Direct Application of Research Study Findings in a Practitioner Setting: The Application of the Small Retail Facilities Model for Retail Facility Assessment

Omar I. Aboulola
University of Jeddah

Strategic planners and decision makers need a usable and simple software that simplifies and supports their spatial location decision making. They need an artifact (website) that can offer visual representations of current and proposed locations while accounting for demographic, retail location, and social media factors with the use of a regression model that shows the expected annual sales for each potential location selected. 50 users reviewed such software; Users completed 10 questions of SUS and 10 questions of UE. Users reported favorably regarding usability and reported being satisfied with the website overall.

INTRODUCTION

The regression model created previously (See Appendix) generates representations of current locations with analysis data overlaid on a map with the use of ArcMap. However, these representations are not beneficial unless it can be accessed and utilized by decision makers, strategic planners, and practitioners. Therefore, a website could help decision makers and strategic planners to visualize these current and suggested location and ease of taking decisions. This study used a design science research (DSR) approach to build and evaluate an artifact (instantiation), in this case, a website. The purpose of this instantiation is to help strategic planners see visual representations of current and proposed locations while accounting for demographic, retail location, and social media factors using a regression model that calculates the expected annual sales for each potential location selected. Using the website, the user can explore outcomes for as many proposed retail locations as they wish. By comparing the analysis data for different proposed location sites, it is expected that the user can be more confident in making his final decision of where to plan for new facilities.

To ensure that the user could easily understand and use the website with confidence, the website was built using design and Human Computer Interaction (HCI) principles, which ensures and offers usability, availability, accessibility, and clarity. The website not only needed to be tested for the outcome it provides (current and potential locations), but also needed to be evaluated to ensure it had been built and designed with HCI principles. Following these principles, easy to understand outcomes are generated on a map showing current and future (analyzed) locations with expected annual sales for each potential location selected.

Research Method

This paper follows a DSR approach, which creates and evaluates IT artifacts to solve identified organizational problems (Hevner, March, & Ram, 2004). DSR is an iterative research approach to design,

build, and evaluate ICT artifacts. Hevner and Chatterjee (2010) define DSR as "a research paradigm in which a designer answers questions relevant to human problems via the creation of innovative artifacts, thereby contributing new knowledge to the body of scientific evidence. The designed artifacts are both useful and fundamental in understanding the problem" (Hevner & Chatterjee, 2010).

In addition, March and Smith (1995) have stated that there are two design processes and four design artifacts that have been produced by design-science research in Information System (IS). The two processes are: build and evaluate. The artifacts are: constructs, models, methods, and instantiations. This study used these design processes and artifacts.

Design and build

To design the website, it was necessary to understand what the criteria, guidelines, and components needed for the creation of a successful, usable website were. To create a list of these needed requirements, many literature review papers were searched. For example, Nielsen (1994) provided ten principles that were considered as rules of thumbs "Heuristics" to design new interfaces and websites. The principles followed were: visibility of system, match between real-world and system, user control and freedom, consistency and standards, error prevention, recognition rather than recall, flexibility and efficiency, aesthetic and minimalist design, help user, and provision of help and documentation (Nielsen, 1994). Additionally, Mvungi & Tossy (2015) mentioned that a website can be explained, developed and designed based upon two main criteria: 1) what is presented? and 2) how is it presented? Keeping these two questions in mind when designing a website ultimately determines how useful the website is, how easy it is to use, and how enjoyable it is to use.

Usability is the factor that most researchers consider central when designing and evaluating websites or systems. Resch & Zimmer (2013) contend that usability is an essential aspect for map-based geographical applications and websites. This concern for usability is driven by the fact that users interact with geographic portals, applications, or websites that involve a complex workflow including a variety of additional tasks (Resch & Zimmer, 2013). The usability of a system generally determines user satisfaction and whether a website is considered high-quality or low-quality. Addressing usability of systems, Mvungi & Tossy (2015) provided a list of items that developers or designers need to consider when creating a system. These items are: ease of use, efficiency, recovery from errors, accessible, and enjoyable.

FIGURE 1
ITEMS DEVELOPERS NEED TO CONSIDER WHEN CREATING SYSTEM by (Mvungi & Tossy, 2015)

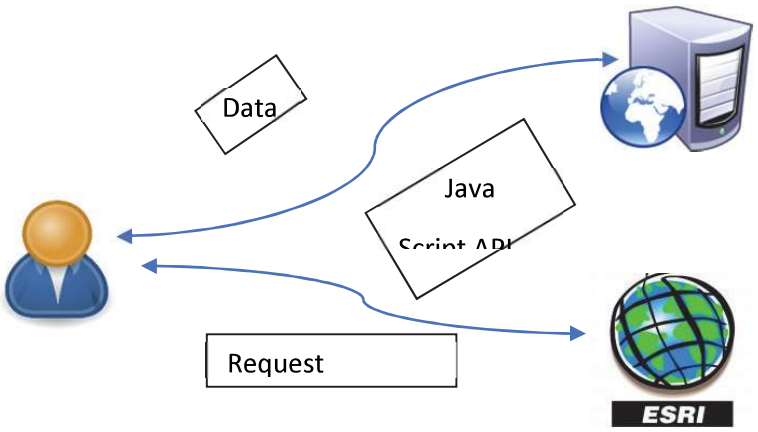
Website Design

The website allowed users (decision makers, strategic planners, and researchers) to visualize current Seattle Starbucks locations while viewing the expected annual sales of proposed store locations. The map showed different factors, such as demographics (race, age, education, population, poverty, etc.), the business' current locations (SQR foot, number of employees, sales, etc.), and social media data (Tweets).

The user accessed the study's website that was connected to a webserver. The website requested and obtained information and data from the ArcGIS Server via JavaScript API. The ArcGIS Server sent the

requested information back to the website so the user could see a visual representation of the data for the current locations and proposed locations that were chosen by the user. Figure 2 illustrates this process.

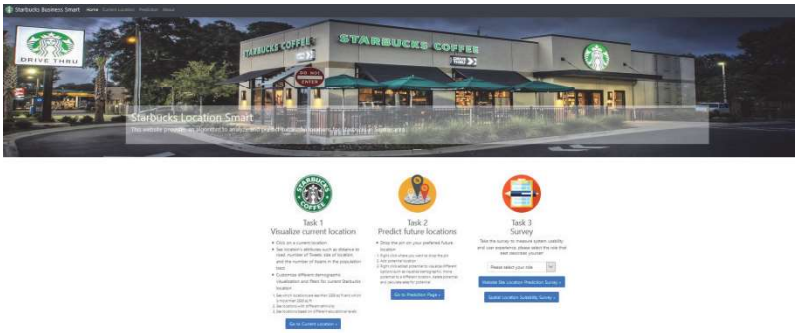
FIGURE 2
DESIGN INTERFACE: USER AND SERVICE CONNECTIVITY



The website contained different pages that were accessed through a horizontal and a vertical navigation. The navigation included pages (tabs) that directed the user to the homepage, the current Starbucks page, the prediction page, or the about page. Each of these pages are explained below.

The homepage of the website (Figure 3) was the main page and included a description of the purpose of the website. The homepage was designed to simplify the use of the website. For example, the home page had a guidance list (ordinal "tasks") that users were guided to follow to understand the purpose of the website and how to use it.

FIGURE 3
HOME PAGE WITH TASKS LISTED



Task 1 (Visualize current location)

- Click on a current location
- See location's attributes such as distance to road, number of Tweets, size of location, and the number of Asians in the population tract.
- Customize different demographic visualization and filters for current Starbucks location
    1. See which locations are less than 2500 sq. ft. and which are more than 2500 sq. ft.
    2. See locations with different ethnicity

3. See locations based on different educational levels

Task 2 (Predict future locations)

- Drop the pin on your preferred future location
    1. Right click where you want to drop the pin
    2. Add potential location
    3. Right click added potential location to visualize different options such as visualize demographic, move potential location to a different location, delete potential location, and calculate sales for potential location

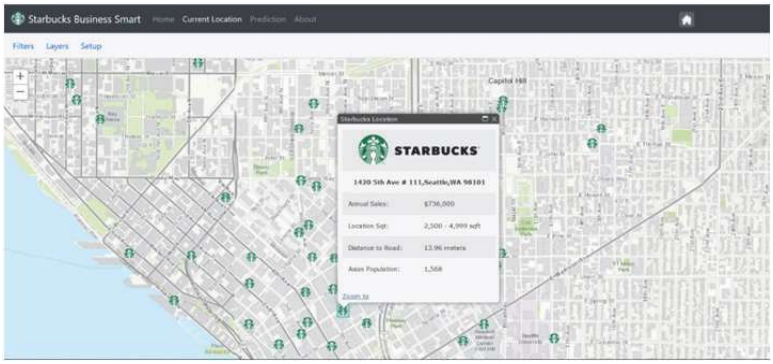
Task 3 (Surveys)

Users were not able to take the two surveys until they chose the group (role) that they belong to. The two groups were GIS experts or non-GIS experts. After choosing the appropriate group, users took two surveys and their responses were stored based on their group.

Current Starbucks Page

The current Starbucks locations page (Figure 4) allowed users to understand where Starbucks locations are in Seattle. It included a horizontal navigation that allowed users to change different demographic representation to simplify the distribution of current locations based on population, education level, ethnicity, etc. Moreover, users could click on a current location to view the metadata of that location, such as the size of the location, the distance to the nearest road, the population of the location, the number of Tweets collected near that location (100 meters), the number of the Asian population who live in that area, and the sales of that current location.

FIGURE 4
CURRENT STARBUCKS LOCATION PAGE



The horizontal navigation had three tabs: base map, and filter, layers. The base map allowed users to visualize the map with different views; the filter allowed users to visualize the location distribution based on the sales volume, location size, number of Tweets around current location, and the Asian population of the area; the layers tabs allowed users to visualize ethnicity distribution of current locations. In the layers tab users could visualize the distribution of different ethnicities, such as Caucasian, African-American, Asian, and Hispanic.

Prediction Page

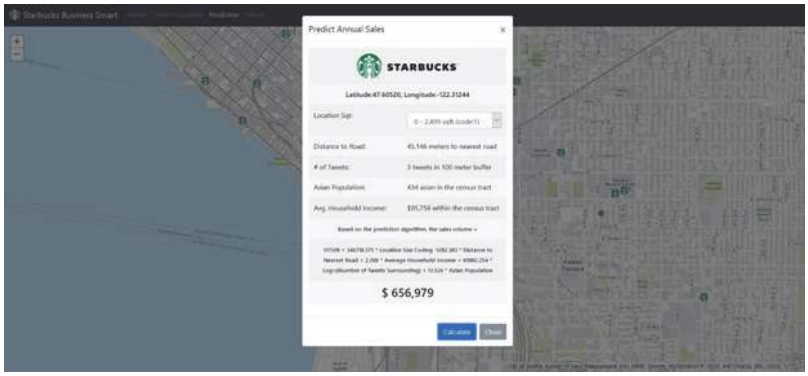
The prediction page was the focus and goal of the whole study/project. The prediction page was populated with the current Starbucks locations in Seattle. This information allowed users to see where

locations were distributed so that they would not drop their proposed location in the same location and so that they could see how close their proposed location would be to another Starbucks store.

Users had the opportunity to drop a pin on the map where they would like to propose a future Starbucks location should be (Figure 5). After selecting a proposed location, the user could click on the location to see a list of tasks that could be accomplished: 1) predict annual sales for chosen location, 2) move location to a different location, 3) receive demographic information for chosen location, or 3) delete chosen location.

If the user selected predict annual sales, the model calculated the expected sales of that location using the model created previously (see appendix). In addition to projected annual sales, the user was also shown metadata for to the proposed location site. To calculate sales of predicted locations. In addition, the about page showed how the idea for the project was derived, the goal and mission of the website, and brief bio and contact information for the author and web developer.

FIGURE 5
PREDICTION PAGE WITH ANNUAL SALES CALCULATION



Evaluation (Application Evaluation)

The instantiation (website) was designed based on the design principles and the human computer interaction principles. In line with these principles, a questionnaire was conducted and given to 50 participants to examine and evaluate the designed website for its usability, ease of use, and other HCI principles. Usability, an important issue for the user (Bevan & Macleod, 1994), should be a considerable factor. Despite the widespread use of map-based web pages, research showed that the number of studies which address usability has been relatively low (Resch & Zimmer, 2013). To ensure usability for the user, this project used a tool called System Usability Scale (SUS) (Brooke, 1986). This tool measured the usability of the instantiation. This tool consisted of ten questions with five response options for respondents; from strongly agree to strongly disagree (See appendix D).

As stated by Resch & Zimmer (2013), most designers and developers focus on functionality and technology rather than paying attention to users and their needs (Resch & Zimmer, 2013). Therefore, in addition to SUS questions, more questions were given to measure user experience satisfaction upon using the website and to find strengths and weaknesses of the website's design (Resch & Zimmer, 2013). These user experience questions measured users' expectations and provided feedback on how to enhance the website's design (See appendix E).

SUS Score and Results

Brooke (1986) stated that SUS measures perceived ease-of-use, system usability satisfaction. Nathan (2015) stated that the average SUS scale score is 68. In addition, Nathan said that if a score is under 68, then there are probably serious problems with website usability; if a score is above 68, then it is considered to be above the industry standard (Nathan, 2015).

There were 50 participants who contributed in the study and surveys. These participants were asked to indicate if they were either GIS experts or non-GIS experts. 14 of the participants considered themselves as GIS exports and 36 considered themselves as non-GIS experts. To assess the usability and likability of the website, the System Usability Scale questionnaire was adopted. Participants provided feedback about their experience after they interacted with the website.

The response from each group will be measured individually to show their differences and interests in the field of spatial location prediction. The site location survey had twenty questions. The first ten were SUS questions, while the other ten questions were user experience (UE) questions.

TABLE 1
PARTICIPANT RESPONSES PER EACH QUESTION

Question	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Total %
I think that I would like to use this system frequently	46	24	18	8	4	100%
I found the system unnecessarily complex	12	16	16	26	30	100%
I thought the system was easy to use	52	34	12	2	0	100%
I think that I would need the support of a technical person to be able to use this system	6	8	8	34	44	100%
I found the various functions in this system were well integrated	40	36	16	4	4	100%
I thought there was too much inconsistency in this system	2	6	18	32	42	100%
I would imagine that most people would learn to use this system very quickly	40	38	18	4	0	100%
I found the system very cumbersome to use	4	12	22	14	48	100%
I felt very confident using the system	34	46	14	6	0	100%
I needed to learn a lot of things before I could get going with this system	0	14	16	22	48	100%

Question 1 “I think that I would like to use this system frequently.” This question shows how likely participant was to use or not to use the system (website) again. Table 1, shows that of the 50 participants, 35 (70%) participants agreed that they would prefer to use the website again and only 6 (12%) participants disagreed.

Question 2 “I found the system unnecessarily complex.” This question shows how difficult or easy it was while participants were using the website. Table 1, shows that of the 50 participants, 14 (28%) agreed that the website was unnecessarily complex while 28 (56%) indicated that they disagree that they found the website unnecessarily complex.

Question 3 “I thought the system was easy to use.” This question shows how likely the website is easy to use and easy to follow the instructions. Table 1, shows that of the 50 participants, 43 (86%) indicated that they agree that the website is easy to use while only one (2%) disagreed while 6 (12%) participants indicated that they neither agree nor disagree.

Question 4 “I think that I would need the support of a technical person to be able to use this system.” This question shows if participants find the website is technically challenging and needed support to use it or not. Table 1, shows that only 7 (14%) participants of the 50 have agreed that they need support of a technical person and 39 (78%) participants disagreed that they need supports, which explains that the website was easy to use and navigate through.

Question 5 “I found the various functions in this system were well integrated.” This question shows how highly the website is integrated and designed. Table 1, shows that of the 50 participants, 38 (76%) agreed that the website is well integrated and designed; while only four (8%) disagreed, and indicated that the website is not well integrated and designed.

Question 6 “I thought there was too much inconsistency in this system.” This question shows if the website includes many inconsistencies. Table 1, shows that only four (8%) participants of the 50 agreed that there was too much inconsistency in the website; while 37 (74%) participants disagreed, and were happy and liked the website consistency.

Question 7 “I would imagine that most people would learn to use this system very quickly.” This question indicates how easy user learn to navigate the website. It also shows if participants need long time to know what is needed and how to use the website. Table 1, shows that 39 (78%) participants of the 50 indicated that the website was easy to follow and quickly they learned how to use the website and navigate through it. Only 2 (4%) participants disagreed that the website could quickly be followed and processed without longer time to learn.

Question 8 “I found the system very cumbersome to use.” This question shows how confident or not confident participants are with the website. Table 1, shows that 8 (16%) participants agreed that the website is very cumbersome while 31 (62%) participants disagreed. The rest indicated they neither agree nor agree.

Question 9 “I felt very confident using the system.” This question shows how confident participants were. Table 1, shows that of the 50 participants, 40 (80%) participants have indicated that they were confident using the website while only 3 (6%) participants disagreed and 7 chose they neither agree nor agree.

Question 10 “I needed to learn a lot of things before I could get going with this system.” This question indicates that the website is complicated, requiring user to spend time getting help to proceed using it. Table 1, shows that of the 50 participants, 7 (14%) participants agreed that they needed to learn a lot of things before they could proceed with the website, but 35 (70%) participants disagreed that they needed to learn a lot of things, which indicates that the website is easy to use and doesn’t need effort to proceed.

Presenting participants respondents explains how they felt about the website, how well the website is designed, and the usability of the website. Bellow section, is an explanation of the SUS scores that demonstrates the usability of the website.

SUS Discussion

SUS Scores illustrates that participant's responses indicated that the website was usable based on the calculated SUS score. GIS experts (14 participants) ranked the website, resulting in an average of 83.3 for the SUS score. While the non-GIS experts (36 participants) ranked the website with an average of 72.2 for the SUS score. Collectively all 50 participants ranked the website with an average SUS score of 75.5 (See appendix F "SUS Scores"). These scores are within an acceptable average range for SUS scores according to Nathan (2015) who finds 68 or above is acceptable.

User Experience (UE) Score and Results

The site location survey had twenty questions. The first ten questions were the SUS questions explained above; the other ten questions were made up of five Likert scale questions and 5 open-ended questions. These questions are user experience questions. As was the SUS score, the UE was also scored based upon the two different group responses and then collectively. The first five questions of the UE were close-ended questions and last five were open-ended questions. UE was interpreted collectively and responses were merged together per question and an average for all responses was calculated.

Table 2, showed that about 29 (42.76%) participants indicated that the website met their needs (approximately 17.97% Extremely Well and 24.79% Very Well), while 16 (47.3%) participants indicated that the website moderately or slightly met their needs. Finally, only 5 (9.94%) participants indicated that the website did not meet their needs at all. This result showed that most of the participants were satisfied with how well the website met their needs.

TABLE 2
WEBSITE SURVEY- USER EXPERIANCE QUESTIONS

Question	Extremely well	Very well	Moderately well	Slightly well	Not well at all	Total %
How well does the website meet your needs?	17.97%	24.79%	12.78%	34.52%	9.94%	100%
Did the website represent the suggested locations nicely?	28.42%	25.76%	33.75%	5.82%	6.25%	100%
How useful is the information provided on the website?	28.23%	50.18%	14.21%	7.39%	0.00%	100%
How enjoyable was navigating and tying the prediction?	21.02%	33.73%	44.68%	0.57%	0.00%	100%
How likely are you to recommend the website to others?	28.73%	19.00%	2.70%	49.01%	0.57%	100%

Table 2, showed that about 36 (54.18%) participants indicated that the website has presented the suggested locations nicely, (28.42% Strongly Agree and 25.76% Somewhat Agreed), while 8 (33.75%) participants indicated that they neither agree nor disagree that the website presented the suggested location nicely. Finally, only 5 (12.07%) participant indicated disagreement with the visualization of the website. This data showed that most of the participants were satisfied with how the website presented the suggested locations.

Table 2, showed that 39 (78.41%) participants indicated that the information provided in the website was useful (28.23% Very Useful and 50.18% Useful), while 10 (21.6%) participants indicated that the information provided was moderate or little useful. None of the 49 (0%) participants indicated that the information provided in the website was not useful at all. This collected date showed that most participants found the website to be useful in retail spatial planning.

As Table 2, showed that 37 (55.75%) participants indicated that trying the suggested tool was enjoyable (21.02% Extremely Enjoyable and 33.73% Somewhat Enjoyable). Only 11 (44.68%) participants indicated that the website was neither Not-Enjoyable nor Enjoyable; none of the 49 (0%) participants indicated that they found using the website to be Extremely Un-enjoyable. This data showed that most participants found the website to be enjoyable.

The last and final Likert scale question asked how likely the user were to recommend the website to others; this question addressed participants satisfaction level and willingness to inform others about their experience using this suggestion website. Table 2, showed that about 39 (50.43%) participants indicated that they were willing to recommend the website to others (28.73% Extremely Likely, 19% Moderately Likely, and 2.70% Slightly Likely). 49% indicated of those surveyed stated that they were neither likely nor unlikely to recommend the website.

CONCLUSION

While spatial site selection has been used in various industries for decades and improvements have been made in its application, research on methods and techniques was scattered and dated GIS technology has made great advances in spatial planning in recent years, yet, most methods and techniques rely heavily on large amounts of data and upon the user's mathematical capabilities. These drawbacks have placed limitations on many methods and techniques usability. Further, despite the overall increase in spatial planning applications and use across industries, few, if any researchers have analyzed social media's value as a factor in spatial planning. This research project aimed to not only create a comprehensive guide for relevant information on retail spatial planning, but also to create a user-friendly GIS program (website) which could be used as a model for other applications of use.

The website allowed users to see visual representations of current Starbucks locations in Seattle with different demographics information. In addition, the website was designed to suggest future locations for Starbucks based upon the model that was developed previously. The website allowed users to choose a proposed site within the Seattle area and the model generated the expected annual sales based on the factors chosen in the created model. The website was evaluated via researchers, academic staff, academic faculty, decision makers, strategic planners, and PhD students using two surveys: a website usability survey (SUS) and a user experience (UE) survey. The results indicated that users were satisfied with the website and that the website design was a success. The data from the UE survey was collected for future research. This model can be used as a template for other applications, across industries, to advance the field of spatial planning in respect with available data and factors.

REFERENCES

Brooke, J. 1986. "SUS-A Quick and Dirty Usability Scale," Usability Evaluation in Industry (189:194), pp. 4–7.

Cios, K. J., Pedrycz, W., Swiniarski, R. W., and Kurgan, L. A. (eds.). 2007. Data Mining: A Knowledge Discovery Approach, New York, NY: Springer.

Hevner, A., and Chatterjee, S. 2010. "Design Science Research in Information Systems," in Design Research in Information Systems (Vol. 22), Boston, MA: Springer US, pp. 9–22. (http://link.springer.com/10.1007/978-1-4419-5653-8_2).

Hevner, A. R., March, S. T., and Ram, S. 2004. "DESIGN SCIENCE IN INFORMATION SYSTEMS RESEARCH," MIS Quarterly (28:1), pp. 75–105.

Mvungi, J., and Tossy, T. 2015. "Usability Evaluation Methods and Principles for the Web," International Journal of Computer Science and Information Security (13:7), p. 86. (http://search.proquest.com/openview/1c5e64c2828ca6f1d8381451176d5324/1?pq-origsite=gscholar&cbl=616671).

Nathan, T. 2015. "How To Use The System Usability Scale (SUS) To Evaluate The Usability Of Your Website," Usability Geek, , July 13. (https://usabilitygeek.com/how-to-use-the-system-usability-scale-sus-to-evaluate-the-usability-of-your-website/, accessed October 15, 2017).

Nielsen, J. 1994. Nielsen's Ten Heuristics.

Resch, B., and Zimmer, B. 2013. "User Experience Design in Professional Map-Based Geo-Portals," ISPRS International Journal of Geo-Information (2:4), pp. 1015–1037. (https://doi.org/10.3390/ijgi2041015).

APPENDIX

Regression Model

Location_Sales_Volume = β + β1 * Coding for location size + β2 * Distance Road + β3 * 2014 Average

Household Income + β4 * Count_Tweet_Log10 + β5 * 2014 Asian Population.

Website

ABOULOLA.COM