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Public School Boundaries and Society

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Abstract. Public school districts play a pivotal role in the functioning of education systems around the world and society in general. Often the public school system relies on a proximity-based assignment to pair residences with neighborhood schools. Housing developments and increase in population generate a continuous need for more school space and redrawing the school attendance zone boundaries, known as rezoning. Rezoning implies debates and agreement over resource allocation in public deliberations held by school authority and community members. Unfortunately these debates are known to be highly contentious. My dissertation seeks to understand if we can improve the state of practice in public school boundary assignments, methodologies, and impact. Specifically, I try to (i) understand if the traditional process of in person deliberation can benefit from total or partial improvement through online participation, (ii) enhance the state of practice with interdisciplinary research from human computing interaction, geographical information systems, and education policies to decrease the complexity and abundance of information, connections, and judgement this process entails, (iii) understand if transparency of data backed decisions can remove bias and rebuild trust in this particular context.

Introduction

Traditionally, rezoning was mainly associated with voting districts for governments, as with rapid growth in population, rezoning become a revolving

process and perpetual constant in school districts as well. In this case, it entails changing the attendance assignment of a neighborhood from one public school to another. It is initiated by the public school officials often because of overcrowded classrooms and seeks concurrence during a public hearing. Often school districts are dealing with one or more rezoning processes per academic year, reverberating sometimes in the need for one student/family to change schools every other year or so. The constraints in time, space, and availability of constituents corroborates with highly computational calculations on vast and complex data not many can understand (Kueng et al. (2019)). Because of their impact and limitations, public school rezoning deliberations often become highly contentious, dividing the communities apart and eroding trust in public school officials (Svrluga (2013)). My dissertation attempts to answer and help with the following questions:

- **RQ1.** Can an online platform assist with information dissemination and deliberations in the process of school boundary changes?
- **RQ2.** Can technology help decrease the level of complexity and computations needed to optimize school building capacity utilization, so participating community members can easily understand the information?
- **RQ3.** Can data-backed decision transparency increase understanding of holistic opportunities and constraints with a role in school rezoning efforts?
- **RQ4.** Can the ability of on-line deliberations shift the status of practice, raise awareness, and create the premises to rebuild community trust in the particular context of public school rezoning?

Completed Work

As a parent, teacher, and researcher I tinkered early on with the idea of concrete ways this process can be aided by readily available technology given that an overwhelming majority of people have access to a smart phone.

The first stage of my research began with involvement in the public school rezoning processes. In order to access complex data regarding rezoning deliberations, the university signed non-disclosure agreements and collaborated with public school systems.

To answer **RQ1**, I started with hundreds of articles, a comprehensive survey of the literature of education policy papers, and computational methods for geographical clustering. As part of a team, I took part in live rezoning efforts, conducted field work, and many interviews between 2017-2021 with school planners, educators, and community members. The key finding was the inability to identify a software tool to suffice in computing all complex data processing and constraint clustering planners needed, resulting in the majority of the work being done manually. The status of school rezoning practice did not keep up with digital technology advancements. The process is highly reliant on printouts, posters, and projectors. The debates were only held in person, in an overcrowded cafeteria during a school night, with planners, parents, and children coming from a long day at work or school, and heading back home, with less sleep,

to another day in school or at work. Attending these meetings would be even more difficult for single parents, these with a second job or shift job, those going to school at night, or traveling out of town.

Things are even more cumbersome: computing a best scenario for building utilization requires intricate calculations and in-depth interdisciplinary knowledge. There are many constraints that need to be mitigated. Planners were required to carry all this work hand or non-education specific GIS software. We have witnessed the same struggle, in all analyzed counties (regardless of the socio-economic composition or geographical location). Our findings are captured in a 21 single column paper, not yet submitted for publication. The work aims to be a survey of the state of practice in entitled: “Redrawing public school boundaries: Traditional practices, the gap, and possible recommendations”.

We have built an on-line interface ¹ through participatory design and conducted pilot testing. Subsequently we deployed the interface in live rezoning processes seeking qualitative and quantitative data points, representative of the population within the studied area. The technical algorithm was developed and published by our team (Biswas et al. (2019)), yet the ability to conduct statistical quantitative community testing was slow to follow. After a 5 year effort, it was clear that the unique underlying social challenges are worth mentioning. Despite answering "yes" to **RQ1** and **RQ2**, for which were able to develop a technical tool able to compute extensive troves of complex data, manipulated with ease, and offered at no charge to all public schools around the university, school districts were reluctant to adopt or propose it during their live rezoning. Even school systems that presented the on-line tool to the community received massive uproar from an upset community.

No matter how much more transparent the school districts were trying to be, there would always be a group of vocal parents vehemently opposing the changes. At this point in time, lab studies produced highly promising results, yet were unable to get a chance at fair testing due to what was predicted to be a chronically eroded communal trust.

While documenting along the way, I continued working with public school officials to improve, test, and optimize the interface while trying to capture a full rezoning process. Despite having a mature interface, lack of mass adoption shifted our focus on a participatory dilemma and **RQ3** and **RQ4** surfaced.

We settled on a qualitative analysis to attempt answering **RQ3**. The fall of 2020 allowed the premises for a convenience testing user study. Here we had 12 participants accounting for over 14 hours of interview transcripts. The subjects were previously exposed to traditional public school rezoning in one or more capacities (parents, community members at large, school board officials, planners, teachers, principals, facility personnel). The interviews captured their first time exposure to the on-line tool, their reactions, understanding, process of intuitively learning, and their ability to complete a fictional rezoning decision within one hour or so. The findings of this exercise were highly positive, enlightening and reinforced the strong "yes" to **RQ1** and **RQ2**, yet surfaced

¹ <https://redistrict.cs.vt.edu/lcps-2021/ay8s0t2p/edit/>

social aspects that resulted in constraints initially overlooked by our team. Examples include the high polarization of previous participation in the surveys, raised participant awareness of the narrow space school planning officials work in due to so many restrictions, and community uneasiness with transparency. This helped answer, at least in part **RQ3**, through qualitative investigation. The findings are captured in a 7 page paper already submitted this year to an HCI conference.

Future Work

Given the research's maturity, we are seeking ways to test the work against statistically significant sample of people for a particular region. We think that including the technology advancements in this area of has the ability to positively impact over 50 million children and their families. However this research remains highly specialized and its unique challenges are not readily evident. We would highly benefit from an open discussion and input of a variate audience during the ECSCW Doctoral Consortium. Ideas generated during this time could be implemented during current school districts, supporting a life rezoning, especially in the context of COVID-19 social distancing. We are hoping to measure the community reactions and trust over the next year and produce a scientific argument to refute or support **RQ4**.

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