Rose Park Golf Course GIS Database & Mobile Application: Final Report

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I. Background and Introduction

The Salt Lake City Municipal Golf Course system aims to provide an excellent recreation option and golfing experience to citizens, while maintaining a profitable or financially solvent enterprise. However, Salt Lake City's municipal golf courses have been plagued by financial issues over the last several years due to a variety of factors, including: decreased golf rounds played, uncooperative weather, water costs, and land lease problems (Piper, 2017a). This has resulted in the closure of two golf courses (Jordan River Par 3 and Wingpointe; McKellar, 2015), and the transfer of Rose Park from the Golf Enterprise Fund to the General Fund of Salt Lake City's budget (Mayor's Proposed Budget, 2017). Rose Park was removed from the Golf Enterprise Fund because it operated at a net loss of $1.4 Million over the last 10-year period of complete data (2005-2014; Rowland, 2017). The Golf Enterprise Fund is intended to be a self-contained and self-sustaining city-run business venture where golf course profits are re-invested for course improvements. Just a few years ago it operated eight golf courses, but it now operates only five. Rose Park's move to the General Fund by Mayor Biskupski essentially marks it as a taxpayer-funded course in order to preserve it as a desirable green space and community asset in the broader northwest Salt Lake City recreation area (Piper, 2017b). The move also protects the Golf Enterprise Fund from having to make up for Rose Park's losses, increasing its likelihood of success.

Rose Park's financial struggles have presented Salt Lake City with an opportunity for it to return to profitability through the implementation of innovative solutions. The goal of this project is to implement a detailed GIS database and develop a mobile application to exploit the GIS data for financial benefit. The mobile app will have three primary functions:

1) Golf Course Maintenance: This function will improve the efficiency of resource consumption for golf course and turf maintenance. It will include modules to estimate and predict the needs of water, seed, fertilizer, pesticide/herbicide, etc.
2) Golf Course Management: This function will provide services for golfers, including tee time reservations, snack bar menu navigation, and food purchases. The course will also be able to manage and implement advertising within the application to promote local businesses and increase course revenue.
3) Golfer GPS: This function will help improve the golf experience by exposing the GIS database for detailed distances to course features in a manner unlike any other golf apps on the market. It will help improve the golf experience and pace of play, leading to an increase in golf rounds played each year.

In turn, this project will help spur cost savings, increase the number of golfers at Rose Park, and increase profits by adding a new revenue stream through in-app advertising. If successful, this project will restore Rose Park's financial stability, allowing it to return to the Golf Enterprise Fund with a positive impact. Additional details on the project, deliverables, and initial work packages can be found in the Project Proposal (attachment 2).

II. Scope and Business Case

The Rose Park Golf Course GIS Database and Mobile Application project aligns directly with Salt Lake City Golf's primary organizational goals: (1) Provide affordable recreation to citizens and (2) Maintain a profitable or financially solvent Golf Enterprise Fund. By moving forward with the project, there is a much greater probability that Rose Park will be able to remain open as golf course for the long term. Further, the course maintenance cost savings through

efficiency gains and increased revenue from additional golf rounds and in-app advertising will help Rose Park once again turn a profit.

Broad requirements outlining the scope of the project are listed below:

1) Build comprehensive GIS database with features representing tees, greens, fairways, bunkers, water hazards, and other golf course infrastructure items.
2) Provide enough attributes in the GIS database to improve the golf experience and course maintenance operations.
3) Develop a mobile app with two primary interfaces:
    a. Staff interface for course maintenance and golf management functions
    b. Public interface for golfers to access GPS distances and snack bar features
4) Mobile app capability for in-app advertising to increase revenue
5) Mobile app capability for food/drink menu editing, viewing, and purchasing

The project will be deemed successful if the mobile application can be launched early in the golf season, currently targeted for 8 March 2018. [For the purposes of this project, the timeline will start on 15 Sep 2017, with work progressing through the winter and the mobile app launching at the start of the 2018 golf season.] Further, the database and mobile app must be stored and run on existing hardware in the Salt Lake City's Department of Information Management Services (IMS). Additional firm requirements will be developed early in the software development phase during stakeholder discussions and prototyping activities. Formal acceptance of the mobile application will occur for each functional component during the corresponding sprint demo, and during the system and user acceptance testing before fielding. Supplementary details can also be found in the project charter (attachment 5) and scope statement (attachment 6).

Overall project cost for the database and mobile application will be $141,379. Of this total, $134,897 will come in the first year, with the rest as annual upkeep of the database and app over its six-year lifecycle. The bulk of these costs (71%) come from externally contracting the software development activities. This task will be contracted with a company familiar with the golf GPS market to decrease costs and shorten the development timeline. The remaining costs (39%) come from a mix of funding internal Salt Lake City personnel (GIS technicians, IT, project management) and testing/fielding activities. The benefits from the project will incrementally increase from years 1-3 and stabilize for the remainder of the mobile app's lifecycle. Cost savings from maintenance efficiency increases are expected to be $9,300 annually, while advertising revenue from the app will be $10,700/year. The added profit from a yearly 3% increase of golf rounds is expected to climb from $10,846 in year 1 to $33,526 in year 3 before plateauing for years 4-6. The summation of these benefits will result in total, discounted benefits of $216,838. This results in the project having a 53% return on investment (ROI) and overall net present value (NPV) of $75,459. Additional details and information on the can be found in the business case document (attachment 3) and its associated attachments.

III. Project Management Knowledge Areas

Throughout the course of putting this project together, several documents were generated in support of the overall project or one of the 10 Project Management Knowledge Areas. The specific knowledge areas identified as key to this project (and therefore focused on) include: scope, time, cost, quality, risk, and procurement management. This section will describe each of those six areas and the supporting documents produced for each area.

Scope Management - The Rose park project will need to be completed on a precise timeline in order for the benefits to be realized at the start of the 2018 spring golf season. For this reason,

scope management is critical to ensure that the work focuses on the agreed upon requirements and stakeholder needs. The documents below help define and control what work will be included in the project.

Business Case (attachment 3)

The Rose Park business case document outlines the background of the project and the overall business objective. It also provides details on the current situation, assumptions, an analysis of options, requirements, and a recommendation. Perhaps most importantly, the business case provides an initial estimate of costs/benefits, a rough timeline for project completion, and a brief description of risks that might be encountered.

Business Case Financials (attachment 4)

As an attachment to the business case, the financials spreadsheet goes into detail on how the costs and benefits were estimated and how they are distributed over time, including discounted costs. This ultimately results in the calculation of ROI and NPV, as well as the payback period. Each of these elements are important in making a decision on whether or not to pursue a project. The calculation of numbers in the business case financials is further detailed in the cost estimate (attachment 9) and benefit estimate (attachment 11) spreadsheets described later.

Project Charter (attachment 5)

The project charter formally recognizes the existence of the project provides and direction on the project's objectives and management. It also outlines the key milestones, budget information, success criteria, and approach. A listing of key roles and responsibilities of stakeholders, their signatures, and comments are included, too. For the Rose Park charter, Agile processes are

defined for the software development aspects of the project, and Salt Lake City's Mayor Biskupski is identified as the project's sponsor.

Scope Statement (attachment 6)

Rose Park's scope statement provides further refinement of the characteristics and requirements of the project, with particular emphasis on the mobile application development. This provides important constraints on scope and is the basis for further scope details described later in the Work Breakdown Structure (WBS; attachment 7) and statement of work (attachment 15). The statement also outlines both project management and product deliverables, and defines the project's success criteria.

GIS Database Diagram (attachment 16)

The GIS database diagram is a conceptual model known as an entity-relationship diagram. It describes the components that will be required in the GIS database and will guide its development and the data collection process. Entities are shown as rectangles, their required attributes are ovals, and the relationships between entities are shown as diamonds.

Time Management - Along with scope management, time management is the other key aspect to ensure the Rose Park project is completed on time. The documents below were developed to provide tracking and a solid plan for the project schedule.

Work Breakdown Structure (attachment 7)

The WBS was created from a top-down methodology and includes 6 summary tasks (some of which are milestones), 5 task levels, and 87 low-level tasks. These tasks provide a detailed outline of work to be accomplished and include duration and work estimates, start/finish dates,

dependencies, and resource names. Assigning resources was important for the GIS database tasks to ensure the two GIS technicians weren't over-allocated with work. The high level of detail helped create an accurate timeline for project completion.

Gantt Chart (attachment 8)

A Gantt chart was created from the WBS described above using MS Project and relied on the aforementioned dependencies and resources (shown on the chart) for auto-scheduling. It also displays summary tasks and identifies project milestones as red diamonds. The Gantt chart will be updated as the project progresses, using MS Project's tracking functions.

Cost Management - Rose Park and Salt Lake City are already facing a tough financial situation and costs for the project need to be tightly monitored. Initial financial estimates were developed for the project, as outlined below. These will need to be closely controlled throughout the project's lifecycle in order to remain on budget.

Cost Estimate (attachment 9)

The cost estimate spreadsheet shows a detailed breakdown of costs associated with the project. These costs are grouped by WBS items and subtasks, with an additional line for project management costs, which aren't explicitly captured in the WBS. Cost estimates are calculated from the expected number hours to complete a subtask and the cost per hour for labor (internal or contracted). Subtotals for each item are summed into totals and a percentage of the entire budget for each item is identified. Note that these estimates are for year 0, maintenance costs for subsequent years are outlined in the business case financials spreadsheet.

Cost Baseline (attachment 10)

Month-by-month costs are calculated in the baseline spreadsheet, derived from WBS items in the cost estimate spreadsheet and distributed according the Gantt chart timeline. A bar plot also shows monthly total costs and cumulative costs as the project progresses. This information will be key in identifying how actual costs compare to estimates and determining if the project is over or under budget.

Benefit Estimate (attachment 11)

In a manner similar to the cost estimate, benefits are estimated and categorized according to three major benefit sources: resource efficiency savings, in-app advertising revenue, and revenue from increased golf rounds. This spreadsheet details how these benefits were calculated and applied in the business case financials spreadsheet. Annual resource costs savings are estimated from average costs in the industry (Williams, 2012) and the expected efficiency gains (10%) from using the mobile app. Yearly advertising revenue is based on a $50/day projection over the 214 day golf season (15 Mar to 15 Oct). Finally, the income from additional golf rounds is based on a 3% increase in rounds played each year in years 1-3. The baseline comes from the average income per round ($7.23) based on recent Rose Park data for rounds played (50,000/year) and annual revenue ($361,558; Rowland, 2017).

Quality Management - A high quality mobile app is needed to provide the services required by the management/maintenance staffs and to compete with commercial GPS golf apps. In order manage quality for the Rose Park project, stakeholder involvement will be relied on to provide quality assurance through multiple stakeholder acceptance instances and extensive user acceptance testing.

Quality Management/Testing Process (attachment 12)

The quality management and testing process flow chart describes the quality assurance/testing components in detail. Using Agile concepts, stakeholders will be involved from start to finish in the software development phase. This will begin with requirements definition and prototype acceptance and continue with several "gates" of stakeholder acceptance. Each sprint will have an iterative process of unit-level and integration testing, followed by bug fixes, and ending with a sprint demo and stakeholder acceptance. Software development will then be concluded with system-wide testing and stakeholder-driven user acceptance testing. The GIS database development is more straightforward and has a simpler quality management process. This will primarily consist of peer review among the GIS technicians, employing cause and effect diagrams when issues develop, and unit and integration testing for each database component.

Risk Management - With the previous financial struggles of Rose Park and thin margins in the overall golf course industry, project failure would be catastrophic for the course. To combat these perils, risk will be mitigated with the use of a risk register and probability/impact matrix (described below), and updated frequently during bi-weekly risk review meetings.

Risk Register (attachment 13)

The risk register identifies several of the project's biggest risks, along with a description, category, root cause, triggers, potential responses, and the risk owner for each. A probability and impact are also defined that, in conjunction with the risk matrix (attachment 14), help highlight risks that need to be monitored most closely. These risks are colored and ranked by their total risk score and ordered accordingly in the register. Those at the top pose the greatest threat. As situations change throughout the project, the risk register and statuses will be updated during the risk review meetings.

Risk Probability/Impact Matrix (attachment 14)

To help highlight the risks that are the greatest threat to the project, a probability/impact matrix was developed from the risk register. Each risk's probability (high-medium-low) is plotted against its impact to determine overall threat category. The colors correspond to the threat level and match the colors in the risk register. This matrix will also be updated throughout the project during risk review meetings, when exposure or impact changes.

Procurement Management - The final knowledge area of "procurement" was chosen because the software development for a mobile app will need to be outsourced to an external company. The selection of the right company is critical to staying on budget and within the project's time constraints. This contracting effort will be handled through a formal procurement process, requiring a precise statement of work.

Statement of Work (attachment 15)

The statement of work defines critical aspects of the software development work that are required, to include scope, period of performance, deliverables, schedule, and acceptance criteria. The greatest emphasis is put into the "scope of work" section as this expands on and further details the scope that was previously outlined in the business case, scope statement, and WBS. This portion of the document also describes processes to be followed and how interactions with the stakeholders will be managed.

IV. Successes

Overall, there were several successes associated with the Rose Park project. Perhaps one of the greatest successes was the use of Microsoft Project to help manage the WBS and Gantt chart creation. MS Project proved very useful and intuitive for creating the tasks in the WBS and

organizing them when going through the top-down method. Some initial time was required upfront to learn how the program worked, but the duration/work fields, resource assignments, dependencies, and auto-scheduling were extremely useful in scheduling tasks. Once the auto-schedule was complete, only a few minor tweaks were necessary to make the timeline and Gantt chart more cohesive. Another success was the use of the draw.io website to create flow charts and diagram documents. While not specifically project management software, the draw.io site made it very easy to create the database design diagram and quality management process flow chart. The combination of these two software tools were instrumental in facilitating the project management process and the creation of several project artifacts. Finally, the application of Agile processes also fit really well with the software development aspects of this project. By taking advantage of the stakeholder involvement often found in Agile, along with the iterative development and testing cycle, it provided a great foundation for putting together a realistic timeline that would ensure a high quality product. This also allowed a mix of waterfall development (GIS database) and Agile development (mobile app) to be used on the project.

V. Unresolved Issues and Challenges

The primary project management challenge encountered during this project was the estimation of costs and benefits during the business case and cost estimation phases. Specifically, identifying a realistic revenue projection from in-app advertising what very difficult to find. Many resources online don't provide adequate estimate information and are often buried in tech-business jargon, such as "cost per impression." These definitions proved nebulous and were only minimally helpful in providing an approximation for the kind of daily revenue advertising in a golf app might generate. With this in mind, the advertising revenue projections were very much a "guesstimate" and there were too many unknowns to effectively calculate the

revenue based on "cost per impression." The second main challenge was estimating the cost of software development for a mobile application. Once again, online resources were very wide-ranging ($25,000 to $1,500,000+) depending on the kind of app being developed, how original it was, and the type of company contracted to do the work (Yarmosh, 2015). Estimates used in this project heavily relied on the fact the golf GPS apps are now ubiquitous, and the idea that the Rose Park app could largely be composed from modules in apps that are already very common. These are the reasons why a cost on the lower end of the scale was chosen.

VI. Summary

Recent struggles encountered by Salt Lake City golf courses have provided an opportunity for innovative solutions to improve profitability. The Rose Park GIS database and mobile application proposed here describe a path forward to return the city's most troubled course to financial stability. This project has the support of the Mayor, an interested and enthusiastic set of stakeholders, a realistic plan, and resources available to execute the plan. The time has come to leverage data and technology to increase efficiency and profits for Rose Park.

Resources used in the creation of project documents and estimates:

Piper, M. (2017a, February 8). Salt Lake City's golf woes face tough crowd in council. *The Salt Lake Tribune*. Retrieved October 15, 2017, from http://archive.sltrib.com/article.php?id=4915676&itype=CMSID.

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McKellar, Katie. (2015, July 16). Wingpointe Golf Course scheduled to shut down Nov. 1. *Deseret News*. Retrieved October 15, 2017, from https://www.deseretnews.com/article/865632784/Wingpointe-Golf-Course-scheduled-to-shut-down-Nov-1.html.

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Yarmosh, Ken. (2015, February 4). How much does and app cost: a massive review of pricing and other budget considerations. *Savvy Apps*. Retrieved September 24, 2017, from https://savvyapps.com/blog/how-much-does-app-cost-massive-review-pricing-budget-considerations.

Rowland, Allison. (2017, May 23). Council Budget Staff Report. Retrieved 24 September, from http://slcdocs.com/council/WebDoc/Golf_Fund_FY17_17_StaffReport_052317WSA7.pdf.