Golf Genius
SOFTWARE

The World Handicap System

Unification, Harmonization, Simplification

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1.0 Introduction

Golf is one of the few sports or games where participants of widely different skill levels can compete with each other and both the accomplished player and the less gifted player can have a very enjoyable time and a satisfying competition.

It's not unusual for a golf match to be decided by the final putt on the last hole. Why? Because golf handicaps serve to "level the playing field" among players of varying skill levels. With handicapping, a dominant player faces the genuine possibility of losing to a golfer who rarely breaks 100 because the 100-scorer might be allocated, or "given", 28 strokes. The talented golfer carrying a zero handicap must overcome his fellow competitor's 28 stroke advantage to prevail. Most golfers would agree that a fair system of assigning handicaps results in more excitement and enjoyment on the course.

> Every handicapping system uses some method of analyzing past scores to estimate a player's ability, which is expressed as a handicap. In most sports, such as tennis or football, there is no way to "equalize" the players. Today, not all of the 50 million golfers around the world have an official handicap but a significant number do. Almost all golfers who compete at golf clubs have a handicap in order to participate in club events.

Determining how to evenly match golfers is a daunting challenge. Should our high handicapper really be allocated a 28 stroke advantage? Why not 27 strokes or 29? It's clear the outcome of a competition could depend on the "fairness" of a precise number. Achieving fairness is what underpins the methodology of modern handicapping systems.

Solving the complex problem of determining fair golf handicaps involves forecasting, or making predictions about the future based on past and current trends. Forecasting is both science and art. The science dimension is part of the management science field and has been well developed over the past several decades. Consider this simple example:

In London it rained for 100 straight days, followed by four beautiful sunny days. Your challenge is to forecast, or predict, tomorrow's weather.

- It almost always rains in London, so it will probably rain tomorrow. John predicts rain.

- We get some good weather in London, and, it usually lasts about a week. Mary predicts sunny.

Mary is much more influenced by the most recent "observations" than is John. Expressed a bit more scientifically, in predicting the future, how much does one consider newer observations and discount older observations? There is no right answer. In this example, it's clear Mary discounts the past more than John does. But we can't be certain she has accurately predicted tomorrow's weather.

Golf handicapping systems have evolved over the years, and today there are six handicapping systems managed by six National Associations. They all function well but are oftentimes incompatible. For example, when a golfer from England with a CONGU handicap (Council of National Golf Unions, the system used in the U.K. countries and a number of others) visits the U.S. to compete at a U.S. golf club, there is no satisfactory way to translate his or her CONGU handicap to a USGA course handicap at a specific course. The USGA handicapping system and CONGU are both excellent systems, but they are fundamentally incompatible. While it is quite easy to translate kilograms to pounds, it is not really possible to translate a CONGU handicap to a USGA course handicap.

> To address the problems of incompatibility and inconsistency, in 2015 the USGA and The R&A set out to harmonize the various handicapping systems used around the world. Their ambitious goal was to develop a single system that would bring together the best of the various methods.
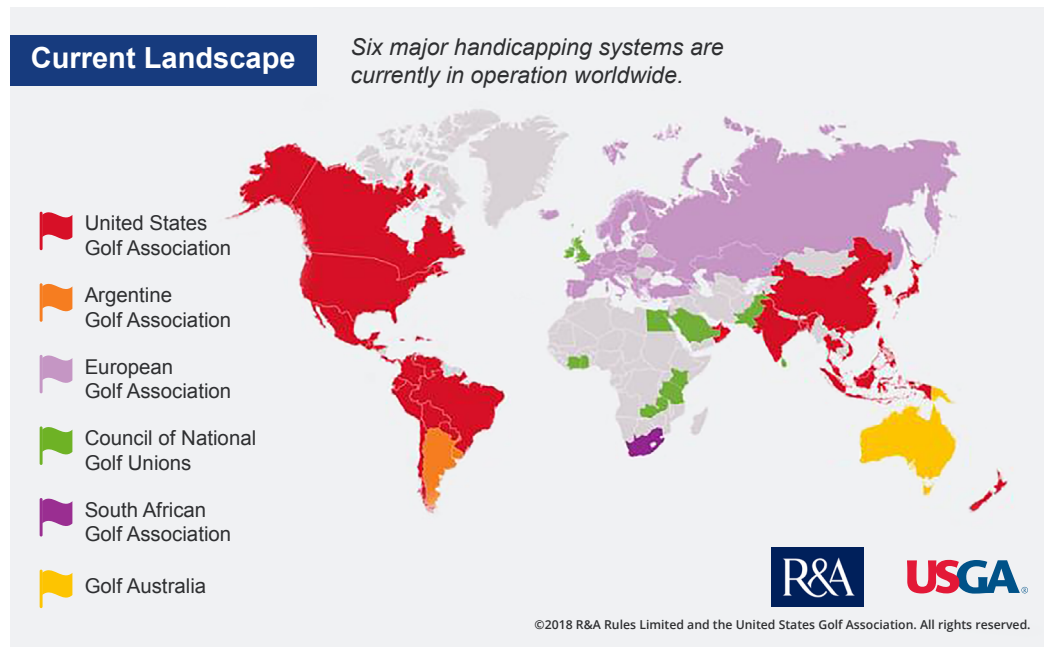
Since the USGA and the The R&A are together responsible for governing the Rules of Golf, it is fitting for these organizations to take on the formidable task of bringing together six handicapping systems to develop a single system acceptable to all jurisdictions. The result of this multi-year effort is the World Handicap System (WHS), scheduled to be adopted by National Associations beginning in 2020. Not only does WHS unify the handicapping systems in use today, it also simplifies golf handicapping. In many important ways, WHS abides by the famous quote attributed to Albert Einstein: "Everything should be made as simple as possible, but not simpler". **In the case of WHS, the simplification is as much an accomplishment as the unification.**

The purpose of this paper is to provide a perspective from a golf industry supplier on the history of golf handicapping, including the development of WHS, the implications for National Associations charged with administering WHS, and the golfers who will ultimately benefit from WHS.

Golf Genius Software (GGS) is a worldwide supplier of tournament management software, handicapping systems and other software tools to the golf industry. These solutions help golf professionals be more efficient while delivering an exceptional golf experience to their members and visitors. Over the past decade, the Golf Genius Tournament Management System has supported most of the major handicapping systems used around the world. GGS brings a worldwide perspective to understanding WHS and assisting National Associations in implementing the technology needed to support WHS. In our view, WHS brings together the best features of the various handicapping systems used today. Golf is a game played around the world, and one of the joyful parts of the golf experience is meeting and competing with golfers from other countries. There is strong camaraderie among golfers wherever they play, and a unified handicapping system will have a very positive impact on the game of golf.

2.0 Handicapping Around the World Today

At the present time, there are six handicapping systems in use.

Current Landscape

Six major handicapping systems are currently in operation worldwide.

- United States Golf Association
- Argentine Golf Association
- European Golf Association
- Council of National Golf Unions
- South African Golf Association
- Golf Australia

R&A   USGA

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These are depicted in the graphic above (courtesy of The R&A and USGA). The systems used by the United States Golf Association (USGA) and the U.K. based Council of National Golf Unions (CONGU) are the basis, in various combinations, for the other four systems (Argentine Golf Association, European Golf Association, Golf Australia, and the South African Golf Association).

3.0 A Brief History of Golf Handicapping

The USGA introduced the course rating system almost 40 years ago, along with a handicapping method based on the USGA course rating system. Fundamental to the course rating system is the idea that every tee on a golf course has a course rating and a slope rating.

Course Rating vs. Slope Rating

▸ **Course rating** is the score one would expect from a scratch golfer — a golfer who normally plays to par.

▸ **Slope rating** is an adjustment for the "bogey golfer", someone who bogeys (scores par plus one stroke) on most holes.

To understand why slope rating is important, consider two golf holes, both 380 yards long to a well-bunkered green. One hole is a straight 380 yards, but the other hole has a severe dogleg at 240 yards. For a scratch golfer, the playing strategy is similar in both scenarios: drive the ball 250 yards, make a 130-yard approach shot to the green and two-putt. But most recreational golfers cannot drive the ball 240 yards, so for them these two holes play very differently. It's unlikely that most bogey golfers would score par on a hole demanding a 240 yard drive that would leave them in position to reach the green in two shots. Integrating the concept of a course rating to measure the difficulty of a hole for a very good golfer, together with a slope rating that adjusts for the less accomplished golfer, was a major innovation and has clearly enabled golfers of different skill levels to compete on a fair basis.

The USGA course rating system is licensed to many National Associations and has been adopted by the WHS board. The decision to license the intellectual property for the course rating system was made in order that this method be incorporated by all National Associations as a foundational element of the World Handicap System.

The USGA also developed a handicapping methodology that builds on the course rating system. Every handicapping system must estimate a player's ability based on scoring history. As we illustrated with our London weather forecast example, the difficult challenge is to predict the future based on the past. The USGA system considers only the last twenty scores for a player. How a player scored before the recording of the most recently posted twenty scores has no bearing whatsoever on a player's handicap index (with some exception made for tournament scores). Each score is converted to a "differential" compared to a scratch (or zero handicap) golfer by adjusting for both the course rating and slope rating of the tee played. The highest ten differentials are discarded, and the remaining ten are averaged. That average is then multiplied by 0.96. (The actual calculation is a bit more complicated, but this explanation captures the essence of the process.) Note that an index is not representative of a player's average play, but rather it represents his or her best rounds — something like the fourth or fifth best score out of twenty. This number is often referred to as an

"aspirational" handicap index. A player should play to his or her handicap about twenty to twenty-five percent of the time. Handicap indexes are calculated and published according to a "revision cycle", which is typically twice per month in the U.S.

A key aspect of a USGA handicap index is "transportability" to any golf course that uses the USGA course rating system. A player's USGA handicap index can be converted to a course handicap at any course/tee by adjusting the index by the slope rating for a particular tee. A player with a handicap index of 10.4 might have a course handicap of 12 on a difficult course/tee and a course handicap of 9 on an easier course/tee.

> This means that player A at club A and player B at club B can play a fair competition at club C because each player's index, even if it consisted only of scores from their home club, can be translated into a course handicap at club C. There is no doubt that the course rating system developed by the USGA was a very key advance in making the "art" of handicapping more of a "science".

One shortcoming of the USGA system is that there is no formal adjustment for unusual playing conditions such as strong winds or rain. Courses are rated for their most prevalent conditions, but may play "harder" or "easier" in unusual conditions. However, if a course is playing harder than is typical, it's likely that a player's differential for that round would not be in the top ten differentials and would therefore be discarded. Moreover, the USGA system employs a method known as "equitable stroke control", or ESC. ESC "caps" the maximum score a player can record on a hole as a function of the player's course handicap—typically one, two or three strokes above par.

Any handicapping system is predicated on the integrity of players posting their scores and doing so accurately for every round of golf they play during the active season. Some golfers are known colloquially as "sandbaggers" because they post only their high scores to maintain a high handicap for competitions. Other golfers have "vanity handicaps" because they're inclined to post only their low scores. The sandbagger problem is dealt with to some extent in the USGA system by performing a separate calculation if there are two or more tournament denoted scores that have a differential three or more strokes better than the player's handicap index. This calculation will then reduce the player's index as per the USGA Handicap Manual. In the USGA system, all scores are to be posted, and those recorded in a formal competition are denoted as tournament scores. If a golfer tends to have lower scores in competitions, the alternate calculation works to reduce the index toward the tournament results.

The USGA handicapping system has "no long-term memory". It considers only the player's most recent twenty scores, and is derived from the USGA course rating system, a precise methodology for determining the difficulty of a course/tee for both the scratch golfer and the higher handicap golfer.

3.1 The CONGU System

The current CONGU system was adopted in 2003 (and in 2004 by the Ladies Golf Union) but its roots go back to the Royal and Ancient's initial handicapping efforts in 1924.

The last edition of the CONGU specification is 123 pages long and deals with numerous unusual conditions. It is fundamentally different than the USGA system in a number of important ways:

- There is no notion of basing a handicap on the past twenty scores or any number of scores. CONGU is a smoothing system whereby a handicap is a function of a player's current handicap and a newly recorded score. The CONGU "buffer zone" model determines the extent to which the new score influences a player's handicap. A new handicap is calculated after every "competition round". A standard report posted on the bulletin board of a U.K. club will show exactly this — previous handicap, today's score, new handicap.

- CONGU adjusts handicaps after every competition round by using buffer zones and is based on the concept that the higher a player's handicap, the wider the dispersion of "normal" scores we would expect from that player. Conversely, the lower the handicap, the higher the skill level, and the more consistent the record of expected scores. If a player records a score above her buffer zone, her handicap will increase slightly; a score below the buffer zone will cause a handicap reduction. Handicaps can go down quickly but move up slowly, as indicated in the following CONGU table for buffer zones:

Handicap Category	Exact Handicap	If Nett Differential is		
		Within Buffer Zone	Above Buffer Zone	Below Buffer Zone
		No change	Add	Subtract for each stroke below
1	Plus to 5.4	0 to +1	0.1	0.1
2	5.5 to 12.4	0 to +2	0.1	0.2
3	12.5 to 20.4	0 to +3	0.1	0.3
4	20.5 to 28.0 [20.5 to 28.4]	0 to +4	0.1	0.4
[5]	[28.5 to 36.0]	[0 to +5]	[0.1]	[0.5]
Club Handicap	28.1 to 54.0 [36.1 to 54.0]	0 to +5	0.1	0.5 for each of the first 6 strokes below and 1.0 for each additional stroke below

- Consider Handicap Category 3 for players with exact handicaps of 12.5 to 20.4 (an exact handicap is a handicap to one decimal place and is stored that way). If a player with an exact handicap of 15.0 scores up to three strokes over his handicap (net differential of 18.0 to be precise), no adjustment is made to his handicap. However, if he scores just one stroke below his handicap, his handicap is reduced by .3 strokes. If he scores four shots over his handicap, his handicap is increased by just .1 stroke. **"Down quickly, up slowly" is an important concept in all handicapping systems.**

> Herein lies the essential difference between the CONGU and USGA systems. What happens when a CONGU player with an exact handicap of 15.0 posts scores with a differential of 18 for the next twenty rounds? Because each round is in the player's buffer zone, the handicap will remain at 15.0. But in the USGA system, the handicap index would begin to move up, at the latest after the eleventh round posted, and after twenty rounds, the handicap index would increase from 15.0 to 17.2. CONGU handicaps are much "stickier" than USGA handicaps, reminding us that forecasting is both an art and a science.

- CONGU has no concept of slope rating to deal with bogey golfers.

- CONGU has a concept of competition rounds that are used for handicap calculations. A club identifies specific events as handicap qualifying events. "Recreational" rounds do not enter into handicap calculations, whereas golfers using the USGA system are required to post all rounds played in a course's defined posting season—unless the player was playing alone. The USGA was roundly criticized when "playing alone scores" were no longer deemed acceptable for posting. In fact, this has long been common practice in other handicapping systems and is an element of the international harmonization process for WHS.

- CONGU provides for unusual conditions adjustments, as do some handicapping systems other than the USGA system. CONGU uses a statistical method to determine if a set of scores played on a particular day at a course/tee are unusually high or low compared to what one would expect. If that is the case, a Competition Scratch Score (CSS) is determined by adjusting the Standard Scratch Score (SSS), which is generally equivalent to a USGA course rating. In essence, the course rating (SSS) is adjusted up or down a few strokes to adjust for unusual playing conditions such as high winds.

- CONGU has a concept of an Exceptional Score Reduction (ESR) to reduce a handicap if a sequence of two or more unusually low scores (relative to the player's handicap) are recorded in a calendar year.

- In the U.K., handicapping calculations are made at the club level, and handicaps are then communicated to the Central Database of Handicaps (CDH) in each country. This is feasible in the CONGU system because a new handicap is simply calculated from a current handicap and the latest score. With WHS, it is likely that each National Association will be responsible for operating a handicap calculation service accessible by golfers and clubs.

3.2 The European Golf Association (EGA)

EGA is an interesting blend of the USGA system and CONGU. It incorporates both the USGA course rating system and the CONGU method of calculating handicaps based on buffer zones. It provides for unusual conditions adjustment with a "computed buffer adjustment" (CBA), but does not provide for exceptional score reductions.

3.3 Golf Australia

Golf Australia (GA) uses most of the concepts of the USGA system, but instead of using the average of the ten best of twenty scores (differentials, to be precise) multiplied by .96, GA uses the average of the best eight of twenty differentials, multiplied by .93. Hence, the GA systems is even more "aspirational" than the USGA system. The GA system, like EGA, has an unusual conditions adjustment called DSR (daily scratch rating), but does not have automated exceptional score reduction (although there is a manual process for dealing with exceptional scores).

3.4 South Africa

GolfRSA handicapping is based on the USGA course rating system and uses the USGA method of best ten of twenty differentials multiplied by .96. It deals with two or more exceptional scores in the past twenty scores but does not have any form of unusual conditions adjustment.

3.5 Argentina

The handicapping system in Argentina uses the USGA course rating but no slope rating. A player's handicap index is based on the average of the best eight rounds of the most recent sixteen rounds. There is no adjustment for unusual conditions or exceptional scores.

The six systems are summarized in a table in Appendix A, courtesy of the The R&A and the USGA.

4.0 Bringing it All Together

In 2018, the USGA and The R&A announced the World Handicap System with a rollout set for 2020. The singular achievement of WHS is that it will unify the six distinctly different handicapping systems.

> WHS is not a compromise solution, but a harmonization of the six systems, bringing together the essential strengths of each. Very importantly, WHS will also simplify the entire system. In our view, this simplification is as important as the harmonization.

When examining any of the today's existing systems, one has to be impressed by the level of refinement and treatment of detail that has evolved over time. How do you handle 9-hole courses, incomplete rounds (only fourteen holes played, for example), scores not "returned", preferred lies, adjustments when playing from different tees, which rounds factor into a handicap calculation, etc.?

Even considering all these fine points, what really distinguishes the systems are four major factors:

1. **Are handicaps adjusted based on some function of the past twenty scores (USGA), or is a smoothing function used with buffer zones (CONGU)?**

2. **Is there a capability to deal with adjustments for atypical weather or other unusual playing conditions?**

3. **Are exceptionally low scores, compared to a player's handicap, used to quickly reduce a player's handicap?**

4. **Is there a method to constrain a handicap from rising too rapidly over some prescribed timeframe?**

Without question, the most fundamental difference is the USGA approach of calculating an index based on the most recent twenty scores versus the CONGU system reliance on buffer zones to adjust handicaps by employing a methodology such that handicaps go down quickly but move up slowly.

Calculating a WHS Handicap Index

> Elegance is often defined as a "simple solution to a complex problem". By that definition, WHS is inarguably elegant. A great deal of credit goes to the system designers, who understood the refrain: "resist making perfect the enemy of good."

Once all National Associations implement WHS, there will be one uniform way to calculate a player's handicap index everywhere golf is played. The index can then be used to calculate a player's course handicap and playing handicap for all courses with a course rating and slope rating based on the course/tee being played and the type of competition.

The process of calculating a WHS handicap is straightforward and summarized below:

- A **handicap index** is calculated based on a simple average of the best eight of the most recent twenty differentials based on "adjusted gross scores". There are no longer "magic numbers" like .96 in the U.S. or .93 in Australia. The buffer zones from CONGU are no longer used.

- An **adjusted gross score** is determined by limiting the maximum score on a hole to net par plus two strokes ("net double bogey"). This scoring limit is familiar to golfers playing a Stableford format and now applies to all forms of play. If a player is allocated one stroke on a par 5 hole, the maximum hole score is 5+1+2=8.

- **"Recreational rounds of play"** can be considered for handicapping purposes at the discretion of the National Association. This would represent a change for the U.K. countries if recreational rounds are adopted there.

- An **initial handicap index** can now be calculated after scores for just 54 holes of play are posted, including any combination of 18-hole and 9-hole rounds. Until a player has a "fully developed" handicap based on twenty 18-hole equivalents, WHS specifies the number of best scores (differentials) to be averaged, ranging from one to eventually eight after twenty rounds are posted.

- **Handicap indexes** are revised after every score posted, which is a significant change for golfers using the USGA system and today accustomed to a twice monthly revision cycle. These golfers will be encouraged to post scores immediately after each round (on the same day), but the system will still allow for posting scores for rounds played on dates in the past.

- A **"playing conditions calculation" (PCC)** is performed daily for each course (but not each tee on the course) if there are submitted scores for eight or more complete 9 or 18-hole rounds from players with a handicap index of 36 or less. Like CONGU CSS, the DSR in Australia and

CBA in the European system, the PCC is a statistical calculation used to determine if a significant number of players returned scores that were unusually high or unusually low compared to their expected scores. If so, PCC will adjust each player's differential for that day. The adjustment is limited both in increasing or decreasing the differential; the adjustment when a course is playing unusually hard can be to reduce the differential 1, 2 or 3 stokes, and the adjustment when a course is playing usually easy can be to increase the differential 1 or 2 strokes. The PCC should be performed at midnight in each time zone, and handicap calculations for prior day postings will be performed immediately after the PCC calculation is complete. Scores posted for a date in the past do not affect the PCC value for that date but do use the recorded PCC to compute the player's differential for that date.

- **Exceptionally low scores** are defined as differentials that are seven or more strokes below a player's handicap index. In these cases, the handicap index will immediately be reduced by one or two strokes. This reduction can occur repeatedly if more exceptionally low scores are posted relative to the new handicap index.

- **Unusually high scores** are handled by reference to a twelve-month low handicap index that is maintained for every player. If a newly calculated handicap index is significantly more than the twelve-month low index, the increase in the index will be "suppressed", such that indexes cannot increase by more than 5 strokes over a twelve-month period.

Considering the points above, **it is clear that WHS is both a simplification and a harmonization of existing handicapping systems**. The course rating system with course rating and slope rating is retained from the USGA system. Daily revisions, typical of non-USGA systems, are now embraced. Unusual playing conditions adjustments are adopted from CONGU, EGA and GA. Handling of exceptionally low scores is adopted from CONGU and South Africa. Limiting the impact of high scores existed in some form in most systems other than USGA and is now included here. Note that in many cases where a handicapping method has been adopted by WHS, it has also been simplified.

5.1 Calculating Course and Playing Handicap

> What makes the handicap system really valuable is that a handicap index is "portable". A handicap index is based on a player's prior twenty rounds, then translated into a course handicap for the course and tee being played, finally resulting in a playing handicap. The course handicap is a function of the course rating and slope rating for the course/tee being played (and possibly par), and the playing handicap is a function of the type of competition being played.

The basic methodology calls for first calculating a course handicap by multiplying the handicap index by slope rating and then dividing by 113. This is a new approach for handicapping systems that previously did not use a USGA slope rating. The next step, and it is optional at the National Association level, is to adjust for the difference between course rating and par for the tee being played. This course handicap is next multiplied by the handicap allowance (e.g., 90% in a fourball competition) and then rounded to a cardinal number that is the "playing handicap". If players are competing from different tees with different pars, a further adjustment is made as detailed below.

One welcome change for golfers using the USGA system is that the process of rounding handicaps is now much simpler. In the current USGA system, rounding is performed at every step in the process. Now rounding is done only once as the very last step.

An area where WHS both innovates and accommodates the differing needs of National Associations deals with the difference between course rating and par. This is best understood with a simple example. Consider a course with red tees (5,400 yards), white tees (6,200 yards) and blue tees (6,600 yards). For men, par is 72 for all three tees, but the course rating is 69.8 for the red tee, 72.1 for the white tee, and 73.6 for the blue tee. The slope rating is 128, 134 and 140, for the red, white and blue tees, respectively. Now consider a stroke play event among scratch golfers (handicap index equals zero), using a player vs. the field format with men playing off of different tees. Admittedly, this example is a bit contrived (scratch golfers would rarely play from the forward tee), but it eliminates dealing with adjustments for slope rating.

Because this event is composed of only scratch golfers, the course slope rating is not relevant, and therefore course handicap equals the handicap indexes, which are all zero. This competition clearly places the golfers playing off the blue tee at a serious disadvantage relative to the players on the white or red tees. Generally, we would predict a scratch golfer on the red tee to score 69 to 70 and the scratch golfer on the blue tee to post a score of 73 or 74. To rectify this anomaly, WHS allows National Associations the option to add a "course rating minus par" adjustment to the course handicap. Players on the red tee will now have a course handicap of $0 - (69.8 - 72) = -2.2$, which rounds to -2. Players on the white tee will have a course handicap of 0.1, which rounds to zero, and players on the blue tee will have a course handicap of 1.6, which rounds to 2. Players on the blue tee will now be determined to have a four-stroke advantage over players on the red tee, which makes perfect sense since the difference in course ratings is 3.8 strokes.

What if par is different for different tees? Let's take the case in the above example where par is 73 from the blue tee. Repeating the calculation, the players on the blue tees will now have a course handicap of 0 − (73.6 − 73) = 0.6 instead of the 1.6. To deal with this scenario, WHS specifies a further adjustment: players on a tee with a higher par get additional strokes equal to the difference in par for those tees. So, players on blue tees get an additional 1 stroke, thereby raising their course handicaps to 1.6, which rounds to 2. This final adjustment is not used for Stableford or par/bogey play because the difference in par is handled hole-by-hole; in Stableford play a 4 on a par 4 hole is two points and a 5 on a par 5 hole is still two points.

For National Associations that elect not to use course rating minus par, then the final step for competitions with players on different tees is to adjust for differences in course rating instead of differences in par. This treatment is equivalent to the much-misunderstood Section 3-5 in the USGA handicapping system. However, under the current USGA system, the course handicap would be rounded to an integer, then the difference in course rating would be added, then the final playing handicap would be rounded again. The WHS approach of rounding only once as a final step is more accurate.

6.0 WHS: The Path Forward

> WHS is currently in the final stages of refinement. The next step will be implementation by National Associations and their software suppliers. The "golf specification" of WHS must be translated into an "IT specification" by software firms that plan to implement WHS on behalf of the National Associations.

While WHS will be ready for 2020 implementation, National Associations are under no obligation to meet that timeframe or any timeframe. The USGA has publicly committed to adoption and implementation on January 1, 2020, and Golf Australia has stated that they will convert to WHS in early 2020. The National Unions of the U.K. are likely to implement WHS sometime in 2020. The Kenya Golf Union recently issued a request for a proposal (RFP) from a local software firm to provide a WHS system.

How will National Associations implement WHS? There are two paths forward and possibly a third. First, an Association can contract with a local software development firm to build a custom implementation of WHS. More likely, Associations will work with software firms that have committed to building and maintaining WHS implementations. Golf Genius Software is one such firm, as is MSL in Australia. There will likely be a few more software suppliers who seek to serve multiple

Associations with one common solution, perhaps by offering internationalization and language localization. Just as there are a number of tournament management products (the Golf Genius Tournament Management System is used today in over 40 countries), there may possibly be a number of WHS providers. Lastly, as a third option, some of the larger Associations might offer to partner with smaller Associations and provide WHS services on their behalf. Because virtually all modern software runs "in the cloud" it would be technologically straightforward for one Association to provide services to other Associations. While no Associations have yet announced any such plans, this path remains a possibility in order to provide for rapid, cost-effective implementations of WHS.

6.1 The Important Role of Standards

Standards make the world and our economy work—from things as simple as light bulbs fitting into sockets to global banks that routinely move trillions of dollars by adhering to common wire transfer standards. And no technology has impacted our lives more in the past fifty years than the internet, which at its core is nothing more than a set of standards by which computers talk to each other to view web pages, send and receive emails and communicate with millions of other applications—such as banking, shopping or golf handicapping services.

Technology standards provide for interoperability among different supplier's systems, which allows firms to specialize: I build processors, you build display screens, someone builds aluminum casings. Apple integrates these components (and obviously many more) into the wildly popular iPhone. Based on a supplier's comparative advantage, the process of specialization minimizes costs and raises quality at every step in the supply chain. The consumer is the ultimate beneficiary. Without standards that enable specialization, cell phones would cost thousands of dollars instead of hundreds of dollars.

WHS will not "just happen". Associations and software firms will need to make significant investments to make WHS one unified and interconnected handicapping system. The ultimate success of WHS will be a function of the total investment required by all National Associations implementing the specification. For this reason, the WHS Board would be well advised to act proactively to minimize total investment by encouraging standard interfaces.

A simple example makes the case for standards as a means to minimize overall cost and insure quality. Let's assume that by 2025, WHS has been adopted by virtually all Associations. The Associations have, in turn, relied on software suppliers for WHS-compliant handicapping calculation software.

Consider two scenarios and the simple case of a golfer or golf professional accessing the WHS system at a National Association to retrieve handicap indexes or post scores.

SCENARIO ONE

A tournament management system is used in different countries but the protocols/rules to post scores in each of these countries is different because there is no common approach (a standard) to implement the function "post scores" in WHS systems. Each system "speaks a different language". Costs rise exponentially with the number of countries served because each software system must implement the interfaces of each country's software. Ultimately, these costs are passed on to the Associations and to golfers.

> Golf Genius Software is committed to working with the WHS Board and other software suppliers to minimize costs and maximize the success of WHS implementations for all parties.

SCENARIO TWO

The WHS board successfully convinces WHS software suppliers to work together to develop and implement a standardized way to retrieve handicaps, or the suppliers themselves decide that it is in their own best interest to work together on key standards. Golfers and golf professionals will be accessing different WHS systems (e.g., a golf professional in the U.S. routinely accesses the USGA system to retrieve handicap indexes for members, but needs to retrieve handicaps for guests from England, Scotland and Australia) but all implementations "speak the same language" (rely on a standard) to retrieve handicaps. One investment in software to retrieve handicaps works in every country. Costs do not rise at all as additional countries adopt WHS. Lower costs for software suppliers translate to lower costs for Associations and golfers. Standards prevail, and everyone wins. Almost every industry works this way, so why not the golf industry?

Examples of cases where standards will be very useful include:

- Post a score, knowing the unique ID of a golfer in a country.
- Retrieve a handicap index for a golfer, given country and unique golfer ID.
- Search a WHS database by name to find a golfer's unique ID and index.
- Lookup the PCC for a particular course on a specific date.

6.2 **Defining Success**

WHS will be successful to the extent that it is implemented by some or all National Associations. We think the benefits are compelling, and that adoption is virtually assured.

We further believe that an even higher measure of success would be a significant increase in the number of golfers who have an official handicap index. Unfortunately, only about 10 million of the 50 million golfers around the world have an official index. What accounts for this surprisingly low percentage? Most National Associations require that a golfer be a member of a golf club to acquire an official handicap index. This is partly to facilitate "peer review" but also because clubs naturally want to attract new golfers and offering a handicapping service that provides a golf enthusiast with a handicap may be a motivator to join a club. In the U.S., roughly 2.3 million golfers out of 24 million have a USGA handicap index, and about that same number of golfers belong to the approximately 3,500 private clubs in the U.S. The other 22 million U.S. golfers play at the 11,500 public access and resort golf facilities. In the U.S., handicap indexes are calculated by the USGA but administered by state and regional golf associations, now referred to as Allied Golf Associations, or AGAs. Some AGAs have implemented strategies to attract public golfers, but as the numbers illustrate there is long way to go.

> We further believe that an even higher measure of success would be a significant increase in the number of golfers who have an official handicap index.

Many National Associations are trying to tackle this challenge by making it easy for "independent" or "nomadic" golfers to maintain an official handicap index. Golf Canada and Golf Australia are two examples. The implementation of WHS can and should be a rallying cry to make official handicaps much more ubiquitous. Just as the USGA set a challenge for improved player satisfaction and reduced resource usage by 2025, wouldn't a goal of 20 million golfers with official handicaps by 2025 be a worthy challenge? It would certainly validate the development of WHS and the industry's investment to implement WHS.

7.0 Summary

WHS is a major step forward in unifying and simplifying handicapping for golfers. Along with the simplified Rules of Golf introduced by The R&A and the USGA in 2019, golf will be more accessible, easier to understand and benefit from improved pace of play.

Handicapping is essential to the game of golf because it "levels the playing field" among players of varying skill levels. This enables fair competition, whether in a casual weekend match or highly organized multi-day "net" golf tournaments involving hundreds of players.

> The USGA system, CONGU and others offering handicapping services have facilitated and supported this notion of fairness within their jurisdictions for many years. With the implementation of WHS, the playing field will be leveled for all golfers regardless of where they play the game. Most importantly, golfers from different countries will compete with each other on a level playing field.

Reaching agreement on a single worldwide handicapping system was undoubtedly an arduous undertaking involving The R&A, the USGA, the Argentine Golf Association, the European Golf Association, the Council of National Golf Unions, Golf Australia and the South African Golf Association. The Japan Golf Association and Golf Canada also helped shape the new system. Together, they deserve a great deal of credit for what they have accomplished. Their achievement is truly "for the good of the game".

Appendix A — Summary of Handicapping Systems

	USGA Handicap System	EGA Handicap System	CONGU Unified Handicap System	South African Handicap System	Golf Australia Handicap System	Argentina Handicap System
Course Rating/ Slope Rating	USGA Course Rating USGA Slope Rating	USGA Course Rating USGA Slope Rating	Standard Scratch Score (Based on USGA Course Rating System)	Standard Course Rating Only	Daily Scratch Rating (which modifies the USGA Scratch Rating) & Slope Rating	Course Rating only based on length and obstacles (No Slope Rating)
Basis of handicap calculation	Based on the average of 10 best of the last 20 rounds	Initial EGA handicap is calculated, then each subsequent net score outside Buffer Zone increases or decreases EGA Handicap	Initial exact handicap is calculated, then each subsequent net score outside Buffer Zone increases or decreases (Exact) Handicap	Based on the average of 10 best of the last 20 rounds	Based on the average of 8 best of the last 20 rounds	Based on the average of 8 best of the last 16 rounds
Frequency of handicap revision	1st and 15th of each month within the U.S. Outside the U.S., between every two weeks and once a month (exception is Canada)	As soon as practicable after each score posted	As soon as practicable after each score posted	Calculated daily (overnight)	Immediately upon the score being processed through GOLF Link	Every month
Calculation of Course/Playing/ Daily Handicap	Handicap Index x (Slope Rating) / 113	EGA Handicap x (Slope Rating / 113) + (Course Rating - PAR)	(Exact) Handicap rounded to nearest whole number		GA Handicap x Slope Rating / 113	Exact Handicap
Score acceptable for posting in a player's scoring record	Scores from all formats, assuming own ball played throughout the round and played under the Rules of Golf. Nine-hole scores acceptable for players with both nine-hole handicaps and 18-hole handicaps (combined with other nine-hole scores)	Scores from Stroke Play, Par/Bogey and Stableford competitions. Round must be played under Handicap Conditions (which include the Rules of Golf). National option to accept (for category 2-6 players): • pre-registered Extra Day Scores (on rounds other than in a competition) and, • nine-hole scores (18 Stableford points added, different buffer used)	Scores from Stroke Play, Par/Bogey or Stableford competitions only. Must be played under the Rules of Golf. NIne-hole scores accepted for all players (with 18 Stableford points added for players in or better than buffer zone; points doubled if worse than buffer zone)	All scores under the Rules of Golf, except match play. Nine-hole scores acceptable, but recorded as 18-hole scores using par for un-played 9, plus 50% of players' handicap (rounded down)	Scores established in all 18-hole singles Stroke Play (Including Par and Stableford) competition rounds and, in some circumstances, four-ball competition scores. Committees may also choose to accept 9-hole competition scores and pre-nominated social scores	Only 18-hole Stroke Play scores apply, completed under the Rules of Golf. Nine-hole scores are also acceptable if played consecutively on same course
Maximum Score Per Hole	Equitable Stroke Control (ESC) based on Course Handicap	Net double bogey (Stableford)	Net double bogey (Stableford)	A form of Equitable Stroke Control, based on handicap and strokes received	Net double bogey (except in Par events where it is net bogey)	No Limit (full score hole by hole posted)
Adjustment for Abnormal Playing Conditions	None	Daily adjusted buffer zone (Computed Buffer Adjustment), when applicable	Competition Scratch Score calculated as soon as practicable after the close of competition. Supplementary Scores/9-hole competitions are based on the SSS, with no CSS calculated.	None	Daily Scratch Rating (DSR)	None

Source: USGA, The R&A, England Golf