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2013

Technology Survey

GCSAA

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INTRODUCTION

The intent of this survey and this subsequent publication is to establish baselines, trends and allocations of resources as they relate to golf courses and today's golf course management.

From June 5, 2013 through July 8, 2013, a survey was conducted by McMahon Group, Inc. on behalf of the Golf Course Superintendents Association of America to gather information and to study Technology used in golf course maintenance by superintendents in the United States of America.

Unique survey invitation links were distributed via email to the sample group of class A, and SM (superintendent member) totaling 4,237 members. By default, the unique links could be used only once, preventing ballot box "stuffing" and "spamming". The final response set of completed surveys totaled 761 of the distributed 4,237, a response rate of 18%.

This survey report is divided into the following sections:

Executive Summary – a summary of key survey results

Results – Tables, figures and charts illustrating the results of the survey.

Margin of Error

These response rates are very good, and provide an accurate representation of the entire class A and SM GCSAA membership. Margin of error is a theoretical margin of error, plus or minus in percentage points, 95% of the time, on questions where opinion is evenly split. For "average" values, most results will be within a +/- 3.22% range of error with a 95% level of confidence. That is, chances are 19 out of 20 that if all Class A and SM members completed and returned their surveys, the average would differ from the sample results by no more than +/- 3.22 percentage points. For many questions, the error range will be smaller than this.

Rounding, Total Responses and Cleaning

Due to rounding, percentages for some questions may not total 100%. Not all respondents answered every question in the survey; therefore, the total number of responses to a particular question may be less than the total responses to the survey. All studies, no matter how well designed and implemented, have to deal with errors from various sources and their effects on survey results. McMahon Group examined data for three different kinds of possible errors and eliminated the data from the surveys started. These cleaning parameters are:

1. Lack of data – 10% or fewer answered questions per respondent, removed entire response.
2. Outliers/inconsistencies – Values that are so far beyond the typical that they seem potentially erroneous.
3. Suspect analysis results – Answers to some questions seem counterintuitive or extremely unlikely.

A Sampling of all Respondents

Survey Sample Overview

Sample Size	4,237
Surveys Started	823
Usable Surveys after Cleaning	761
Percent of total sample size	18%
Margin of Error	+/- 3.22%

Types of Golf Course

Municipal	18%
Semi-Private	20%
Private	40%
Daily Fee	23%

Geographic Area of Respondents

Pacific	8%
Southwest	8%
Upper Mountain-West	7%
Transition	17%
Northeast	15%
Southeast	23%
North Central	20%
Outside US	2%

18-Hole Rounds Played

Less than 10,001	4%
10,001-20,000	27%
20,001-30,000	30%
30,001-40,000	20%
40,001-50,000	8%
50,001-60,000	4%
Greater than 60,000	7%

Alone, surveys should never be used to compare golf courses. The information contained in this report is an amalgamation of many types of golf courses. Golf courses differ in many ways, in far more unique characteristics than can be included in these pages. Due to these vast differences, one must judge the merits of maintenance techniques by the satisfaction of the golfer and successes at that particular facility.

EXECUTIVE SUMMARY

It is the intention of this study to measure the use of modern technology among the practitioners of golf course turf management. By documenting this 2013 baseline, it will be interesting to see how much technology has impacted the golf course industry in future years. Additionally, it will be interesting to see how industry will accommodate and develop technologies to aid the superintendent with the ultimate goal of finer playing conditions, while keeping focused on business, ecology, and the fine golf tradition.

In 2009, 82% of superintendents had access to a computer in their office; today that percentage has increased to 97% of superintendents. Cell phones are being used by 98% and smartphones account for 80% of those cell phones.

Executive summary (continued)

In general, the use of technology is more prevalent among younger superintendents and at golf courses with higher green fees/guest fees. As software and hardware become more adapted to easy data collecting, communication and storage, the possibilities for technology meshing with golf management seem limitless.

Portable computing now has the capability to take powerful devices into the field and control and adjust irrigation, track job tasks, record images, view maps and satellite images, recall reference material and communicate to the world from a golf cart on the fifth hole.

Sharing information and photographs via structured forums has also contributed to knowledge sharing retrieval. A problem or success can be posted to a site and instantly shared with thousands, soliciting responses within moments, from across the globe.

With water resources becoming more valuable throughout the world, nearly every facility has some type of microprocessor or computer to aid in the distribution of water to the golf course. Nearly 85% of all golf courses have central irrigation control, meaning a computer program distributes water to the course in the most economical way. These central controls measure user defined parameters and past and current environmental conditions and make adjustments based on these factors. These conditions may include:

Slope	Pipe size
Type(s) of plant	Sprinkler type and model
Wind speed and direction	Sprinkler nozzle size
Precipitation	Soil type
Sun intensity	Pump capacity
Water flow rate	Temperature
Water pressure	Humidity

The above variables and user defined parameters in irrigation and water distribution have been at the leading edge of technology for more than 25 years. Each year, irrigation companies have invested substantial resources in water conservation and computer software technology to make better use of the planet's valuable water supply.

These controls can even report how many gallons will be pumped and what the cost will be before the irrigation cycle begins.

The collection, dissemination and storage of massive amounts of information are currently being used today in the golf course industry. Who would have thought we would have robots mowing greens?

SUPERINTENDENTS AND COMPUTERS

Superintendents with a Computer at Work by Age and Green Fee/Guest Fee								
	Age					Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Percent with Computers	96.5%	95.3%	97.2%	96%	96.1%	92.0%	95.6%	99.8%

Table 1 Superintendents with a computer at work by age and green fee/guest fee

Years Superintendents have been using a Computer at Work by Age					
Years	Overall	Under 35	35 - 44	45 – 54	55 and Older
Less Than 1 Year	0.3%	0.0%	0.0%	0.4%	0.7%
1-2 Years	1.1%	3.9%	0.5%	1.2%	0.0%
3-4 Years	2.1%	4.9%	1.9%	2.0%	0.7%
5-6 Years	6.1%	19.4%	3.3%	5.6%	2.0%
7-8 Years	8.7%	29.1%	5.1%	4.8%	6.7%
9-10 Years	14.7%	20.4%	15.0%	10.9%	16.0%
11–12 Years	10.9%	13.6%	15.9%	6.0%	10.0%
13-14 Years	11.8%	7.8%	20.1%	10.1%	6.0%
15-16 Years	14.8%	1.0%	22.4%	14.9%	13.3%
17-18 Years	8.6%	0.0%	6.5%	15.3%	5.3%
19-20 Years	10.4%	0.0%	7.5%	14.5%	14.7%
21-22 Years	3.5%	0.0%	1.9%	4.4%	6.7%
23-24 Years	3.3%	0.0%	0.0%	5.2%	7.3%
Greater Than 24 Years	3.7%	0.0%	0.0%	4.4%	10.7%

Table 2 Years superintendents have been using a computer at work by age

Nearly 97% of all superintendents reported that the computer used for work was located in their office.

More than half of all computers used for work were part of a network, with municipal facilities topping the list at 74.3% and green fee courses of less than $40 at the bottom, with 52.6%.

Golf facilities generally are keeping pace with new technology when it comes to the age of computer hardware at facilities. The age of computers being used at golf courses overall was reported to be 84.2% less than 5 years old, with 41.2% of those less than 3 years old.

Of all of the golf courses with computers, a reasonably large number of facilities have multiple computers.

Superintendents and Computers (continued)

Number of Desktop Computers Located in the Maintenance Facility by Facility Type					
Number of Computers	Overall	Municipal	Semi-Private	Private	Daily Fee
1	24.5%	25.2%	36.8%	16.0%	29.0%
2	30.6%	36.6%	32.4%	27.4%	29.7%
3	20.3%	22.9%	11.8%	23.3%	20.0%
4	12.7%	6.9%	9.6%	18.4%	9.7%
5	5.1%	6.1%	5.1%	5.2%	3.9%
More Than 6	6.8%	2.3%	4.4%	9.6%	7.7%

Table 3 Number of desktop computers by facility

Number of Laptop Computers Used by Staff by Facility Type					
Number of Computers	Overall	Municipal	Semi-Private	Private	Daily Fee
0	47.2%	63.8%	43.6%	40.1%	49.4%
1	40.9%	31.2%	41.6%	44.7%	41.3%
2	9.2%	3.6%	12.1%	11.6%	7.0%
3	1.7%	1.4%	1.3%	2.0%	1.7%
4	0.4%	0.0%	0.0%	0.7%	0.6%
5	0.3%	0.0%	0.7%	0.3%	0.0%
More Than 5	0.4%	0.0%	0.7%	0.7%	0.0%

Table 4 Number of laptop computers used by facility

In Table 3, a majority of participants (75.5%) indicated that more than one desktop computer is available for use at the facility. In Table 4, 52.8% of respondents indicated they have at least one laptop computer.

COMPUTER FUNCTIONS

Eighty nine percent (89%) of all respondents used computers to prepare budgets and track expenses; the next closest category that superintendents used computers for was 77% for chemical and fertilizer tracking. The computer use results follow:

FUNCTION / USE	% USAGE
Budgets/Expense Tracking	89%
Fertilizer and Chemical Tracking	77%
Equipment Inventory	76%
Reports and Journal Entries	75%
Event Tracking and Maintenance Scheduling	63%
Labor and Task Tracking	58%
Maps	57%
Equip Repair & Maintenance Functions	57%
Time Clock Functions	50%
Fuel Inventory Tracking	41%
Training / Video Demonstrations	37%
Tree Inventory	13%

Frequency of Computer Use for Budget Preparation and Expense Tracking by Age and Green Fee/Guest Fee							
			Age			Green Fee	
Frequency Used	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
< 5 per Year	14.7%	5.9%	12.2%	18.1%	19.3%	22.0%	18.5%	9.0%
Once per Month	11.6%	8.9%	9.8%	12.3%	14.3%	12.1%	16.0%	7.7%
2 – 3 per Month	16.0%	9.9%	17.6%	17.6%	16.4%	14.3%	18.2%	14.4%
Once per week	14.2%	16.8%	14.1%	13.7%	12.9%	13.2%	14.2%	14.7%
2 – 3 per Week	19.5%	26.7%	20.0%	15.4%	20.7%	16.5%	17.5%	22.1%
Daily	23.9%	31.7%	26.3%	22.9%	16.4%	22.0%	15.6%	32.1%

Table 5 Budget preparation and expenses tracking by age and green fee

Computer Functions (continued)

Frequency Used	Facility Type					Number of Golf Holes			
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
< 5 per Year	14.7%	21.3%	19.7%	8.4%	17.0%	16.7%	11.7%	8.8%	4.4%
Once per Month	11.6%	13.9%	15.9%	9.8%	9.2%	11.6%	11.7%	13.2%	8.9%
2 – 3 per Month	16.0%	13.9%	17.4%	18.2%	12.2%	16.1%	23.3%	8.8%	15.6%
Once per Week	14.2%	13.1%	16.7%	16.1%	9.2%	15.2%	10.0%	16.2%	6.7%
2 – 3 per Week	19.5%	20.5%	13.6%	21.0%	21.3%	18.1%	16.7%	25.0%	31.1%
Daily	23.9%	17.2%	16.7%	26.6%	31.2%	22.2%	26.7%	27.9%	33.3%

Frequency of Computer Use for Budget Preparation and Expense Tracking by Facility Type and Number of Golf Holes

Table 6 Budget preparation and expense tracking by facility type and golf holes

Frequency Used	Age					Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
< 5 per Year	5.3%	3.3%	3.9%	7.8%	5.0%	6.4%	7.0%	3.8%
Once per Month	11.9%	12.2%	12.3%	11.5%	11.7%	11.5%	16.2%	8.6%
2 – 3 per Month	20.1%	10.0%	15.6%	21.4%	33.3%	24.4%	21.8%	17.6%
Once per Week	27.0%	27.8%	28.5%	26.6%	25.8%	25.6%	29.3%	25.2%
2 – 3 per Week	24.3%	28.9%	27.9%	22.4%	17.5%	24.4%	18.3%	29.5%
Daily	11.4%	17.8%	11.7%	10.4%	6.7%	7.7%	7.4%	15.5%

Frequency of Computer Use for Chemical and Fertilizer Tracking by Age and Green Fee/Guest Fee

Table 7 Computer use for tracking chemical and fertilizer use by age and green fee

Frequency Used	Facility Type					Number of Golf Holes			
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
< 5 per Year	5.3%	3.8%	7.3%	4.1%	6.9%	5.8%	3.8%	4.6%	2.6%
Once per Month	11.9%	13.5%	15.5%	9.8%	11.5%	13.0%	11.3%	6.2%	10.3%
2 – 3 per Month	20.1%	30.8%	20.9%	14.8%	20.8%	20.6%	22.6%	20.0%	10.3%
Once per Week	27.0%	25.0%	27.3%	29.2%	24.6%	28.8%	22.6%	24.6%	17.9%
2 – 3 per Week	24.3%	20.2%	17.3%	29.5%	23.8%	23.4%	26.4%	27.7%	25.6%
Daily	11.4%	6.7%	11.8%	12.7%	12.3%	8.4%	13.2%	16.9%	33.3%

Frequency of Computer Use for Chemical and Fertilizer Tracking by Facility Type and Number of Golf Holes

Table 8 Computer use for tracking chemical and fertilizer use by facility type and golf holes

SOIL SENSORS

Relatively recent technology is soil sensors buried below the turf surface. These sensors typically report, via wireless data transmission, specific soil conditions in real time. Typically, these measurements are soil moisture, soil temperature and salt content.

Superintendents That Currently Have Soil Sensors In Use by Age and Green Fee/Guest Fee								
			Age			Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Sensors Used	10.2%	12.3%	9.6%	10.8%	9.2%	2.6%	4.0%	18.5%

Table 9 Soil sensors in use by age and green fee

Superintendents That Currently Have Soil Sensors In Use by Facility Type and Golf Holes								
		Facility Type				Number of Golf Holes		
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Sensors Used	10.2%	6.7%	4.9%	16.9%	5.6%	8.3%	10.8%	12.7%	28.3%

Table 10 Soil sensors in use by facility type and golf holes

These soil sensors may save significant water, power to pump water and indicate important timings for flushing of salts from the turf root-zone.

Superintendents That Are Considering Soil Sensors Within The Next Three Years by Age and Green Fee/Guest Fee								
			Age			Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Considering Installation	16.6%	21.5%	15.8%	16.7%	12.4%	9.1%	16.1%	20.4%

Table 11 Superintendents considering soil sensors by age and green fee

Computer Functions (continued)

Superintendents That Are Considering Soil Sensors Within the Next Three Years by Facility Type and Golf Holes									
		Facility Type				Number of Golf Holes			
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Considering Installation	16.6%	14.5%	11.0%	18.7%	19.9%	16.1%	17.2%	14.5%	27.3%

Table 12 Superintendents considering soil sensors by facility type and number of golf holes

TYPES OF COMPUTERS AND SOFTWARE

Primary Computer Type By Age and Green Fee								
		Age				Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Laptop	20.2%	22.6%	20.1%	21.3%	17.3%	13.2%	17.9%	25.0%
Desktop	78.6%	76.4%	78.5%	77.5%	81.4%	84.2%	81.5%	73.4%
Tablet	1.2%	0.9%	1.4%	1.2%	1.3%	2.6%	0.7%	1.2%

Table 13 Primary computer type by age and green fee

Primary Computer Type By Facility Type and Number of Golf Holes									
		Facility Type				Number of Golf Holes			
Frequency Used	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Laptop	20.2%	9.6%	22.9%	22.7%	22.0%	19.9%	13.6%	25.0%	25.5%
Desktop	78.6%	88.1%	75.7%	76.7%	76.8%	78.9%	83.3%	75.0%	74.5%
Tablet	1.2%	2.2%	1.4%	0.7%	1.2%	1.3%	3.0%	0.0%	0.0%

Table 14 Primary computer type by facility and number of golf holes

2013 Technology Survey

Computer Functions (continued)

When asked, "What brand of computer do you use as your primary computer?" respondents answered:

Brand of Computer Used	Overall
Dell	49.3%
Hewlett-Packard	19.4%
Other	10.8%
Acer	4.0%
Lenovo	3.2%
VeiwSonic	2.2%
LG	2.0%
Toshiba	2.0%
Apple	1.6%
Gateway	1.5%
IBM	1.2%
Sony	0.8%
Samsung	0.4%

Table 15 Brand of computer used by 761 golf course superintendents

There was no significant difference in the categories of age, green fee, facility type or number of golf holes managed for the brand of computer used.

Operating System Software Used	Overall
Windows XP	40.0%
Windows 7	37.3%
Windows 8	8.1%
Windows Vista	6.8%
Windows 2003	3.5%
Windows 95	1.5%
Windows 2000	1.2%
Other	0.9%
Mac OS	0.5%

Table 16 Computer operating system currently used

Even after 12 years, Windows XP remains the most popular operating software with 40% of respondents indicating Windows XP as their computer operating system.

Computer Functions (continued)

CLOUD COMPUTING

Cloud computing is an emerging trend of online file access being used by individuals and businesses worldwide. It creates a virtual space or "cloud" of files and applications on remote storage devices, which can be used from anywhere via an internet connection. It generally requires a subscription to utilize the services of a provider to organize installations and data customizations for user retrieval. The significance of cloud computing, especially in the future, may make portable devices less sensitive to massive data storage requirements needed by software applications.

We asked, "Do you currently subscribe to a cloud-type data storage or retrieval provider?"

	Cloud Storage Use By Age and Green Fee							
		Age				Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Yes	15.3%	17.9%	17.5%	14.9%	10.5%	6.2%	11.1%	22.1%
No	84.7%	82.1%	82.5%	85.1%	89.5%	93.8%	88.9%	77.9%

Table 17 Cloud use by age and green fee

	Cloud Storage Use By Facility Type and Number of Golf Holes							
		Facility Type				Number of Golf Holes		
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Yes	15.3%	8.3%	12.0%	19.6%	16.0%	14.4%	16.7%	19.4%	17.0%
No	84.7%	91.7%	88.0%	80.4%	84.0%	85.6%	83.3%	80.6%	83.0%

Table 18 Cloud use by facility type and number of golf holes

	Cloud or Other Software to Synchronize Computer and/or Other Devices Use By Age and Green Fee							
		Age				Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Yes	23.2%	23.1%	29.4%	20.7%	18.8%	14.3%	20.0%	29.3%
No	76.8%	76.9%	70.6%	79.3%	81.2%	85.7%	80.0%	70.7%

Table 19 Cloud or other software to synchronize computer and/or other devices use by age and green fee

Computer Functions (continued)

Cloud or Other Software to Synchronize Computer and/or Other Devices By Facility Type and Number of Golf Holes								
		Facility Type				Number of Golf Holes		
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Yes	23.2%	19.1%	22.4%	22.9%	28.0%	20.9%	27.7%	31.0%	33.3%
No	76.8%	80.9%	77.6%	77.1%	72.0%	79.1%	72.3%	69.0%	66.7%

Table 20 Cloud or other software to synchronize computer and/or other devices by facility type and number of golf holes

Cloud use is more prevalent among younger respondents and high green fee facilities.

SOFTWARE

We asked, "Would you consider yourself proficient at the following software programs?"

Superintendents Proficiency with Software Types By Age					
		Age			
Type of Software	Overall	Under 35	35 - 44	45 - 54	55 and Older
Spreadsheet	76.1%	92.5%	82.8%	70.5%	64.8%
Word Processor	79.5%	97.2%	86.0%	70.5%	73.5%
Presentation/Slides	42.8%	80.4%	49.3%	31.8%	25.9%
Data Base	30.7%	43.9%	32.1%	26.1%	28.4%
Publishing	20.4%	29.2%	25.8%	16.1%	14.8%
Graphics	11.2%	21.5%	12.7%	8.8%	6.2%

Table 21 Superintendents proficiency with software types by age

In Table 21, software use and proficiency is dramatically driven by age, with younger superintendents being more proficient.

Computer Functions (continued)

Office Type Software Use By Age and Green Fee								
			Age				Green Fee	
Software Brand	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Microsoft Office	79.5%	85.6%	84.8%	78.1%	70.3%	74.1%	76.3%	84.1%
Open Office	2.9%	4.8%	1.4%	3.6%	2.6%	3.6%	3.0%	2.5%
Word Perfect	8.8%	1.9%	4.1%	12.0%	14.8%	11.6%	10.7%	6.2%
Google Docs	1.6%	1.9%	1.4%	0.4%	3.9%	0.9%	1.7%	1.9%
Other	7.2%	5.8%	8.3%	6.0%	8.4%	9.8%	8.3%	5.3%

Table 22 Office type software use by age and green fee

Office Type Software Use By Facility Type and Number of Golf Holes								
			Facility Type			Number of Golf Holes		
Software Brand	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Microsoft Office	79.5%	78.4%	69.0%	85.9%	77.8%	79.8%	75.4%	80.3%	80.4%
Open Office	2.9%	1.5%	4.9%	2.3%	3.1%	3.4%	0.0%	1.4%	2.2%
Word Perfect	8.8%	9.0%	12.7%	6.7%	9.3%	8.5%	15.4%	7.0%	6.5%
Google Docs	1.6%	2.2%	2.8%	0.7%	1.9%	1.3%	0.0%	4.2%	4.3%
Other	7.2%	9.0%	10.6%	4.4%	8.0%	7.0%	9.2%	7.0%	6.5%

Table 23 Office type software use by facility type and number of golf holes

Microsoft Office dominates the landscape of available office-type software products.

Internet Browser Use By Age and Green Fee								
			Age				Green Fee	
Browser Brand	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Internet Explorer	60.3%	53.8%	62.2%	59.7%	62.8%	62.5%	60.3%	60.1%
Google Chrome	25.0%	27.4%	23.5%	27.0%	23.1%	22.3%	24.3%	25.9%
Apple Safari	1.6%	1.9%	2.3%	1.6%	0.6%	1.8%	0.7%	2.5%
Firefox	10.2%	17.0%	8.3%	8.5%	10.3%	8.9%	11.0%	10.0%
Other	2.9%	0.0%	3.7%	3.2%	3.2%	4.5%	3.7%	1.6%

Table 24 Internet browser use by age and green fee

Computer Functions (continued)

Internet browser selection is dominated by Microsoft in all categories, with Google Chrome a distant second.

Internet Browser Use By Facility Type and Number of Golf Holes									
		Facility Type				Number of Golf Holes			
Browser Brand	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Internet Explorer	60.3%	62.4%	57.3%	62.1%	58.0%	59.8%	55.4%	61.0%	72.3%
Google Chrome	25.0%	23.3%	31.5%	22.5%	25.3%	24.6%	27.7%	29.2%	19.1%
Apple Safari	1.6%	0.8%	1.4%	2.4%	0.6%	1.6%	4.6%	0.0%	0.0%
Firefox	10.2%	8.3%	8.4%	9.7%	14.2%	11.1%	7.7%	9.7%	4.3%
Other	2.9%	5.3%	1.4%	3.0%	1.9%	2.9%	4.6%	0.0%	4.3%

Table 25 Internet browser use by facility type and number of golf holes

Superintendents Using Map Functions on Computers By Age and Green Fee								
		Age				Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Yes	58.8%	73.1%	63.5%	55.4%	47.7%	50.0%	53.5%	67.1%
No	41.2%	26.9%	36.5%	44.6%	52.3%	50.0%	46.5%	32.9%

Table 26 Superintendents using map functions on computers by age and green fee/guest fee

Superintendents use map functions to help examine and communicate golf course features, educate employees, measure land areas, plan projects and other important tasks. Satellite map features have revolutionized the ability of the superintendent to view the golf course in a scalable way from any computer via the internet.

Superintendents Using Map Functions on Computers By Facility Type and Number of Golf Holes									
		Facility Type				Number of Golf Holes			
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Yes	58.8%	59.0%	52.8%	62.5%	56.2%	57.7%	63.1%	61.1%	62.2%
No	41.2%	41.0%	46.2%	37.5%	43.8%	42.3%	36.9%	38.9%	37.8%

Table 27 Superintendents using map functions on computers by facility type and number of golf holes

Illustrated in Table 26, use of map functions is 25.4 percentage points higher in the "under 35"group than the "over 35" group.

IRRIGATION AND COMPUTERS

In Tables 28 and 29, when asked, "Is the irrigation system you currently have operated by a central computer?" courses that had green fees/guest fees of less than $40 had the least central computer driven irrigation systems at 63.5%. Green fee/guest fee courses greater than $70 had 95.4% central computer driven irrigation central controls, a 31.9% difference.

	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
		Age				**Green Fee**		
Yes	84.8%	83.0%	86.3%	83.7%	84.5%	63.5%	81.3%	95.4%
No	15.2%	17.0%	13.7%	16.3%	15.5%	36.5%	18.7%	4.6%

Irrigation Central Computer Control By Age and Green Fee

Table 28 Irrigation central computer control by age and green fee

	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
		Facility Type				**Number of Golf Holes**			
Yes	84.8%	83.0%	78.9%	89.6%	82.4%	81.7%	87.7%	95.8%	100.0%
No	15.2%	17.0%	21.1%	10.4%	17.6%	18.3%	12.3%	4.2%	0.0%

Irrigation Central Computer Control By Facility Type and Number of Golf Holes

Table 29 Irrigation central computer control by facility type and number of golf holes

Of those that responded with irrigation central computers, 44.6% had weather stations connected to the central computer. Golf courses with green fees less than $70 reported 33% and semi-private courses had 28% connected to weather stations. Courses with 45 or more holes reported 57% with weather stations connected to irrigation central computer controls.

Of those that responded "yes" with regards to a having a weather station connected to irrigation central control, nearly 80% overall stated that the irrigation central control system has the capability to adjust irrigation run times based on weather conditions and/or evapotranspiration. However, only 35% used the weather station interface with the central irrigation computer to automatically adjust irrigation run times.

Nearly 60% of overall respondents that have irrigation computer central control have remote access away from the workplace to make adjustments to the system.

Computer Functions (continued)

Irrigation Central Computer Control Software Brand By Age and Green Fee								
		Age				Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Hunter	4.3%	2.3%	4.3%	5.7%	3.8%	9.6%	5.8%	2.0%
Rain Bird	35.1%	35.6%	34.2%	37.0%	34.6%	37.0%	30.5%	38.4%
Toro	58.5%	58.6%	59.9%	55.9%	58.5%	49.3%	61.3%	58.4%
Other	2.0%	3.3%	1.5%	1.4%	3.0%	4.1%	2.4%	1.3%

Table 30 Irrigation central control software brand by age and green fee/guest fee

Irrigation Central Computer Control Software Brand By Facility Type and Number of Golf Holes								
		Facility Type				Number of Golf Holes		
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Hunter	4.3%	5.4%	8.1%	2.6%	3.7%	5.3%	3.5%	1.5%	0.0%
Rain Bird	35.1%	31.5%	26.1%	36.8%	41.9%	36.6%	35.1%	29.9%	27.7%
Toro	58.5%	60.4%	64.0%	58.3%	52.9%	56.7%	59.6%	64.2%	66.0%
Other	2.0%	2.7%	1.8%	2.3%	1.4%	1.3%	1.8%	4.5%	6.4%

Table 31 Irrigation central control software by facility type and number of golf holes

Respondents that have an irrigation central computer were asked, "Is the irrigation computer used for any other purpose than operating the irrigation system?" Overall, 66.5% said no, the irrigation computer was dedicated to only operating the irrigation system.

COMMUNICATION TECHNOLOGY

Ninety eight percent (98%) of superintendents said that they have and use a cell phone at and for work duties. Overall, 73% of superintendents receive reimbursement for all or part of their cell phone charges. Respondents, who use cell phones for and at work, reported that 80% of all cell phones would be considered to be a smart phone. Of the respondents that did not have a smartphone, 38.9% said they are considering a smartphone within the next year.

Smartphone operating systems used overall are:

Smartphone Operating Software Used	Overall
Apple iOS	56.4%
Android	33.1%
Other	6.9%
Windows	3.1%
Palm Web OS	0.5%

Table 32 Smartphone operating software used

Across all categories of smartphone users, Apple iOS and Android operating systems made-up nearly 90% of all users.

Applications Used on Smartphones by Age and Green Fee/Guest Fee							
		Age				Green Fee	
Smartphone Functions	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Photos	74.0%	90.7%	83.7%	67.8%	60.5%	56.9%	71.0%	83.5%
Text Msg.	72.5%	90.7%	82.4%	67.4%	56.8%	55.3%	70.0%	81.7%
Weather	71.7%	90.7%	82.4%	65.1%	56.8%	54.5%	70.7%	79.6%
Email	69.6%	89.7%	81.0%	62.8%	52.5%	54.5%	66.4%	78.7%
Calculations	62.8%	87.9%	77.4%	55.2%	41.4%	48.0%	59.6%	71.6%
News	50.9%	75.7%	60.6%	44.8%	32.1%	39.8%	46.9%	59.1%
Notes	43.0%	65.4%	55.7%	34.5%	25.9%	30.9%	38.8%	51.1%
Social Media	30.6%	57.0%	38.9%	19.5%	19.8%	22.0%	29.6%	35.1%
Maps	29.3%	43.9%	36.2%	25.3%	16.7%	24.4%	26.4%	33.8%
Irrigation	26.5%	41.4%	33.9%	20.7%	16.0%	14.6%	18.6%	38.4%
Turf Mgt.	18.4%	43.9%	22.6%	10.0%	9.3%	14.6%	16.9%	21.3%
Word	12.0%	23.4%	13.6%	7.3%	9.3%	11.4%	9.1%	14.9%
Books	6.6%	15.9%	7.7%	3.4%	4.3%	7.3%	2.3%	10.4%
Other	3.7%	3.7%	3.6%	3.8%	3.7%	2.4%	3.3%	4.6%

Table 33 Functions used on smartphones by age and green fee/guest fee

As evident in Table 33, the "Under 35" category had a much more robust use of smartphone applications over all other categories.

Communication Technology (continued)

Applications Used on Smartphones by Facility Type and Number of Golf Holes									
		Facility Type				Number of Golf Holes			
Smartphone Functions	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Photos	74.0%	62.3%	71.1%	83.1%	69.8%	73.9%	67.2%	75.0%	83.3%
Text Mess.	72.5%	59.4%	71.1%	82.1%	67.4%	72.5%	68.7%	73.6%	77.1%
Weather	71.7%	55.1%	71.8%	82.1%	66.9%	72.3%	65.7%	68.1%	79.2%
Email	69.6%	58.7%	67.8%	78.8%	64.0%	68.6%	67.2%	72.2%	81.3%
Calculations	62.8%	51.4%	59.1%	71.9%	59.3%	62.4%	62.7%	63.9%	66.7%
News	50.9%	39.1%	45.0%	59.9%	49.4%	52.1%	38.8%	48.6%	56.3%
Notes	43.0%	31.9%	39.6%	51.7%	39.5%	43.2%	43.3%	44.4%	37.5%
Social Media	30.6%	25.4%	26.2%	34.4%	32.0%	31.2%	19.4%	38.9%	27.1%
Maps	29.3%	21.0%	30.2%	32.5%	29.7%	28.9%	31.3%	29.2%	31.3%
Irrigation	26.5%	21.7%	18.1%	35.4%	22.1%	24.7%	26.9%	38.9%	29.2%
Turf Mgt.	18.4%	13.8%	17.4%	20.9%	18.6%	18.8%	13.4%	22.2%	14.6%
Word	12.0%	10.1%	11.4%	12.9%	12.2%	11.3%	10.4%	15.3%	16.7%
Books	6.6%	2.9%	3.4%	9.3%	7.6%	6.6%	4.5%	9.7%	4.2%
Other	3.7%	2.9%	5.4%	3.3%	3.5%	3.3%	3.0%	6.9%	4.2%

Table 34 Functions used on smartphones by facility type and number of holes

Smartphone users were asked what turf management applications they currently use; the results are:

TURF MANAGEMENT APPLICATIONS	% USAGE
Turfgrass Weeds (any type)	8%
Turf ID (any type)	6%
Turf Management (University Georgia)	6%
Turf Management Calculator (University of Georgia)	3%

The 35 and under group had a much higher use rate; these results are:

TURF MANAGEMENT APPLICATIONS	% USAGE
Turfgrass Weeds (any type)	19%
Turf ID (any type)	13%
Turf Management (University Georgia)	24%
Turf Management Calculator (University of Georgia)	10%

Respondents were asked to list any other applications used on smartphones; the results were;
29 respondents mentioned Turfpath; 5 respondents mentioned Turf Republic.

Communication Technology (continued)

Overall, storage and retrieval of any information from smartphone users from a cloud type service was 38%. Of all categories surveyed, the only statistical difference was the respondents from the 36-hole category with a cloud usage of 52.79%.

Cloud Use to Synchronize Your Smartphone With Other Devices by Age and Green Fee/Guest Fee								
		Age				Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Yes	37.9%	47.9%	46.0%	29.6%	27.7%	27.5%	30.2%	46.7%
No	62.1%	52.1%	54.0%	70.4%	72.3%	72.5%	69.8%	53.3%

Table 35 Cloud use to synchronize smartphone with other devices by age and green fee/guest fee

Cloud Use to Synchronize Your Smartphone With Other Devices by Facility Type and Number of Golf Holes								
		Facility Type				Number of Golf Holes		
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Yes	37.9%	38.1%	37.8%	36.2%	41.1%	35.9%	39.6%	52.7%	37.5%
No	62.1%	61.9%	62.2%	63.8%	58.9%	64.1%	60.4%	47.3%	62.5%

Table 36 Cloud use to synchronize smartphone with other devices by facility type and number of golf holes

Tables 35 and 36 generally indicate that cloud synchronization between smartphones and other devices is most prevalent among younger respondents and more affluent facilities.

Although relatively new, cloud offerings for data storage and software retrieval became available wide-spread to the individual in 2008. The golf maintenance industry has embraced these services to a significant extent.

TABLET COMPUTERS

Tablet Computers Used at Work by Age and Green Fee/Guest Fee								
		Age				Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Yes	21.7%	28.0%	22.3%	17.8%	21.7%	10.3%	14.1%	33.0%
No	78.3%	72.0%	77.7%	82.2%	78.3%	89.7%	85.9%	67.0%

Table 37 Tablet use by age and green fee/guest fee

Tablet Computers Used at Work by Facility Type and Number of Golf Holes								
		Facility Type				Number of Golf Holes		
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Yes	21.7%	13.4%	19.9%	29.7%	15.9%	20.7%	20.9%	29.6%	23.4%
No	78.3%	86.6%	80.1%	70.3%	84.1%	79.3%	79.1%	70.4%	76.6%

Table 38 Tablet use by facility type and number of golf holes

When respondents were asked the brand of tablet computer they used, overall, 93% use the Apple iPad.

Applications Used on Tablets by Age and Green Fee/Guest Fee								
		Age				Green Fee		
Applications or Functions	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Weather	20.1%	24.3%	23.1%	16.1%	18.5%	10.6%	12.1%	31.1%
Email	18.5%	25.2%	20.8%	14.2%	17.3%	9.8%	11.1%	29.0%
Photos	17.6%	23.4%	19.5%	14.6%	15.4%	8.9%	11.7%	26.2%
Irrigation	14.8%	24.3%	16.7%	11.9%	10.5%	5.7%	9.8%	22.9%
Maps	12.6%	20.6%	15.8%	8.8%	8.6%	6.5%	7.2%	20.1%
News	12.6%	16.8%	14.5%	9.6%	11.7%	7.3%	6.8%	20.1%
Calculations	12.2%	17.8%	14.9%	9.6%	8.0%	5.7%	7.5%	19.2%
Social Media	9.7%	17.8%	12.7%	6.1%	5.6%	4.9%	7.5%	13.7%
Word	8.7%	13.3%	9.5%	6.9%	7.4%	2.4%	5.5%	14.9%
Notes	8.0%	17.6%	6.8%	6.1%	5.6%	2.4%	5.2%	12.8%
Spread Sheet	7.0%	15.0%	7.7%	5.0%	3.1%	2.4%	4.2%	11.3%
Turf Mgt.	4.9%	9.3%	5.4%	3.4%	3.1%	3.3%	2.9%	7.3%
Books	4.2%	5.6%	3.6%	4.2%	3.7%	0.8%	2.3%	7.3%
Other	1.2%	1.9%	0.5%	1.5%	0.6%	0.0%	1.0%	1.8%

Table 39 Functions used on tablet computers by age and green fee / guest fee

Tablet Computers (continued)

Applications Used on Tablets by Facility Type and Number of Golf Holes									
	Facility Type					Number of Golf Holes			
Applications or Functions	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Weather	20.1%	13.8%	14.8%	28.8%	14.5%	19.2%	19.4%	27.8%	20.8%
Email	18.5%	13.8%	14.1%	25.8%	13.4%	17.8%	16.4%	26.4%	18.8%
Photos	17.6%	12.3%	12.8%	24.5%	14.0%	16.9%	16.4%	22.2%	20.8%
Irrigation	14.8%	10.9%	10.7%	21.2%	10.5%	14.3%	13.4%	20.8%	14.6%
Maps	12.6%	8.7%	11.4%	16.6%	9.9%	11.5%	10.4%	22.2%	14.6%
News	12.6%	9.0%	9.4%	16.9%	10.5%	11.7%	6.0%	22.2%	18.8%
Calculations	12.2%	8.0%	8.1%	16.6%	11.6%	11.0%	11.9%	19.4%	16.7%
Social Media	9.7%	8.7%	7.4%	11.9%	8.7%	9.1%	7.5%	13.9%	14.6%
Word	8.7%	5.1%	6.7%	11.6%	8.1%	9.1%	4.5%	12.5%	4.2%
Notes	8.0%	6.5%	8.7%	9.6%	5.8%	7.1%	6.0%	15.3%	10.4%
Spread Sheet	7.0%	5.1%	6.0%	8.9%	5.8%	6.8%	4.5%	12.5%	4.2%
Turf Mgt.	4.9%	1.4%	2.7%	6.3%	7.0%	4.0%	4.5%	11.1%	6.3%
Books	4.2%	3.6%	2.0%	6.0%	3.5%	3.7%	3.7%	8.3%	2.1%
Other	1.2%	0.7%	0.7%	1.0%	2.3%	0.9%	0.0%	5.6%	0.0%

Table 40 Functions used on tablet computers by facility type and number of golf holes

Tablet users were asked what turf management applications they currently use; the results are:

TURF MANAGEMENT APPLICATION	% USAGE
Turfgrass Weeds (any type)	3%
Turf ID (any type)	3%
Turf Management (University Georgia)	3%
Turf Management Calculator (University of Georgia)	1%

The under 35 age group had a somewhat higher usage rate; the results are:

TURF MANAGEMENT APPLICATION	% USAGE
Turfgrass Weeds (any type)	6%
Turf ID (any type)	6%
Turf Management (University Georgia)	5%
Turf Management Calculator (University of Georgia)	4%

OTHER TECHNOLOGY

Use of Digital Movies to Communicate or Document Work by Age and Green Fee/Guest Fee

| | Overall | Age | | | | Green Fee | | |
		Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Yes	16.3%	23.4%	19.2%	12.7%	13.8%	10.8%	10.8%	23.7%
No	83.7%	76.6%	80.8%	87.3%	86.2%	89.2%	89.2%	76.3%

Table 41 Use of digital movies to communicate or document work by age and green fee / guest fee

Use of Digital Movies to Communicate or Document Work by Facility Type and Number of Golf Holes

| | Overall | Facility Type | | | | Number of Golf Holes | | | |
		Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Yes	16.3%	12.4%	12.2%	21.7%	13.6%	16.0%	17.9%	16.7%	17.0%
No	83.7%	87.6%	87.8%	78.3%	86.4%	84.0%	82.1%	83.3%	83.0%

Table 42 Use of digital movies to communicate or document work by facility type and number of golf holes

Use of Portable Soil Moisture Sensors by Age and Green Fee/Guest Fee

| | Overall | Age | | | | Green Fee | | |
		Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Yes	36.0%	43.0%	35.2%	35.5%	32.1%	19.2%	23.0%	54.8%
No	64.0%	57.0%	64.8%	64.5%	67.9%	80.8%	77.0%	45.2%

Table 43 Use of portable soil moisture sensors by age and green fee / guest fee

Use of Portable Soil Moisture Sensors by Facility Type and Number of Golf Holes

| | Overall | Facility Type | | | | Number of Golf Holes | | | |
		Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Yes	36.0%	19.7%	26.7%	51.7%	29.6%	34.0%	31.3%	42.3%	57.4%
No	64.0%	80.3%	73.3%	48.3%	70.4%	66.0%	68.7%	57.7%	42.6%

Table 44 Use of portable soil moisture sensors by facility type and number of golf holes

Other Technology (continued)

Potable soil moisture meters are used by one-third of all respondents. These portable soil moisture meters measure volumetric water content. A soil water deficit amount can be ascertained and appropriated water can be applied as needed, essentially taking the guesswork out of water applications to fine turf. Used properly, these meters can save substantial amounts of water.

Spray Equipment with Computer Adjusted Pressure and Flow by Age and Green Fee/Guest Fee								
			Age			Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Yes	56.3%	68.9%	56.0%	55.0%	48.4%	46.7%	52.8%	62.7%
No	43.7%	31.1%	44.0%	45.0%	51.6%	53.3%	47.2%	37.3%

Table 45 Spray equipment with computer rate adjustments by age and green fee/guest fee

Computer controlled application equipment has the ability to adjust flow and pressure based on speed and pump capacity. In Table 45, except for the age 55 and older group and Green Fee/Guest Fee of less than $40, more than half of all golf courses had the ability to apply chemicals and fertilizers with computer controlled equipment.

Spray Equipment with Computer Adjusted Pressure and Flow by Facility Type and Number of Golf Holes								
			Facility Type			Number of Golf Holes		
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Yes	56.3%	53.7%	52.1%	60.7%	54.2%	53.1%	61.2%	66.2%	72.3%
No	43.7%	46.3%	47.9%	39.3%	45.8%	46.9%	38.8%	33.8%	27.7%

Table 46 Spray equipment with computer rate adjustments by facility type and number of golf holes

When asked, "Does a turf sprayer in your equipment fleet have a computer to adjust flow and pressure to the nozzles and turn on and off nozzles based on GPS or other programing?", a small percentage of 5%, answered "yes."

When asked, "Looking into the future, what single most important area of technology would you invest in at the course(s) you manage?" An overwhelming 60% of respondents answered that irrigation/water would be the technology that is most important.

Other Technology (continued)

Future Technology Investment by Age and Green Fee/Guest Fee								
		Age				Green Fee		
	Overall	Under 35	35 - 44	45 - 54	55 and Older	Less Than $40	$40 - $70	Greater Than $70
Irrigation / Water	60.2%	68.9%	65.1%	60.4%	46.8%	55.1%	64.7%	58.2%
Mowing	6.7%	5.7%	7.3%	7.5%	5.1%	11.0%	6.3%	5.5%
Chemical Application	25.5%	19.8%	21.1%	24.3%	37.3%	31.4%	21.7%	26.8%
Communication	7.6%	5.7%	6.4%	7.8%	10.8%	2.5%	7.3%	9.5%

Table 47 Future technology investment by age and green fee/guest fee

Future Technology Investment by Facility Type and Number of Golf Holes								
		Facility Type				Number of Golf Holes		
	Overall	Municipal	Semi-Private	Private	Daily Fee	9-18	27	36	45 or more
Irrigation / Water	60.2%	60.3%	62.3%	60.1%	58.4%	59.6%	59.7%	62.5%	63.8%
Mowing	6.7%	6.6%	2.7%	5.4%	12.7%	7.0%	6.0%	6.9%	4.3%
Chemical Application	25.5%	27.9%	26.0%	25.2%	23.5%	26.4%	23.9%	19.4%	25.5%
Communication	7.6%	5.1%	8.9%	9.4%	5.4%	7.0%	10.4%	11.1%	6.4%

Table 48 Future technology investment by facility type and number of golf holes

Respondents were asked, "If you had the money in your budget to spend on technology, which of the following would you spend it on? You have 100 points to allocate for all categories, so think in terms of what percentage of your technology budget would be spent in each category." Respondents allocated funds in the following manner:

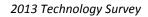|	
Advanced Irrigation and Water Technology	45%
Advanced Chemical Application Technology	26%
Advanced Mowing Technology	14%
Advanced Communication Technology	13%
Other (responses below, Page 28)	1%

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Other Technology (continued)

Other write-in responses were:

Installation of course wide Wi-Fi,
Employee training, safety
Weather station
Remote controlled devices
Monitor and control topdressing rates and organic matter content
Smartphone applications
Chlorophyll meters, soil nutrient meters
Wireless labor tracking
Equipment repair & maintenance technology
GPS equipment tracking
Advanced labor management
Crew radios for communication
Computer
Disease & Pest Tracking
GPS Mapping
Business management
GPS to track employee's whereabouts and time spent on non-essential tasks
Radar/GPS Mapping
Fuel reducing technology
Maintenance shop internet and PC's
Equipment service
Power point schedule board for job assignments, status etc.

WRITE-IN QUESTION

"What other technology have you heard about or have you seen that you would like to use at the golf course you manage?" Below on are the responses in alphabetical order:

3 D printing
A more reliable handheld device that has course irrigation mapped and the ability to make changes in the field and download changes to central
A smartphone with communication to my irrigation central computer
Ability to monitor equipment throughout the course
Advanced weather and irrigation controls, GPS spraying
Aerial photography/images
Anything weather related
Aerial Map
Bar code or q reader technology
Being able to for example document a spray record and have it in a notebook to share with the appropriate staff
Central control
Computer hooked up to the TV in the break area for training
Computer programs for inventory, budget, chemical, fertilizer etc.
Computerized infra-red weed identification for spraying

Other Technology (continued)

Course mapping for fertilizer and chemical applications via GPS
Digital task board with pictures, tasks and location maps
Disease management
Drones for early morning inspections to locate any stuck sprinklers or large leaks
Electronic Communications Board to communicate better to the maintenance staff
Electronic traffic control for golf carts
Entering, recording, sharing and retrieving records
Equipment maintenance
Equipment maintenance alerts. Tie in Great Plains purchasing with equipment maintenance expense, chemical inventory and application programs.
Equipment maintenance monitoring devise on the equipment that reports problems to the mechanic
Equipment monitoring service for maintenance
Expanded soil sensors, expanding wireless network through irrigation satellites
Fertigation
Fertilizer applied using GPS and soil tests
Fleet management software that keeps track of maintenance records, by scanning a bar code that is on the equipment
Geographic Information System
GIS and mapping
Golf car control, GPS
Golf cart tracking and speed control.
GPS
GPS
GPS
GPS area measurements
GPS chemical application
GPS chemical applications
GPS for all equipment
GPS for cart traffic control
GPS for carts
GPS for golf carts and for turf equipment to keep track where they are and what has been done instead of driving all over the course to find them.
GPS for golfers and maintenance personnel
GPS for spray applications
GPS for spray rigs, mowers, etc.
GPS for tracking equipment movement
GPS irrigation mapping
GPS like the farm equipment
GPS machinery control
GPS mapping
GPS Mapping
GPS navigated sprayers, central irrigation computer and hybrid or e-cut mowers
GPS nozzle control on sprayer
GPS on all golf carts
GPS on spray rig
GPS operations on equipment (Spray rigs)
GPS spray rig
GPS Sprayer

Other Technology (continued)

GPS sprayer control, we could reduce the amount of waste
GPS technology for sprayers
GPS tracking
GPS tracking for all equipment
GPS Tracking of equipment movements throughout the golf course
GPS Tracking/Mapping of equipment. GPS/Automated operation of equipment - mowing, spray, fertilizer, edging - cart paths, bunkers
GPS units for people mover vehicles to track travel time, still time, and production
GPS with sprayer application and soil sensors connected with irrigation computer
Greens rollers and various mowing equipment
Hand held soil probes
Hand held tablet for GPS control of irrigation system.
Having the use of an iPad in the field will limit the amount of time I need to spend in the office
Hole location mapping and publication of hole locations for players
Hybrid machinery
Hybrid/electric mowers and equipment
I am about to get an iPad to use for irrigation and communication.
I believe that technology is there, I just need to justify the cost so I can apply it.
I would definitely like to buy a soil moisture meter and moisture sensors
I would like to get into the soil moisture monitors.
I would like to have a tablet for ease of use on the course
I would like to have the advanced sprayer technology and water sensor devices
I would like to improve my budgeting technology
I would like to move toward irrigation control on tablets or smartphones
I would like to see better development with moisture meters and their communication with other devices
I would like to use more GPS mapping to help measure areas, scout pest etc.
I would love to have the GPS computer system for spraying
If I had consistent summer water quantities, I would look at the moisture sensors connected to the computer.
IGENS, or Precise Path
Inferred mapping
Infrared aerial pictures to better manage stress of trees and turf.
Interactive mapping system that would link to a smart board
Internet to monitor pump station 24/7
Inventory control software
I-pad to adjust individual run irrigation in the field with central computer
Irrigation control from cell phone
Irrigation control from I-phone
Irrigation control from smartphone
Irrigation control using an iPad
Irrigation controls from smartphone
Irrigation programming by Smartphone
Irrigation runs by tablet or smartphone
Irrigation uniformity of distribution software
It would be nice to turn my irrigation on or off from a remote site
Just getting started with cloud based technology
Laser beam turf mowing units, robot employees, Warning sirens/alarms when golf carts enter out of play areas, flying drone supervisors, Flying drone sprayers,
Link all of our pump stations (5) to our smartphones, tablets, and computers.

Other Technology (continued)

Maintenance fleet GPS tracking
Management of equipment fuel
Map control amount of acres in each fairway, rough, greens, etc.
Mapping
Mapping
Mapping course differences: hot spots, soil types, drainage, etc.
Mapping program that would allow making changes to current irrigation maps when changes are made
Microscope diagnosis of pest control
Moisture meter
Moisture meters, an updated irrigation system to use the technologies that are available, and a GPS sprayer
Moisture sensor
Moisture sensors
Moisture sensors
Moisture sensors
Moisture sensors
Moisture sensors
Moisture sensors
Moisture Sensors and Weather Station tops my priority
Moisture sensors in all greens to possibly cut down time probing and hand watering
More advanced weather station for Irrigation
More apps
More GPS
Mowing Technology Soil Sensors
My Turf by Toro
New Chemical application equipment
New irrigation system with iPad control capability
New irrigation Technology
People-less mowers / more soil moisture tech
Permanent moisture sensors
Poa cure
Projectors linked to either iPhone or laptop/tablet to perform slide shows during staff meetings or presentations to GM
Pump station monitoring
Radiant heating and cooling for greens all controlled from a central
Rain measurements from Doppler
Remote access for irrigation operation from home
Remote access to irrigation computer
Remote controlled or GPS controlled sprayers to reduce exposure to operators, especially spray hawking greens
Remote irrigation starting
Remote mowers
RFID tagging of golf carts and utility vehicles
Robot fairway mowers or robot mowers for anything
Robot radio controlled greens mowers
Robotic
Robotic greens mowers
Robotic mowers
Robotic mowers
Robotic mowers

Other Technology (continued)

Robotic mowing
Robotic precision cut mowers
Satellite imagery,
Satellite infrared to track hot spots on course
Smart lighting for shop, electronic overhead door controls, liquid fertilizer mixing,
Smartphone weather/ lightning strike apps
Smartphone/tablet connection with the irrigation system
Soil fertility monitoring
Soil mapping & nutrient application
Soil moister meter
Soil Moisture Meter
Soil moisture meter
Soil moisture meters, palm pilot irrigation control, computer based time clock and recording system
Soil moisture sensors
Soil moisture sensors
Soil moisture sensors
Soil Moisture sensors
Soil moisture sensors
Soil Moisture Sensors
Soil moisture sensors are on the radar
Soil moisture, smartphone app to control irrigation remotely
Soil probes/weather station
Soil Sensors
Soil temp control
Solar / Electrical Technology
Sonar for algae control
Spectrum Technologies I-phone Chlorophyll App. Nitrogen meters.
Sprayer technology would be an area we would like to see more on
Sprayers with GPS / Moisture meters
Staff GPS interface to bookmark locations
Sub air movement of moisture through the soil profile.
Subsurface mapping
Tablet based equipment circle checks.
Tablet control of the irrigation system
Tablet for irrigation control
Tablet Irrigation planning
Tablet to control and remote monitor irrigation system
Tablet with a mapped overlay of golf course irrigation to individually adjust head run times
Tablets that record info from sensors on the course
Tablets to manage the irrigation system
Temp probes, soil probes, new chemistries
The GPS spray systems for chemical applications.
The irrigation map technology for tablets and smartphones.
The mapping technology is interesting and would be a great training aid
The trailer that takes soil pH and salinity samples every few feet as it travels down the fairway
The unmanned walk mower
To be able to run and change irrigation program from my phone
Toro Lynx irrigation system with mapping features
Toro Lynx Smartphone app

Other Technology (continued)

Toro Lynx, Mapping Applications
Tree GPS mapping
Turf-Centric equipment repair and maintenance tracker
Unit that measure moisture salinity etc. and syncs with irrigation computer
Use of tablet for irrigation control
Using GPS on spray rig to control individual nozzles and reduce chemical usage
Vehicle tracking
Video board for assigning jobs and training
Water moisture meters
Weather prediction
Weather station
Weather station
Weather Station and soil moisture meters
Weather station for irrigation system
Weather station with moisture sensors on my tee's, green's, & fairways
Weather station, soil moisture sensors in the field,
Weather stations
Wind Turbines, Solar Panels, GPS Sprayer, All Electric Mowers
Wireless communication to satellites
Wireless time clock
Would like a weather station / have not seen soil monitoring systems, sounds interesting
Would like that Toro Irrigation (NSN) mobile app for Android phone like they have for Apple iOS
Would like to set-up video presentation capabilities in staff room for educational purposes
Would like to sync my iPhone to irrigation computer for irrigation control

-END OF REPORT-