by 2025 – however, ski sports organizations have a long way to go to become digital frontrunners*

P. 9

4 | *Despite great desire, it will be a rocky road to achieve gender parity in ski sports by 2025 – both on and off the slope*

P. 11

5 | *Gaming in ski sports will not play a vital role by 2025 – neither in attracting the majority of people to play, nor in motivating young generations to ski*

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CLIMATE FOCUS IS INEVITABLE AND THE WINTER SPORTS INDUSTRY WILL MASTER THIS EXISTENTIAL CHALLENGE

CLIMATE CHANGE IS AMONG THE MOST CURRENT TOPICS OF OUR TIME AND IT INCREASINGLY AFFECTS THE WORLD OF SKIING. FOR SKI RESORTS, CLIMATE CHANGE MIGHT NOT JUST BE A PROBLEM, BUT AN EXISTENTIAL THREAT.

Glaciers are shrinking at an unprecedented rate and are more and more often closed to skiers. Ski resorts might see a significant drop in the number of days they can operate every season. They try to fight back with an armada of snowmak-

“ARTIFICIAL SNOW PRODUCTION HAS IMPROVED AND WILL FURTHER IMPROVE THROUGH TECHNOLOGY AND THEREFORE HELP TO MAINTAIN GOOD SKIING CONDITIONS IN A MORE CLIMATE-FRIENDLY WAY”

ing machines that paint the hills white. This reliance on snowmakers leads to two questions: When will ski resorts get too warm for snowmaking machines? And will this reliance be sustainable in the future? Sustainability is certainly a hot topic for the foreseeable future and a major point of criticism that ski resorts face. However, does this mean that ski resorts have no choice but to become more sustainable in the future? Might they withstand the growing pressure from consumers and tourists for climate-friendly solutions? Or might sustainability become a prerequisite for all stakeholders in the winter sports ecosystem to be successful?

FIG. 1.1
2025: SUSTAINABILITY HAS BECOME A CRITICAL PREREQUISITE FOR STAKEHOLDERS IN THE WINTER SPORTS ECOSYSTEMS TO BE SUCCESSFUL



MORE SUSTAINABILITY IN WINTER SPORTS IS HIGHLY DESIRED, BUT THE BUSINESS IMPACT UNTIL 2025 REMAINS DEBATABLE

The debate about climate change and its role in the world of skiing is not new, but it is gaining a whole new type of momentum now with increasing societal awareness. Therefore, we projected for 2025 that “Sustainability has become a critical prerequisite for stakeholders in the winter sports ecosystems to be successful.” On the one hand, climate change has become tangible, and one group of experts argued that all stakeholders will need to act sustainably if they want to stay in business. Basically, it will no longer be a choice of whether be more sustainable, but a prerequisite for success as win-

ter sports tourists will demand it. Offering zero-emission-winter-sports might be a competitive advantage in the future. There is consensus among the experts that more sustainable ski resorts will be able to attract larger numbers of guests. However, if zero emissions are to be reached on a larger scale, it would need to be a common goal of all stakeholders involved. It is conceivable that subsidies, licenses, and public permits will be more and more dependent on sustainability efforts. Winter sports officials among our group of experts see the need to take the topic seriously and to develop a viable action plan (see Fig. 1.1).

On the other hand, despite the reality of climate change, another group of experts argued that sustainability won't be a prerequisite for success in winter sports. They believe that climate change

“WE NEED TO TAKE SUSTAINABILITY SERIOUSLY AND ALSO PUT REQUIREMENTS INTO PLACE”

“IF WINTER SPORT RESORTS ARE NOT GOING TO DO WORK MORE SUSTAINABLY, THEY WILL BE LEFT WITHOUT VISITORS”

might play a role for ski resorts, but not by 2025. For now, sustainability is no more than a buzzword in their view; while it is widely debated, it does not lead to any significant action being taken. Visitors are still driving hundreds of kilometers into the mountains with their SUVs for a few days of skiing.

Whether or not winter sport stakeholders will act significantly more sustainably by 2025 is, of course, very difficult to predict. It is clear, though, that the issues of climate change and sustainability will not disappear. Ultimately, it will be consumers and tourists who decide whether sustainability will become a prerequisite for success in winter sports. Our experts agree that more sustainable winter sports would be highly desirable (highest desirability amongst all projections, see Fig. 1.1), but leave open whether the affected stakeholders are willing to bear the costs and live with the consequences.

TECHNOLOGIES WILL PLAY A DECISIVE ROLE IN THE FUTURE OF WINTER SPORTS INCLUDING MAINTENANCE OF GOOD SKIING CONDITIONS IN A CLIMATE-FRIENDLY WAY

Experts of our study rated the projection that “technologies have helped to maintain good skiing conditions in a climate-friendly way” with the third highest score on all three dimensions – probability, impact, and desirability (see Fig. 1.2). While there is overall consensus about the importance of climate-friendliness, our experts show different levels of optimism in achievement of climate-friendly winter sports with the help of technology.

Some of our experts see an inherent contradiction between winter sports and climate-friendliness. For example, over-tourism and artificial snow are inherently bad for our climate. Maintaining good

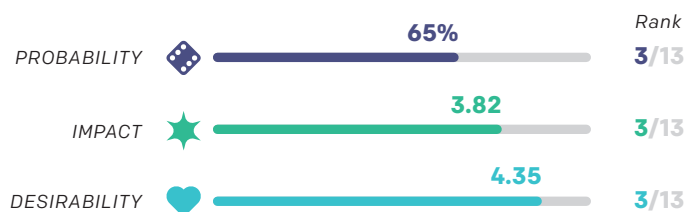
skiing conditions in a climate-friendly way seems to be technically unrealistic. There is a lot of skepticism whether there will be innovations (e.g., in artificial snow) that can make a difference at a rea-

“I WOULD LIKE SUSTAINABILITY TO BECOME A PREREQUISITE TO BE SUCCESSFUL, BUT I AM NOT OVERLY OPTIMISTIC”

sonable cost. However, other experts are much more optimistic. They argue that technology has already helped the skiing industry to become significantly more energy efficient, for example, in terms of snow-grooming equipment or snowmaking machines. In their view, advanced technologies as well as entirely new technical solutions will help preserve good skiing conditions.

Thus, there seems to be consensus that good skiing conditions will be maintained in a more and more climate-friendly way in the future. It is questionable though whether we will ever see true climate-friendliness – i.e., zero emissions – in the world of skiing. This would clearly require significant investment, radical rethinking, and more climate-friendly ways of snow-making. But, many stakeholders in the winter sports industry truly care about nature and they will leverage technology for viable solutions.

FIG. 1.2
2025: TECHNOLOGIES HAVE HELPED TO MAINTAIN GOOD SKIING CONDITIONS IN A CLIMATE-FRIENDLY WAY



MODERN TECHNOLOGIES CAN CONTRIBUTE SIGNIFICANTLY TO THE ADVANCEMENT OF SKI SPORTS, BUT INSTITUTIONAL SUPPORT IS NEEDED

THE IMPACT THAT TECHNOLOGIES HAVE HAD ON THE WORLD OF SPORTS IS VAST AND MIGHT BECOME MORE PRONOUNCED IN THE FUTURE. EXAMPLES OF IMPACTFUL APPLICATION OF TECHNOLOGY IN SPORTS ARE NUMEROUS RANGING FROM SPRINTING, JAVELIN AND THE POLE VAULT (HAAKE, 2009), CYCLING, AND SWIMMING, TO TEAM SPORTS SUCH AS FOOTBALL AND BASKETBALL (FOSTER ET AL., 2012; SCHMIDT & EBERHARD, 2016).

In most sports, the rate of improvement sportive performance has plateaued given the natural limits of human ability. Most performance improvements in the future will be the consequence of technological innovation and application (Balmer et al., 2011; Dyer, 2015). For example, researchers found that only half of the progress in terms of world records in speed skating stems from actual athletic improvement, while the other half results from technological advancements (de Koning, 2010). Technology has also massively increased athletes' safety over the past few decades and we expect to see continued improvements in the future. The sports industry might take a leading role in the introduction of "yet unforeseen digital technologies" (Merkel et al., 2016). Winter sports are no different and we have seen and will continue to see similar developments in the future.

TECHNOLOGIES WILL FURTHER INCREASE SAFETY AND PERFORMANCE IN WINTER SPORTS – BOTH FOR PROFESSIONAL ATHLETES AND RECREATIONAL SKIERS

The projection that "technologies have increased athletes' safety and sportive performance," yielded the second highest estimated probability, and impact and highest desirability of all projections in our study (see Fig. 2.1). This suggests that our

FIG. 2.1
2025: TECHNOLOGIES HAVE INCREASED ATHLETES' SAFETY AND SPORTIVE PERFORMANCE



Delphi experts strongly believe in the effect and benefit that technology will have on both safety and performance. For athletes' safety, we have already seen significant improvements over the past few dec-

“AS THE SPORT IS UNIQUE IN TERMS OF OUTDOOR FACTORS (E.G., SNOW, ICE), THE DIGITAL SIMULATIONS' BENEFITS MIGHT BE MARGINAL”

ades with the FIS Injury Surveillance and Prevention System, protective wear, and inflatable airbags, to name a few. At the same time, there is still significant room for improvement, particularly in areas like material, analytic tools, and physical training (e.g., with neurological feedback). One of the most promising areas, according to our experts, is the prevention of injuries using technology and analytics. The ever-improving quality of data allows athletes and their coaches to take preventive actions and adapt behaviors where needed. Similarly, advanced analytics help to simulate slopes and potential crashes to improve slopes and reduce risk.

When it comes to performance, we have also seen remarkable technological im-

provements, particularly in terms of better material. Our experts agree that the level of physical ability has reached its relative maximum so the next level of performance improvement will come from technology. For example, digital solutions will allow athletes to train better and (mentally) prepare for training and competitions. Artificial intelligence could be used to improve the interplay of human ability and technology. As in any industry, the pace of change and development will largely depend on willingness to invest in technologies.

TECHNOLOGIES ALONE WILL NOT BE ENOUGH TO FURTHER INCREASE INCLUSIVENESS IN SKI SPORTS

Will we see ski world cups where all athletes, independent of gender, age or disability, compete against each other in the same competition? This was the underlying question of our future projection that, "Ski world cups have become inclusive for athletes across the board through modern technologies." The answer, according to our experts, is: unlikely. They believe that the probability and impact of this scenario to be relatively low (see Fig. 2.2). Interestingly, they also consider it not to be particularly desirable, which might be counterintuitive.

High-tech hardware such as prostheses could allow disabled and non-disabled athletes to compete at eye level. Modern technologies could also allow for competition among non-disabled athletes across age groups and gender. Similarly, they could allow amateur sportsmen to compete with elite athletes, which could have many benefits including fan engagement and wider access to sports. Imagine amateurs with exoskeletons racing against elite downhill skiers without supportive aids. Technologies could not only help to include more individual athletes, they could also give national teams access to sports that would usually be out of reach due to weather conditions, for example. Access could be facilitated by training in virtual environments or by production of artificial snow. Participation of more nations in ski world cups would make them more inclusive and increase interest around the world.

“FEEDBACK ON METABOLISM AND TECHNIQUE WILL BE INCREASINGLY IMPORTANT TO MAKE SURE ATHLETES WILL BE FIT FOR THE DESIRED ACTIVITY. THIS IS TO AVOID INJURIES AND TO MAKE SURE THE BEST POSSIBLE PREPARATION WILL TAKE PLACE ON EVERY LEVEL (ELITE TO TOURIST)”

However, our study results suggest that there could be several reasons why technology is unlikely to make ski world cups more inclusive. Arguments include, for example, the different preconditions of disabled and non-disabled athletes, which would never allow for a fair competition given the lack of comparability. Experts supporting this line of argumentation claim that competition between athletes with equal preconditions is one of the most important aspects of sports; the preconditions keep sports fair and interesting for spectators. A key problem for full inclusiveness in ski world cups will remain; skiing is only performed in a few countries and is, even with the help of virtual reality technology, unlikely to achieve a global presence.

HIGH-END DIGITAL SIMULATIONS WILL COMPLEMENT, BUT NOT REVOLUTIONIZE, TALENT DEVELOPMENT IN SKIING BY 2025

The question whether “high-end digital simulations of ski races for professional athletes have revolutionized talent development and training for elite skiing” led to a lot of debate among our experts (see Fig. 2.3) and they did not reach consensus. Many of the experts see strong advantages of ski race simulations. They argue that simulations might significantly improve the quantity and quality of feedback athletes can receive about their technical and physical skills that, in turn, can lead to better performance and improved safety (e.g., injury prevention). This could become particularly important given advancements in sensor technology. For performance analysis (as well as tracking over time) in general, simulations could become a key component. Simulations could also aid the identification and development of talent. The experts also see great potential in the use

of virtual reality, for example, to prepare athletes for (difficult) slopes. The notion of training anywhere and anytime seems to be a desirable goal. Skiing simulations could significantly increase athletes’ maximal training hours by making training independent from snow and weather conditions. It would simplify training and reduce costs (e.g., travel) at the same time. But benefits do not only arise for elite athletes. Ski schools could use simulations to educate and train both first-time and more advanced skiers. Similarly, it could help older skiers, in particular, to maintain the physical condition they need for skiing into old age.

It is, however, also worth mentioning that an opposing group of experts considers these simulations significantly less probable and desirable. They see digital applications as a potential support in some areas of training at best, arguing that the impact for elite athletes will be marginal compared to real-life training and feedback coaching. In any case, a great user experience will be indispensable for adaption of simulations.

FIG. 2.2
2025: SKI WORLD CUPS HAVE BECOME INCLUSIVE FOR ATHLETES ACROSS THE BOARD THROUGH MODERN TECHNOLOGIES

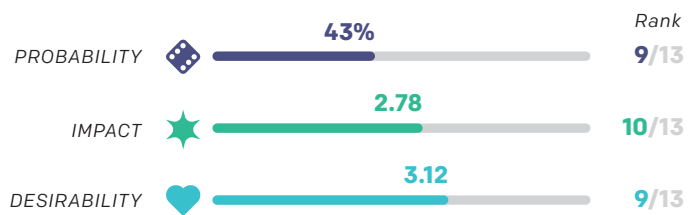
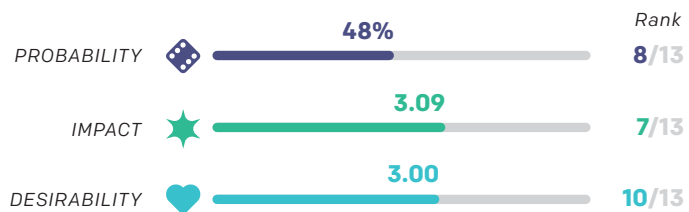


FIG. 2.3
2025: HIGH-END DIGITAL SIMULATIONS OF SKI RACES FOR PROFESSIONAL ATHLETES HAVE REVOLUTIONIZED TALENT DEVELOPMENT AND TRAINING FOR ELITE SKIING



RECREATIONAL SKIERS WILL HAVE A SEAMLESS EXPERIENCE IN SKI RESORTS BY 2025 – HOWEVER, SKI SPORTS ORGANIZATIONS HAVE A LONG WAY TO GO TO BECOME DIGITAL FRONTRUNNERS

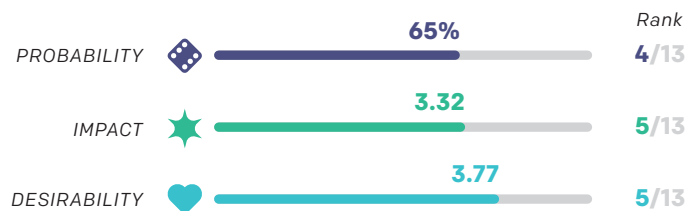
TECHNOLOGY IS NOT ONLY KEY FOR PROFESSIONAL ATHLETES TO IMPROVE THEIR PERFORMANCE, BUT IT IS ALSO IMPORTANT TO IMPROVE THE EXPERIENCE FOR RECREATIONAL SKIERS.

Today, nearly three out of four recreational skiers are equipped with wearables (ISPO, 2017). And while skiers with action cameras are a common picture on the slopes, ski masks that integrate Wi-Fi, GPS, and Bluetooth features displaying skiers' performance on the snow, using Augmented Reality, are rather new (Fedosov et al., 2016). The experience off the slope is similarly subject to change from modern technologies. Since digitization allows for a more seamless experience in every part of our life, winter sports fans also expect the highest degree of convenience when visiting a ski event or when hitting the slopes. But how will the ski sports ecosystem evolve?

MOST SKI RESORTS WILL BECOME COMPLETELY CASHLESS BY 2025, OFFERING A SEAMLESS EXPERIENCE FOR VISITORS

The projection that “most ski resorts have become cashless making them more secure” was assessed by our experts to have a stable probability of 65% (see Fig. 3.1). Isolating the responses of the technology experts within our panel, however, reveals that this group agreed with 77% probability, making it the highest ranked projection within this sample of study participants. This fact bolsters confidence in the likelihood of ski resorts to become cashless and more secure by 2025. Experts also assess the impact and desirability of this projection relatively high (rank 5 of all projec-

FIG. 3.1
2025: MOST SKIING RESORTS HAVE BECOME CASHLESS MAKING THEM MORE SECURE



tions). While there are already ski resorts where most skiers do not need cash in their pockets, there is some skepticism by our experts about the speed of distribution. Adoption rates in smaller ski resorts might be lower and the accessibility of cashless technologies for elderly resort visitors could be a hurdle.

Next to a cashless and more secure skiing environment, experts also assessed the projection that the “ski sports ecosystem offers a seamless experience for recreational visitors through digital technologies” by 2025. This projection was also given high probability (62%) and solid impact (rank 4 out of 13 projections) ratings (see Fig. 3.2). According to our experts, ski resorts will further improve

customer centricity and increase convenience to retain existing and attract new winter sports enthusiasts. Our experts imagine winter vacations without queues as skiers are directed to empty lifts via apps or digital signals and a convenient process of booking travel, renting skis, and buying lift passes with just a few clicks based on customer preferences. This would offer tremendous upside potential for ski resorts since such a seamless experience would allow customers to spend their time on the key activity: skiing.

While the impact of such a projection seems obvious, there are two main obstacles to this development: First, the ski sports ecosystem is relatively fragment-

“I WOULD PREFER THE MOUNTAINS TO REMAIN DIGITAL AND TECH FREE AS MUCH AS POSSIBLE TO REMAIN ITS FLAIR. BUT FROM A BUSINESS-PERSPECTIVE THIS IS OF HIGH DESIRABILITY”

“ESPECIALLY THE FOREFRONT OF RESORTS, BEING MORE COURAGEOUS AND INNOVATIVE, WILL MAKE FULL USE OF DIGITAL TICKETING AND GEO-LOCATION TRACKING FOR INCREASED EXPERIENCE. THE SAME HOLDS TRUE FOR SECURITY, PURCHASE PROCESS OF FOOD AND BEVERAGES, AS WELL AS MERCHANDISING AND TICKETING”

ed, which makes a conversion towards a seamless process along the entire customer journey more difficult. Second, many experts agree that the resorts at the forefront will achieve the seamless experience by 2025, but many resorts will lag behind—taking much longer than until 2025 to become digitized.

to close the gap to digital frontrunners is high (see Fig. 3.3). In fact, this is the most desired projection of those unlikely to occur by 2025.

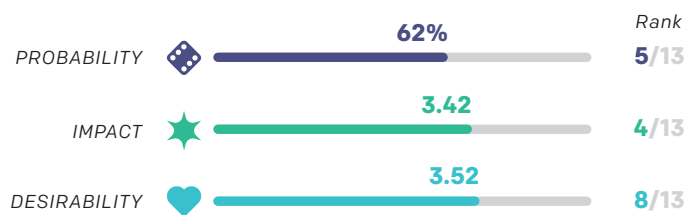
Consequently, the urgency for ski sports organizations to digitize is salient, as reflected in our experts’ discussion. Other sports organizations appear to have ex-

tended their lead in terms of digital capabilities. It is not too late, but experts agree that ski sports organizations must focus on digital development and application of new technology to catch up. This is not only important to ensure the relevance of skiing in the future, but also to attract young talent to work in the winter sports sector.

DIGITIZATION OF SKI SPORTS ORGANIZATIONS WILL LAG BEHIND DIGITAL FRONTRUNNERS, DESPITE A STRONG DESIRABILITY TO CATCH UP

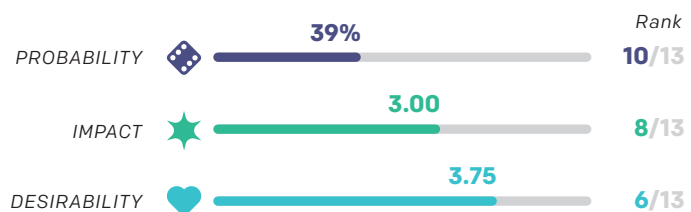
Regarding the projection that “ski sports organizations have become digital frontrunners compared to other sports organizations” by 2025, there is skepticism that this projection will become reality. At the same time, the desirability

FIG. 3.2
2025: THE SKI SPORT ECOSYSTEM OFFERS A SEAMLESS EXPERIENCE FOR RECREATIONAL VISITORS THROUGH DIGITAL TECHNOLOGIES



“FOR ME THERE IS NO DOUBT THAT THE SKIING RESORTS WILL HAVE BECOME CASHLESS IN 2025”

FIG. 3.3
2025: SKI SPORTS ORGANIZATIONS HAVE BECOME DIGITAL FRONTRUNNERS COMPARED TO OTHER SPORTS ORGANIZATIONS



DESPITE GREAT DESIRE, IT WILL BE A ROCKY ROAD TO ACHIEVE GENDER PARITY IN SKI SPORTS BY 2025 – BOTH ON AND OFF THE SLOPE

GENDER INEQUALITY HAS BEEN AMONG THE IMPORTANT SOCIAL ISSUES FOR DECADES. IN 2017, MORE THAN 70% OF THE GLOBAL POPULATION BELIEVED THAT THERE WAS STILL INEQUALITY BETWEEN WOMEN AND MEN IN TERMS OF SOCIAL, POLITICAL OR ECONOMIC RIGHTS (STATISTA, 2017).

This inequality is also reflected in winter sports, though there has been progress. At 43%, the 2018 Winter Olympics in Pyeongchang had the highest female share in history, but there were still disciplines that remained men’s only, such as Nordic combined (The Guardian, 2018). A similar picture emerges in professional alpine ski sports. For races where men and women participate, prize money is equal. However, over the course of a season the amount of prize money for men is still higher, largely because women do not participate in some of the most prestigious and rewarded races. For example, women do not participate in the Hahnenkamm race in Kitzbühel, where in 2019 the “prize money was almost twice as high [...] as at comparable events in the alpine skiing World Cup” (FIS, 2019). The question is: How will gender parity evolve?

ON THE SLOPE, WAGE GAPS BETWEEN MALE AND FEMALE ATHLETES COULD BECOME SMALLER, BUT SPONSORSHIPS AND SPECIAL EVENTS WILL STILL MAKE A DIFFERENCE

With a probability of 55%, experts in our study do not reveal confidence in the assumption that “the wage gap between professional male and female skiing athletes has been closed” by 2025 (see Figure 4.1). Most experts stated that, already today, prize money is the same for events where male and female athletes participate. The difference comes instead from

sponsoring income; and this will continue to hold true in the future. They argue that “the interest on male skiing races” and “the money you can earn on the male sport” will remain higher than for female races. On the other hand, there will always be top female athletes who earn more money than most male competitors. Some experts argue that “public pressure” and rejuvenation in ski sports organizations could help to reduce this gap.

Next to endorsement deals, there are also special events exclusive to men such as the Hahnenkamm race that account for a difference in payment. Experts of our Delphi study do not believe that “women racing will have been brought back to the Hahnenkamm” by 2025. This projection yielded the second lowest estimated

“50% OF SKIER CONSUMERS ARE FEMALE AND WE SEE IN THE INDUSTRY ALREADY TODAY A SIGNIFICANT INCREASE OF FEMALE MANAGEMENT POSITIONS”

probability, impact, and desirability, suggesting that experts neither see a need, nor a wish for women to compete in this skiing event (see Figure 4.2). Interestingly, female participants have even less appetite for this projection, rating it lowest

FIG. 4.1
2025: THE WAGE GAP BETWEEN PROFESSIONAL MALE AND FEMALE SKIING ATHLETES HAS BEEN CLOSED

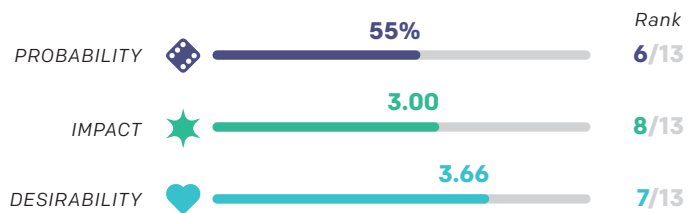
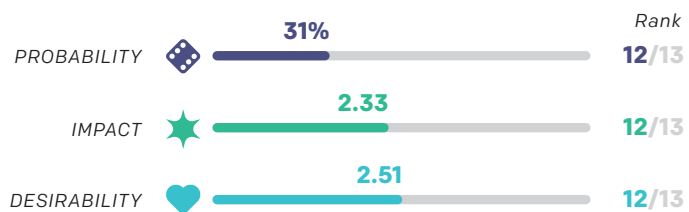


FIG. 4.2
2025: WOMEN RACING HAS BEEN BROUGHT BACK TO THE HAHNENKAMM



in terms of probability, impact, and desirability. However, this topic still appears to polarize, since the experts surveyed did not reach consensus on this projection.

Key arguments by experts include both sportive and economic reasoning. While the danger for athletes could be minimized by future technology, some experts simply believe that “the Streif as a stand-alone event for men is a value” and that any changes would take away some of its DNA. Nevertheless, there are some experts who see a trend towards less segmentation in male and female competition and the potential to have a female slalom race in Kitzbühel. However, it seems clear from the expert perspective, that there will be no women downhill race at the “male bastion” Hahnenkamm by 2025.

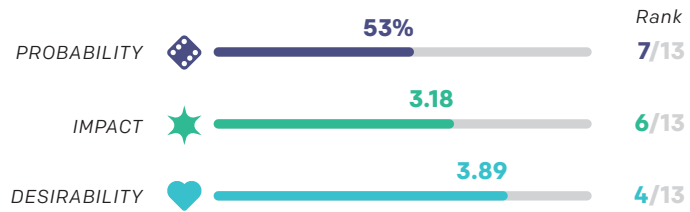
GENDER PARITY IN MANAGEMENT POSITIONS IN SKI SPORTS ORGANIZATIONS IS STRONGLY DESIRED

The projection that “ski sports organizations have entered a promising way to achieve gender parity in management positions” by 2025, revealed a large discrepancy between reality and wishful thinking. While experts rated the desir-

“SKI SPORT ORGANIZATIONS, ESPECIALLY SMALL AND LOCAL ONES, ARE STILL VERY TRADITIONAL AND NEED FURTHER CULTURAL DEVELOPMENT”

ability as high (rank 4 of all projections), the probability of occurrence was only assessed at 53%, rank 7 (see Figure 4.3). This picture holds true for all group of experts, and is even more distinct amongst female study participants, who rank the desirability of this projection second, but their confidence in its probability is low at only 56%, rank 9 within this group.

FIG. 4.3
2025: SKI SPORTS ORGANIZATIONS HAVE ENTERED A PROMISING WAY TO ACHIEVE GENDER PARITY IN MANAGEMENT POSITIONS



Regarding the probability of occurrence, there are two main obstacles according to our Delphi experts. First, there is “not enough interest by women” and there “are not many women, who want to engage themselves in the organizations.” Second, some experts argue, that there is a cultural shift required to achieve gender parity in management positions as some “ski sport organizations, especially small and local ones, are still very traditional” and the “governance [is] old-fashioned.” While it is

not evident that ski sports organizations will have reached gender parity by 2025, the high desirability might help to overcome obstacles and make positive steps towards gender parity off the slope.

Leana Dobler during the Giant slalom of Longines Future Hahnenkamm Champions at the Streif.



GAMING IN SKI SPORTS WILL NOT PLAY A VITAL ROLE BY 2025 – NEITHER IN ATTRACTING THE MAJORITY OF PEOPLE TO PLAY, NOR IN MOTIVATING YOUNG GENERATIONS TO SKI

IN TODAY'S OMNIPRESENT DISCUSSION OF DIGITIZATION THERE IS ONE PHENOMENON NOT TO BE MISSED: ESPORTS. EVERYONE TALKS ABOUT IT NOWADAYS, AND EVEN IF WE ARE NOT INTERESTED IN ESPORTS, WE ARE SOMEHOW ATTACHED TO DIGITAL GAMING.

“I DON'T BELIEVE THAT GAMING WILL BE A RELEVANT ACCESS THAT BRINGS PEOPLE INTO THE SNOW”

According to latest estimates, there are 2.5 billion video gamers on the globe (Statista, 2019a); this number takes into account regular and casual gamers – even those who just play on their smartphones every now and then. However, it is important to differentiate between gaming and eSports. In contrast to gaming, eSports only comprises competitive

gaming. While there are only a few hundred professionals who can make a living from playing videogames, the global audience for eSports has already exceeded 450 million people (Newzoo, 2019). These numbers show that both eSports and

gaming have become an integral part of our society and social life. But how does this relate to ski sports?

First of all, digital sports simulations are typically not amongst the most popular eSports titles globally. Playing competitively in digital tournaments is something that is established in football with the simulation game FIFA or Pro Evolution Soccer. However, there are far more popular games like League of Legends, Dota 2, or Counterstrike (Nielsen, 2019). As of now, digital ski sports simulations are focusing rather on casual gaming than eSports.

THE OUTDOOR SKIING ADVENTURE WILL NOT BE SUBSTITUTED BY VIDEO GAMING BY 2025

FIG. 5.1
2025: MORE PEOPLE PLAY DIGITAL SKI RACING SIMULATIONS THAN ACTIVELY PARTICIPATE IN SKIING

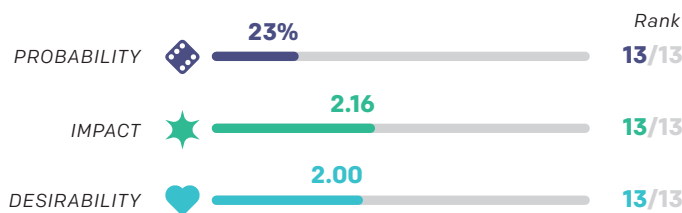
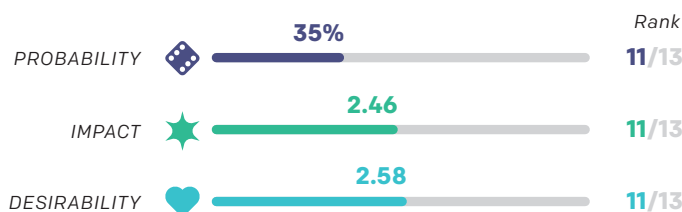


FIG. 5.2
2025: DIGITAL SKI RACING SIMULATIONS HAVE INCREASED THE ATTRACTIVENESS OF WINTER SPORTS IN YOUNG TARGET GROUPS



Although gaming is a popular leisure activity, experts do not expect the number of ski sports gamers to exceed the number of actual skiers worldwide (see Fig. 5.1). This perception is consistently shared across experts of all age groups. Given that there are already more than 110 million skiers in the 15 largest skiing nations and more than 150 million winter sports enthusiasts around the globe, this assessment sounds reasonable (Statista, 2019b). There is not only consen-



▲ **Children during the starting numbers draw for the Men’s super-G of FIS Ski Alpine World Cup at the Streif in Kitzbühel.**

“THE ACTIVE PART IN THE NATURE IS THE MOST IMPORTANT EXPERIENCE FOR SKIING”

sus in terms of probability of occurrence, but also in terms of desirability. Experts largely agreed that they would not like to see “more people play digital ski racing simulations than actively participating in skiing.” Hence, experts expect skiing to remain an outdoor activity in the future and will not be substituted by a digital experience.

ACCORDING TO EXPERTS, GAMING WILL NOT BRING YOUNG PEOPLE INTO THE SNOW

While skiing might not be substituted digitally, our experts can imagine real skiing to be complimented by video gaming. But

the assumption that “digital ski racing simulations have increased the attractiveness of winter sports in young target groups” by 2025 was also assessed with a probability of only 35% by the experts of this study (see Fig. 5.2). Even though it is a slightly more desirable to reach the next generation of skiers with digital simulations, the overall impact of gaming was rated low (see Fig. 5.2). Experts still see parents as the main factor to motivate young people to ski. However, the opportunity of reaching a broader audience, e.g., Chinese skiers, with mobile games was also appreciated by some ex-

perts. Digital ski racing simulations might not have a stunning effect on the future of skiing, but there are still advocates for more ski gaming offerings amongst the experts surveyed.

STUDY DESIGN AND METHODOLOGY

THE PRESENT STUDY WAS CONDUCTED ON BEHALF OF MASTERCARD AND IS BASED ON THE DELPHI METHOD THAT WAS INVENTED BY THE U.S. RAND CORPORATION. THE DELPHI TECHNIQUE IS A SCIENTIFICALLY ESTABLISHED RESEARCH METHOD THAT SOLICITS OPINIONS FROM A PANEL OF EXPERTS IN AN ITERATIVE SURVEY PROCESS.

As part of the method, selected experts evaluate preformulated future theses, so-called projections, according to their probability of "occurrence" (in percent), as well as their "impact" and their "desirability" on a Likert scale from 1 (very low) to 5 (very high). The experts support their quantitative evaluations with optional comments and arguments. Upon completion of their own evaluation, experts get access to the evaluations of the entire panel. Moreover, they are provided with summary statistics such as the median or the level of consensus/agreement by projection. Experts may choose to maintain or modify their evaluations in subsequent iterations (von der Gracht, 2012). This study used a so-called "Real-time Delphi," which is an advanced form of the Delphi technique where experts can immediately compare their responses to those of other participants and change their opinion as often as they like. This scientifically valid procedure reduces the dropout rate (Gnatzy et al., 2011). The present Delphi study was conducted in three steps as depicted by Figure 6.2. In

FIG. 6.1
DELPHI-STUDY SHOULD TACKLE THREE MAJOR TOPIC AREAS FOR PROJECTIONS IN 2025

A / TECHNOLOGY & DIGITALIZATION	B / SPORTS & CLIMATE	C / INCLUSIVENESS IN SKI SPORTS
<p>1 The ski sport ecosystem offers a seamless experience for recreational visitors through digital technologies Fig. 3.2</p> <p>2 Ski sports organizations have become digital frontrunners compared to other sports organizations Fig. 3.3</p> <p>3 Most skiing resorts have become cashless making them more secure Fig. 3.1</p> <p>4 More people play digital ski racing simulations than actively participate in skiing Fig. 5.1</p> <p>5 Digital ski racing simulations have increased the attractiveness of winter sports in young target groups Fig. 5.2</p> <p>6 High-end digital simulations of ski races for professional athletes have revolutionized talent development and training for elite skiing Fig. 2.3</p>	<p>7 Technologies have increased athletes' safety and sportive performance Fig. 2.1</p> <p>8 Sustainability has become a critical prerequisite for stakeholders in the winter sports ecosystems to be successful Fig. 1.1</p> <p>9 Technologies have helped to maintain good skiing conditions in a climate-friendly way Fig. 1.2</p>	<p>10 Ski world cups have become inclusive for athletes across the board through modern technologies Fig. 2.2</p> <p>11 Women racing has been brought back to the Hahnenkamm Fig. 4.2</p> <p>12 The wage gap between professional male and female skiing athletes has been closed Fig. 4.1</p> <p>13 Ski sports organizations have entered a promising way to achieve gender parity in management positions Fig. 4.3</p>

step 1, the future projections were formulated. In step 2, the actual Delphi survey was conducted. In step 3, the survey results were aggregated and analyzed by means of descriptive statistics and coding of the qualitative arguments to derive scenarios.

FORMULATION OF FUTURE PROJECTIONS

The relevant literature (e.g., Gausemeier et al., 1996) recommends the derivation of Delphi projections from several sources.

FIG. 6.2
PROCESS OF THE DELPHI STUDY
(BASED ON VON DER GRACHT & DARKOW, 2010)



Our process for this study was as follows: Future drivers of ski sports were identified through input from experts and via desk research of largely internet-based sources. To structure the insights, all drivers were assigned to one of the three overarching themes: (i) technology and digitization, (ii) sports and climate, and (iii) inclusiveness in ski sports. For every theme, 3-6 projections were formulated that best condensed the respective drivers. This process ensured a broad spectrum of projections and concentration on key developments to minimize participant dropout rates (Nowack et al., 2011; Hung et al., 2008). The time horizon of the study, by 2025, was based on relevant comparable Delphi studies that allow a foreseeable time period (von der Gracht & Darkow, 2010). A five-year projection is not seen as 'looking too far into the future', which fosters expert discussion on changes that seem realistic in the near to mid-term.

SELECTION OF EXPERTS

By definition, Delphi panels are not statistically representative; therefore, an improper expert selection is one of the most serious validity threats to Delphi studies (Creswell, 2003). In our study, the expert selection was conducted in a multi-stage process similar to Okoli and Pawlowski (2004). First, categories were defined to ensure a balance between the expert groups: (i) sports (tech) executives, (ii) athletes and ski sports officials, (iii) media representatives and academics, and (iv) resort managers (see Fig. 6.3). Balanc-

ing of Delphi panels is recommended because different views from different expert groups enhance the validity of Delphi studies (Yaniv, 2011). Next, we identified potential experts for each category. The resultant list of 248 candidates was shortened to 162 experts based on several criteria (e.g. years of experience, age, mix of backgrounds). The 162 candidates received a written invitation including a personalized link to our online Delphi portal. Finally, 46 experts from 41 organizations (see Fig. 6.4) participated in our Delphi survey. This equals a remarkable participation rate of 28.4%. Thus, the panel size was in line with comparable Delphi studies (Merkel et al., 2016).

EXECUTION OF THE SURVEY AND ANALYSIS OF RESULTS

The Delphi survey was conducted over a three-week period and was administered via the internet using "Surveylet" by Calibrium (<http://calibrium.com/>), an online survey tool specifically designed to facilitate the Delphi research method. We analyzed the 1,794 quantitative evaluations provided by our 46 experts for 13 projections on three dimensions. The projections were then clustered into five scenarios based on their content-related proximity. Additionally, 429 written arguments were analyzed. While the future projections have a mean probability of occurrence between 23% and 77%, the impact of 10 of the 13 projections is rated as medium or high (i.e., at least a score of 2.5 on a 5-point Likert scale). This underscores their relevance and confirms the accuracy of the prefor-

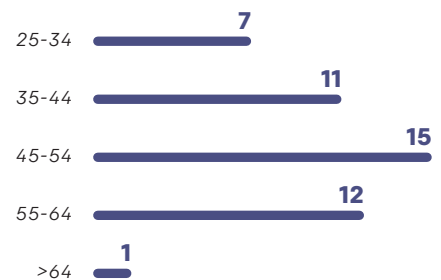
mulation process. Only six projections display a coefficient of variance of more than 0.5, which denotes consensus according to the relevant literature (von der Gracht & Darkow, 2010). As intended, the balance of our expert panel apparently triggered controversial discussion.

FIG. 6.4
DEMOGRAPHICS OVERVIEW N=46

COUNTRY OF ORIGIN OF EXPERTS



AGE



GENDER



BACKGROUND

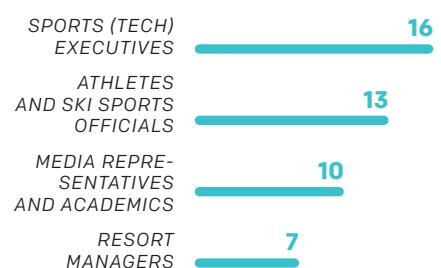


FIG. 6.3
WITH 46 EXPERTS THE DELPHI-STUDY HAS A SOLID OPINION BASE – ORIGIN, AGE AND BACKGROUND ARE WELL DISTRIBUTED – GENDER WITH HIGH PROPORTION OF MEN, REPRESENTING INDUSTRY AVERAGE



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