Engagement in Practice: Vacant Lot Optimization Matrix

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Gary earned his Bachelor of Science degree in Civil and Environmental Engineering from Clarkson University in Upstate New York (1978), and Masters in Business Administration from Indiana University at South Bend (1985). He is a licensed Professional Engineer in Indiana (since 1982).

Gary continues to serve as President of Board of Public Works in South Bend which has management oversight for the municipality.

Gary previously served as Director of Public Works and President of Board of Public Works in South Bend and Elkhart, Indiana for a combined 30 years.

Gary remains actively engaged in the community. Locally, Gary was recognized for distinguished public service by the South Bend Alumni Association. On a statewide level of recognition, Gary is a recipient of the Ivan H. Brinegar municipal management award through the Indiana Association of Cities and Towns. Nationally in August, 2010, Gary was selected as the nation's 2010 "Public Works Leader of the Year" by American City & County magazine for technology innovation.

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Engagement In Practice: Optimizing Vacant Lot Reuse Strategies

Introduction

In February of 2013, the City of South Bend, Indiana published a report detailing the implementation of an initiative that would address the growing rate of abandoned housing throughout the city[1]. The 1000 Homes in 1000 Days initiative resulted in 1,122 homes being repaired, deconstructed, or contracted for demolition in the one thousand day deadline. Although the issue of abandoned housing began to improve, vacant land, also referred to as vacant lots or parcels, became a rising concern without a clear path for remediation. With the increasing volume of vacant lots throughout the City, a collective desire between City officials and neighborhood associations to create and implement a system for determining optimal reuse strategies provided an opportunity for a community engagement project between students from the University of Notre Dame and the City of South Bend. In October of 2015, twelve students from the university's Society of Women Engineers chapter, known as the Tech Team, established a participatory design based partnership between the City of South Bend's Department of Public Works and the Southeast Organized Area Residents (SOAR) to address the vacant lots in the Southeast neighborhood of South Bend. Applying the technical skills acquired in the classroom coupled with continuous feedback from stakeholders, the team created the Vacant Lot Optimization (VLO) matrix, a tool that weighs technical specifications, social neighborhood preferences, and economic viability and determines the optimal reuse strategies for any given vacant lot.

Partnership

In order to establish an alliance that emphasized and encouraged participation of all stakeholders, the Tech Team opened the line of communication by reaching out to the Department of Public Works and SOAR with a list of several community engagement project proposals. Several meetings between the Tech Team and SOAR were conducted to determine a project that would align with community development goals while providing a platform for the team to apply their technical backgrounds to real-world issues. Throughout the project assessment process, SOAR identified the lack of a program or procedure to deal with the growing amount of vacant lots in the Southeast neighborhood.

Using the feedback from their community partner, the Tech Team approached the City of South Bend's Department of Public Works to collaborate on an analytical method for determining how each vacant lot can be reused for the benefit of the Southeast neighborhood. As part of the joint effort between the Tech Team and the City of South Bend, the City's Office of Innovation proposed the use of ArcGIS, a software employing geographical information to display data in a simple and comprehensible manner, and conducted a weekend training session with the team to provide them with the necessary skills to accomplish the task. The City of South Bend also provided the foundational data sets that would be analyzed in the assessment of land use strategies.

Project Design

Utilizing ArcGIS and the software training provided by the City of South Bend, the Tech Team approached the framework of the VLO matrix by defining what constituted a vacant lot. After evaluating the City of South Bend's definition for vacant land, it was established that a vacant lot would be any parcel of land that formerly housed a structure that was later demolished or deconstructed. To establish which parcels were vacant and required analysis, a logic model, found in Appendix I, characterizing the attributes of a vacant lot was established and applied to the data through ArcGIS. In a similar fashion, the team established an economic logic model to assess the financial feasibility of a lot's acquisition and reuse for a beneficial purpose.

Following the establishment of which lots could reasonably be acquired, two reuse strategies were identified by the team and proposed to SOAR and the Department of Public Works as the basic tier for determining how to generate positive benefit through land reuse. The two major reuse strategies, neighborhood development and green infrastructure implementation, were adapted into logic models (Appendix I) and were applied to the data in ArcGIS to identify which parcels were optimal candidates for the two specified reuse strategies. Initially, neighborhood development and green infrastructure were chosen based on the immediate positive impact both strategies could have on the community. For example, green infrastructure was an efficient vacant lot solution that not only addressed land vacancy, but also aided the combined sewer overflow prevention effort that the City of South Bend has taken on in recent years[2]. By placing rain gardens on vacant lots in the neighborhood, the VLO matrix is able to provide analytical and statistical support for a strategy that cooperates with multiple City initiatives. Rain gardens, one particular form of green infrastructure, were also relatively inexpensive to implement (approximately $1,600) in comparison to other reuse strategies. With the help of the National Science Foundation (NSF), green infrastructure implementation was an attainable solution that was implemented within several months of the VLO matrix's pilot. On the other hand, neighborhood development was chosen as a baseline reuse strategy because it provided a reliable reuse solution for vacant land. Since the vacant land previously contained a structure, the land had an allocated zoning purpose, particularly residential, commercial, or tax exempt, which made neighborhood development a minimal risk solution that did not involve extensive change to the existing layout of the community.

In the later stages of the project during the Summer of 2016, four reuse options, split lots, infill housing, pocket parks, and little free libraries, were introduced and the two existing strategies were revised to define the nature of the strategy in greater detail. The four additional land reuse options were converted into logic models and applied to the data. Employing the repertoire of logic models created by the team, a rigorous filtration of the vacant lots in the Southeast neighborhood was conducted and a universal framework for the VLO matrix was constructed.

Project Execution

Initial team project execution took place weekly through the Tech Team, which began to implement the ArcGIS software coupled with the logic models created. The team was able to fully complete the technical layers of the pilot by the end of the

2015-2016 academic year, with a continuation of work on the project during the Summer of 2016. During that summer, a field check was implemented in order to accurately perform a quality verification of the results produced by the ArcGIS data filtration.

The overall results of the field check revealed an impressive accuracy within the data, amounting to roughly eighty-seven percent of the data being correct. The technical layer was then corrected in order to provide an in depth analysis of factors contributing to the optimization of lots for green infrastructure. Since the nature of certain forms of green infrastructure, such as rain gardens, require certain criteria, a refining of the technical layer provided for greater data specification in the VLO matrix . After calibration of the tool had been analyzed, the economic and social layers could begin. Initially, progress on the project was slow, as the social data for the neighborhood in question was lacking and the economic data on the land values of the parcels had to be input by hand. Following extensive economic research, the land value layer was successful in evaluating which sectors of the neighborhood were at high risk. A social data survey was created and distributed at an all neighborhood event in order to acquire a greater scope of social data. The survey was successful, but unfortunately was not filled out by a wide range of participants. The social layer is currently developing with the hopes of receiving more feedback from neighborhood participants.

Successes & Lessons Learned

Overall, the greatest successes of the project came from the calibration of the tool during the field check as well as the growth and maintenance of the relationships formed with the City of South Bend and Southeast Neighborhood members. Fortifying these relationships was one of the main goals of the team throughout the project. Another success that came about after the first iteration of the project was the implementation of a rain garden, a green infrastructure solution geared at preventing combined sewer overflows due to storm events, on a vacant parcel that was deemed optimal for green infrastructure. Applying the VLO matrix to a proposed project to ensure success reaffirmed the team's goal of creating a tool that would inform stakeholders and policymakers on how to create the most benefit for the community through vacant lot reuse. Although the entire project was a learning process, the team's understanding of community engaged work was significantly increased. The skill of working with stakeholders and applying knowledge to open-ended problems is invaluable for a student to learn during his or her college career. The opportunity to work with a community to develop a project from concept to execution is an unparalleled experience that has enriched the education of the students involved with the project.

Throughout the process of designing, implementing, and refining of the VLO matrix, student feedback remained important in defining the overall outcome of the project. In the initial stages of the project, the female engineers on the Tech Team provided input on the desired outcomes and goals to be achieved by the projected, which was shared and echoed by SOAR and the Department of Public Works. Even though certain details of the project changed along the way, such as amount and specification of reuse strategies, the overall goal of creating a matrix that could determine the optimal reuse option for a vacant lot in the Southeast neighborhood

remained. The Tech Team was able to provide formal feedback regarding their experience with the VLO matrix through final project documents where they detailed the chain of events that led to the concept of the matrix and continued through the project's completion. Similarly, students involved in the VLO matrix's redefinition and expansion process over Summer 2016 were able to provide feedback on their work through reflections and project progress reports. In both instances, students identified several areas that they found productive, such as team cooperation, stakeholder feedback, and project scope adjustment based on stakeholder feedback and time constraints. However, the Tech Team and the Summer 2016 VLO matrix interns expressed a desire to incorporate additional community input for the matrix with an end goal of providing a balanced understanding of land optimization. Currently, the VLO matrix relies heavily on the technical and social aspects of the tool to determine the most beneficial use for a vacant lot, which students hope to improve with coming iterations of the tool.

Transferability

The underlying framework for the VLO matrix was designed with the ability to be easily transferable to any neighborhood across the nation. With the project's existing capabilities, the VLO matrix could be taken to any other community and perform the same analysis as was conducted in the Southeast neighborhood of South Bend, Indiana. Furthermore, the matrix also has the capacity to be adjusted for specific neighborhood preferences or nuances that apply. In addition to the work done for the City of South Bend, the Tech Team received a proposal from the City of South Bend to conduct the same analysis to their vacant lots in order to assess how to make use of their vacant parcels in beneficial ways. A major goal for the team was to create a project that would inform policymakers and stakeholders across the nation and provide a platform for analysis that makes assessing vacant land utilization simple and understandable. The framework, which can be tailored to the desires of a specific neighborhood, is robust in that it can provide a synopsis of where a particular community stands in terms of the extent to which vacant lots have arisen. Nonetheless, the VLO matrix provides the added benefit of giving a community ideas and proposals for projects that promote enrichment and a sense of pride in the community's identity.

Conclusion

Through the groundwork established by the City of South Bend's 1000 Homes in 1000 Days initiative, students from the University of Notre Dame's Society of Women Engineers were able to lay the foundation and pilot a tool that addressed a pain point affecting cities across the U.S. The Southeast neighborhood of South Bend, Indiana provided the sandbox for innovation that allowed the Tech Team to employ participatory design and experience a project fueled by community engagement, both of which contributed to the overall success of the project. With a desire to promote optimization of land reuse throughout the United States, the VLO matrix is a tool with the possibility to influence the manner in which policymakers view vacant land the important role it plays in community and urban planning. Although there is no precise answer as to how to prevent land abandonment, the VLO matrix provides a response for the question of what to do when land vacancy arises.

References

1. Buttigieg, P., Kelly, J., Ainsley, K. , Gachaw, M., Gould, M., Heppenheimer, M., Hughes, P., Kostienley, A., Mannix, A., Maradik, E., Mariani, M., Meyer, P., Mullen, P., Morton, R., Nash, A.C., Roos, K., Scott, T., and Toppel, C., 2013, “Vacant & Abandoned Properties Task Force Report,” City of South Bend, IN.
2. City of South Bend, IN. "Combined Sewer Overflow - CSO." *Combined Sewer Overflow - CSO*. City of South Bend, IN, n.d. Web. 12 Mar. 2017. <https://www.southbendin.gov/government/content/combined-sewer-overflow-cso>.

Appendix I

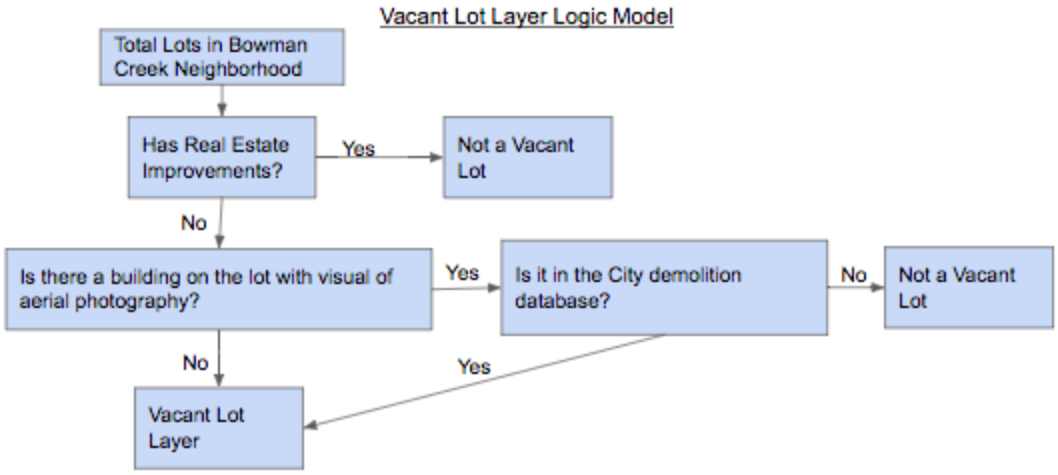

Figure 1. Vacant lot logic model

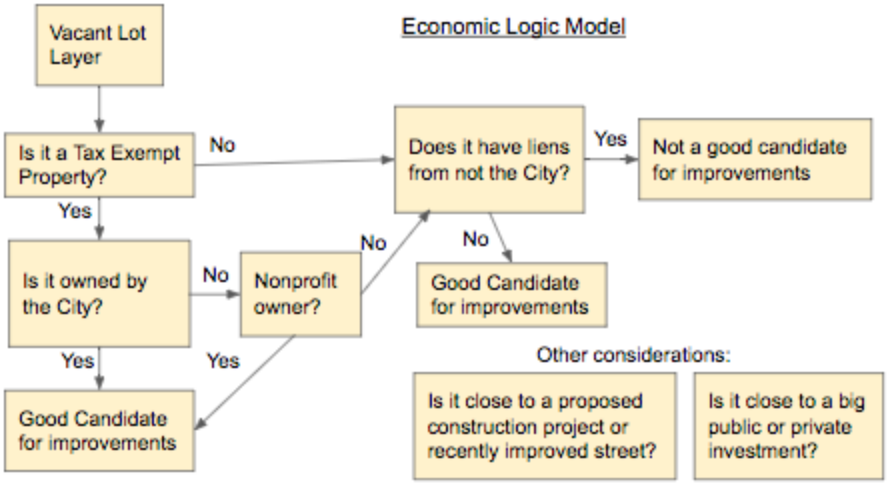

Figure 2. Economic feasibility logic model

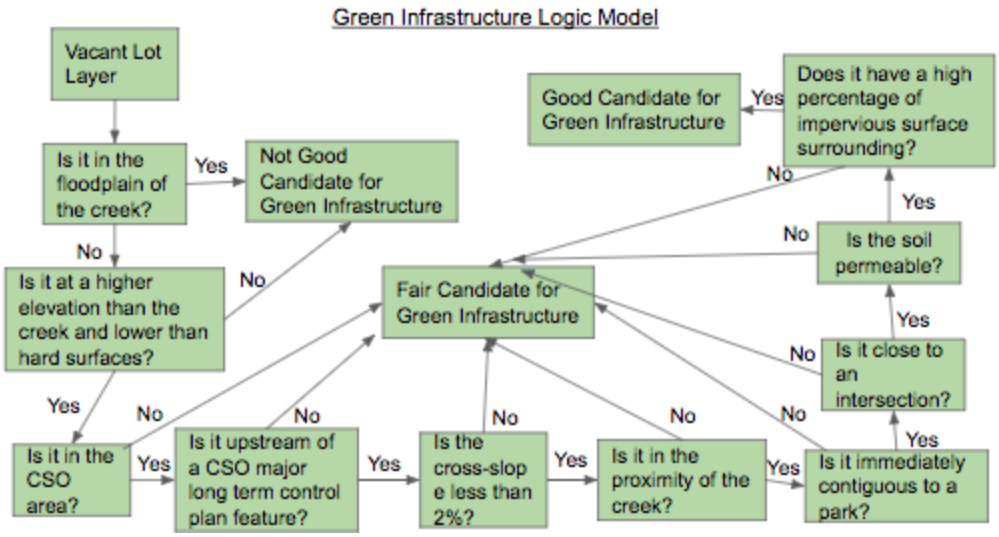

Figure 3. Green infrastructure logic model

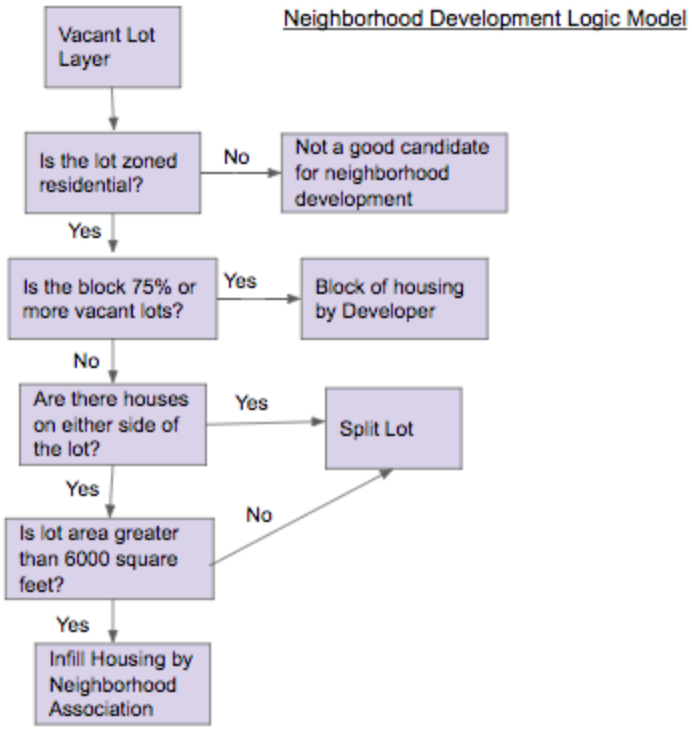

Figure 4. Neighborhood development logic model