DESIGN OF A GEOGRAPHICAL VISUALIZATION-BASED INTERFACE FOR A COMMUNITY ACADEMIC KNOWLEDGE EXCHANGE

by

Billy Selvaseelan Augustine

B.Eng., Bharathiar University, 1994
M.Eng., Bharathidasan University, 1998

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Examinig Committee:

Dr. Luanne Freund, iSchool (Library, Archival and Information Studies) Supervisor

Dr. Richard Kopak, iSchool (Library, Archival and Information Studies) Supervisory Committee Member

Dr. Richard Arias-Hernandez, iSchool (Library, Archival and Information Studies) Supervisory Committee Member
Abstract

Bridging the existing divide between the members of the DTES community and academic research was the overarching motivation in this research project. With the members of the DTES community as the primary users, an easily accessible map-based visual interface was planned and designed as an alternative point of entry to the existing Downtown Eastside Research Access Portal (DTES-RAP) to access community-based research.

The author commenced the research by conducting a literature review to study the theories of community-based research that corresponded to the goals of the research. Here, journal articles dealing with aspects of community engagement, cultural sensitivity, geographic visualization, community mapping, searching as learning were among those that were studied. Following this study, textual analysis was done on journal articles about the DTES that were available through the DTES-RAP, to bring out locational references and main topic areas addressed in each study. An iterative design-based approach with stages such as empathize, define, ideate, prototype and test, was adopted. The resulting connections between organizations, authors and topics were represented in a map-based visual interface, designed to promote learning through exploration.

Following the prototyping stage, a pilot study of the interactive version of the interface was conducted with graduate students of the University of British Columbia. On receiving the approval of the UBC Behavioural Research Ethics Board, a small-scale usability study was conducted with the members of the DTES community to evaluate the current design and identify areas for improvement. Some conclusions have been drawn and recommendations made based on the knowledge gained through this study.
Lay Summary

This project aims to develop an easy to use map-based visual interface to the Downtown Eastside Research Access Portal (DTES-RAP). The project seeks to bridge the divide between the members of the DTES community and academic research(ers). Journal articles about the DTES that were gathered and shared through the portal were studied to identify places, organizations and topics mentioned. These were presented on a map interface, which allows for exploration of the information. A design-based research plan was followed, with stages to learn about user needs, build a model, and test it. A small study was carried out with members of the DTES community with the approval of the human ethics board to evaluate the current design and identify areas for improvement.
Preface

The research for this thesis was carried out exclusively by the author under the guidance of the supervisor and two supervisory committee members. The author conducted pilot study with UBC graduate student participants. The author further conducted usability studies with participants from the community of the Downtown Eastside with the approval of the UBC Behavioural Research Ethics Board (certificate of approval H19-01613).
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<td>BioMed Central</td>
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<tr>
<td>CBPR</td>
<td>Community based participatory research</td>
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<tr>
<td>CBR</td>
<td>Community-based research</td>
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<tr>
<td>CCID</td>
<td>Cultural context-oriented information design</td>
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<tr>
<td>CoV</td>
<td>City of Vancouver</td>
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<tr>
<td>DTES</td>
<td>Downtown Eastside</td>
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<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<td>MRAi</td>
<td>Making Research Accessible Initiative</td>
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<tr>
<td>MVP</td>
<td>Minimum Viable Product</td>
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<tr>
<td>NGO</td>
<td>Non-governmental Organization</td>
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<td>PPGIS</td>
<td>Public Participatory Geographic Information Systems</td>
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<tr>
<td>PR</td>
<td>Participatory research</td>
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<tr>
<td>PWUD</td>
<td>People Who Use Drugs</td>
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<tr>
<td>SIA</td>
<td>Social Impact Assessment</td>
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<tr>
<td>STOREE</td>
<td>Supporting Transparent and Open Research Engagement and Exchange</td>
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<td>SUI</td>
<td>Search User Interface</td>
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# Glossary

**Community Mapping**
Community Mapping, also called Public Participatory Geographic Information Systems (PPGIS), is a tool that can be used to tell a story about what is happening in our communities.

**Concept map**
A concept map or conceptual diagram is a diagram that depicts suggested relationships between concepts.

**Design thinking**
A systematic and collaborative approach to identifying and creatively solving problems.

**Geographical Visualization**
Geovisualization or geo-visualization (short for geographic visualization), refers to a set of tools and techniques supporting the analysis of geospatial data through the use of interactive visualization.
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Thanks also to my parents and dear family for their constant encouragement over the years.

I am grateful to my wife Nerthi and my daughter Candace, for their patience and support during this period.

Above all, I thank my Saviour and Lord Jesus Christ, who makes all things beautiful in His time, and through whom all things are possible.
Dedication

This work is dedicated to the members of Vancouver’s Downtown Eastside community.
Chapter 1: Introduction

1.1 Background

This master’s thesis research by the student researcher comes under a sub-project of the ‘Making Research Accessible in the Downtown Eastside’ Initiative’ (MRAi-DTES). MRAi is a campus-community collaboration led by the Learning Exchange Unit of the University of British Columbia seeking to improve access to academic research and community generated materials with a focus on Vancouver’s Downtown Eastside (DTES).

Figure 1 Satellite image of Downtown Eastside

The key areas in this research fall in line with MRAi’s intended outcomes which are to ‘increase the accessibility and impact of research by facilitating: open access to research materials, the development of plain-language summaries, and opportunities to share information and learn from one another (i.e. knowledge mobilization.’ (From MRAi Statement on guiding principles and work plan, October 2018.) More specifically, this work focuses on the DTES InfoHub project which is carried out as part of the STOREE Research Project.

1.2 Significance of this research

One of the issues addressed by this research is the disconnect between academic researchers (and the products of their research) and members of the DTES community. The following factors based on studies of the DTES have contributed to this ‘disconnect’, including:


2. Stigmatization and stereotyping of marginalized communities (Liu & Blomley, 2013)

3. Expectation of social justice / social change and lack of investment in community (Boyd, 2008), (Blacksher, Nelson, Van Dyke, Echo-Hawk, Bassett, & Buchwald, 2016), (Hacker, 2013)

4. Researchers pursuing non-participatory community-based research projects (Damon et al., 2017)

To address the disconnect, researchers here at the University of British Columbia, have commenced dedicated efforts to address issues underlying this problem. Lack of access to community research has been recognized as an important barrier to sharing knowledge obtained.
regarding Vancouver’s DTES. This could remain as an ongoing challenge for any academic institution due to reasons such as;

1. Restricted rights and ownership of published research,
2. Differences between academic and non-academic audiences and
3. Poor availability and access to the concerned information in a mode and time of choice.

In order to make academic research about the DTES available to members of that community, the MRAi has developed the DTES InfoHub as a collaboration between the learning exchange and the UBC library. The InfoHub is an open access information repository hosting DTES-based academic research and community-generated materials. These are in the form of mostly text-based journal articles, theses / dissertations, and some community-based grey literature, including unpublished reports from community organizations. One of the contributions of the information hub is that wherever possible, academic publications or preprints are made available through the portal, taking into account legal rights and restrictions.

1.3 Basis and general focus

Non-academic users of this repository of community research come across barriers in terms of the format and scientific nature of the resources housed therein. This therefore has become one of the hurdles in the way of MRAi’s intention to increase access to and the impact of research among members of the DTES community. Clement and Shade (2000), portray a seven-layered conceptual model of access that identifies the many ways in which access to online information can be hindered and facilitated. Layers such as devices, software tools, content services, service/access provision and literacy / social facilitation fall in between. The general focus of this research is to aim for enhancement of access to reach a high level of literacy and
social facilitation by means of a user-centered design of the search interface for the community research at the DTES InfoHub. Community users shall be encouraged (through the design) to search and find suitable sources of information which they consider to be relevant and accurate based on their needs and context of use. While discussing the concept of ‘universal usability’, Shneiderman (2000), notes that mere access is not sufficient to ensure successful usage of computing services. According to him, educational agencies should acknowledge the challenges of technology variety, ‘user diversity’ in terms of differences in skills, knowledge, literacy, culture, income, etc. Novick & Scholtz, (2002), consider ‘universal usability’ as a research agenda and as an ideal. They explain that interface usability issues which seem trivial to some users could be significant for some others. They attribute this to user characteristics such as age, location, culture, education, cognitive / physical abilities and also economic status.

1.4 Design-based approach

This research aims to take a design-based approach to increasing the accessibility of materials in the Infohub through the interface. At this stage, a geographical form of visualization (map-based approach) is conceived as a means of facilitating user navigation and discovery through exploratory browsing that is suited to the needs of this user group and the project goals. The idea behind this approach is to integrate and represent key community locations and research in a visual form to which community users of this platform can relate, given the strong place-based community identity of the DTES. A visual search interface has the potential to be effective with a wide range of user groups with different levels of reading ability and digital literacy, which is a feature of the study population. The visual interface aims to highlight the connections that exist between research projects, published research and physical locations (organizations)
within the DTES neighborhood, thereby situating the research in a community context. This also is important due to the investment of the community members in activities related to the health and well-being of their community where research results could inform their work.

1.5 Goal of the research

The main goal of this research is to improve access to research on the DTES by designing a search interface based on geographical visualization that meets user needs. This research will be informed by community perspectives on research. In achieving this goal, steps shall be taken to identify a set of community / place-based attributes (metadata) that could be used to represent community-based research to develop an interactive exploration-driven prototype geographic visualization interface. The interactive prototype version of the interface shall also be evaluated through user study.

1.6 Research question

Given that the goal of this research is to improve access for members of the DTES community to research on the DTES, the overarching research question becomes:

How to best meet user goals and needs while accessing DTES-based research through the design of an interactive geographic visualization-based interface, which;

a. offers users an explorative learning experience

b. provides location-based resources on DTES-based research

c. connects topic-based metadata to location or agency-based research within the DTES
1.7 Perceived user benefits

There are two user groups that have been considered as potential users of the proposed interface. The primary user group consists of the community members working and or living in Vancouver’s DTES. The secondary user group is researchers who wish to engage in community-based research based on the DTES. Based on prior community-based research, some of the conceivable benefits for the primary users of the DTES InfoHub are;

1. Ease of access to community research through a visual, map-based interface.
2. Quick access to the results (highlights) of the research.
3. Learning about connections between research and physical locations within their neighborhood.

Perceived benefits for secondary user group (researchers) are;

1. Improved visibility of published research by members.
2. A novel conceptualization of their research as place-based.
3. Enhanced search capability offering better clarity of their study population.
Chapter 2: Literature review

2.1 History of the problem

Applied research (under which community-based research falls) has been observed to possess a distinct set of challenges when compared with theoretical research. This becomes more evident considering the issues covered by community research, including health, housing, employment, cultural identity, etc. The impact of these issues on every-day life for members of the community is clear. The main stakeholders in community-based research are members of the community themselves, community organizations and researchers (including NGOs / academic entities). These include historically marginalized communities and therefore there is a heightened need to conform to ethical protocols, practice and maintain ethical standards / requirements at every stage of the research process.

This further requires a clear and detailed understanding of the moral and ethical implications based on the specific area of research. Community engagement and participation in the research cannot be expected without due consideration for individual (cultural) identity, dignity / respect. This is more so due to the difference in the viewpoints of both the community members and the researcher. The researcher aims to achieve high-quality (un-biased) information /data which would lead to more effective research (of course with more benefits to the community). The community member’s standpoint would be one of curiosity (and suspicion) on the intentions of the research(er) and the hope of a better life in exchange for the transaction of information. Often, the members of the community feel the most vulnerable when non-members attempt to invade their personal spaces. Conflicts could arise due to social, cultural and personal preferences, differences and received stances. Besides these, the element of novelty in research also could bring with it a need for a shift in cultural thinking of the individual or community
concerned. For example, when participatory activities such as community mapping are conducted to identify community assets in a neighborhood. It becomes imperative that these challenges on the part of the community members be recognized and respected by the researchers for any effective level of community interaction or participation can ever commence.

Damon et al., (2017) reiterate the value and difference that truly community-based participatory research makes in the level of involvement and satisfaction achieved in the eyes of the research participants themselves. They bring this out quite strongly in the words of one of the DTES participants, who said, “this person actually listened to me. I could see change. I could see that he or she is taking interest in what we’re saying”.

Callaghan (2018), believes that researchers must find ways to engage intimately and develop trust with communities understanding and accepting community narratives on their own terms. Community members must be treated as “first among equals” in this process where they can review and even redesign proposed research methods, question and instruments.

2.2 Theories of community-based research

2.2.1 Expectation of social change

There is an expectation of social change in some form or the other by the members of the community as a result of their involvement in research. They expect this to play out in a tangible form either in the immediate future or in the long term, depending on the urgency of the problem of research. The researchers have their eyes set on achieving the best quality of data collected during the research process. (Blacksher et al., 2016). This difference in priorities between the researchers and the community over many years, translates into the frustration felt by members of the community who feel that their trust and vulnerability have been violated or exploited.
There is an overall sense of disappointment due to unfulfilled expectations creating a barrier between research(ers) and the community who form the major stakeholders in the research. This gulf due to the perceived breach of trust deters the community from active participation in research even if the cause is one of relevance and prime concern for the intended community. One method of instilling a sense of trust within the community members would be to give back the knowledge gained in a manner that is both relevant, current and acceptable to them. As Clark, 2008 clarifies, ‘change' is not an inevitable consequence of research engagement, and users shy away from researchers when they perceive that “nothing changes” in their circumstance.

Boyd records this statement from a participant “I really am wondering now. How is this project going to benefit the people down here? People, a lot of them spilled their guts, and a lot of people worked very hard on this project. And I'm not sure, really, now, what use it's going to be put to, how it's going to help” (Boyd, 2008, p. 39). She also states that even researchers sometimes wonder how research findings would make a difference in the lives of the women who live in the DTES.

Blacksher et al. (2016), concur with the notion that building trust is a “never ending process” and requires an observable correlation between action and words of researchers in the eyes of the community to become a reality. They are of the view that this is more likely to happen in a ‘participatory relationship’ wherein community involvement and agreement is obtained at all stages of the research, right from forming the research agenda to data sharing, reporting progress or joint development of publications. There is also the view that advocacy should be a key component in the research to make the community believe that researchers and the research “match words with actions”.

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2.2.2 Culturally-sensitive community relationship development

Adequate thought, effort and time should also be put into community-based investments that develop relationships with members of the community. Leavy (2017), notes that community-based participatory research (CBPR) involves collaborative partnerships between researchers and the community members. The concept that researchers should actively involve communities right from identification of research problem to the distribution of the research findings is reiterated with reference to power sharing arrangements. She also assigns much importance to understanding culturally sensitive definitions and cultural perspectives within the context of the research. Good ethical practice should be reflected in the research since ‘social justice’ drives issues in CBPR: “An inclusive and collaborative process is most likely to result in a worthwhile, mutually beneficial, and culturally sensitive approach.” (Leavy, 2017, p. 230).

Boilevin, Chapman, Deane, Doerksen, Fresz, Joe, Leech-Crier, Marsh, McLeod, Neufeld, Pham, Shaver, Smith, Steward, Wilson and Winter, (2018) address some salient ethical issues in their “Manifesto for ethical research in the DTES”. They recommend that ‘consent forms’ be written in ‘accessible language’ to ensure participant understanding of their role in the research. They also expect the researchers to adopt a ‘trauma-informed perspective’ to consider how the research could negatively impact or harm the participants.

2.2.3 Ethical / contextual considerations in community engagement

Fitzpatrick, Martiniuk, D'Antoine, Oscar, Carter, & Elliott (2016) have undertaken a systematic literature study on methods adopted for seeking consent for research among Indigenous people groups. They considered literature covering research done in the United States of America, Australia, New Zealand and Canada. The ethical considerations adopted during
recruitment of Indigenous participants for research contain provisions such as having an interpreter (for obtaining informed consent), questionnaire-based consent materials, information booklets or flip charts. The researchers note that for health-based Indigenous research projects the participants preferred graphically illustrated flip charts over information booklets. This, in combination with the use of interpreters and a story telling methodology that embraced their cultural practices was found to be effective for their involvement in the research. These examples provide evidence to support the inclusion of these considerations in the dissemination of research findings.

Some observations made by the researchers lend themselves to a better comprehension of the needs of the community after completion of research. As elaborated by Fitzpatrick et al. (2016) in page 5 of their findings from this systematic review, the following points may be brought forth that bear much relevance and significance to the MRAi context and objectives. In the context of the design of a visual interface for community members in the DTES considering the diversity of the local population, including many Indigenous community members in the neighborhood, the following findings by the authors were considered to hold relevance in this research as well.

1. Flip chart with visual content found meaningful (health-based research context). This brings into view the benefits of visual interpretation against textual at least in the context of the health-based research.

2. Removal or reduction of legal and scientific jargon. Evidence of improved trust by avoiding word repetition and careful choice of words.

3. Graphics used to illustrate concepts / assist understanding

4. Mistrust of research due to past discrimination by researchers
5. Cultural beliefs that contradict with research requirements

6. Requirements such as signing research form (taken as insult to elders since a ceremonial offering of tobacco was accepted earlier). Sensitivity to cultural practices and protocols go a long way in community acceptance and engagement in research.

Some decisions taken by researchers hold good for meaningful and relevant presentation of research findings to the community;

1. Establish a reciprocal relationship with the community by involving them in the research process (including interpretation of results) to promote a sense of connection and feeling of importance in the research.

2. Ensure a logical flow of information (during translation into other languages).

Among the current guidelines for seeking (ethical) consent there is consent for dissemination of research and consent for feedback for research results to the communities. Ethical requirements of research bring in the need for plain language explanation of the research at all stages as also highlighted by Boilevin et al., (2018).

2.3 Design Approaches to Community Geovisualization

Building upon the notions of community-based research, culturally appropriate design, and the value of visualization to enable access to information across diverse user groups, this project will employ geographic visualization as the core design component of the interface. The following sections describe different approaches to geo-visualization, mapping and exploration as a means of supporting information access.
2.3.1 Borrowing and extending ideas from concept mapping

Alpert (2006), throws light on the usage of concept maps (knowledge maps) describing them as being visual representations of the knowledge of a domain. They are formed using “nodes representing concepts, objects, events, or actions connected by directional links defining the semantic relationships between and among nodes.” Having been used effectively in educational settings since the 1970s as organizational and visualization tools, they aid study and comprehension of a domain. More recently, computer-based concept mapping has been used to visualize the structure (of pages, documents) or resources of a website, as well as being a mechanism for direct navigation to specific pages. The ability of concept maps to centralize and visually organize relevant content in clearly structured ways while showing the connections between knowledge and information elements is valuable, as it offers more than a flat view of information, such as that observed when examining results from generic search engines. Concept maps can represent the hierarchy within which a topic or an object can be located or the connections that exist between properties or characteristics of an object or a system.

While considering the applicability of concept mapping in the context of this research, we need to explore possible methods to prepare such maps to accurately and effectively represent the resources within the database. In this regard, research done by Valerio (2014), provides some useful insight. The benefits of concept maps in aiding concise presentation of information as well as in enabling quick access to content depends on their accurate representation of the included documents. While it is certain that they “provide a browsable index to help humans navigate through documents to find material of interest “, he also brings into attention the difficulty in manually constructing concept maps for a large pool of candidate documents. He has
investigated usage of text mining algorithms to provide automatic support towards the
development of accurate and automated concept maps.

In the context of this research it is felt that by extending the features of concept mapping
to include locational details, a richer and more satisfying user experience can be provided to each
interested member of the DTES community. The indirect benefits for the user during the
interaction with such a visual representation of knowledge is that the user gets an idea of the
connections between individual information elements and an idea of the hierarchical order in
combination with (or without) the geographical or spatial attributes. This brings in the need for
working out a feasible system of cataloging and classification that would bring the benefits of the
resources within the DTES-Infohub within the easy reach of the user.

2.3.2 Cultural context-oriented information design

You, Kim and Lim (2016), examine cultural issues in information design through their
survey-based study. They found that the quality of information is elevated through developing a
good relationship between cultural context-oriented information and information design. They
consider the advantages of CCID (cultural context-oriented information design) in providing
value in terms of aesthetic and emotional experience to the users. Cognitive aspects such as
interpretability, accessibility, understandability are also improved using such designs they
observe. The authors sought answers to the following questions in their study based on restroom
signs in public places. Comparison had been made with conventional universal information
design-based signage and signs developed with CCID. Their questions on both types of signage,
aim to evaluate attributes such as accessibility, appropriateness, objectivity, attractiveness,
relevance (to cultural identity), completeness, understandability and levels of error.
The authors believe that their findings can help in shaping information design guidelines through what they call positive and negative conditions of high-quality information. They also conclude that the degree of emotional stimulation on human sensibilities, such as joy, pleasure, boredom, and lack of interest, might play an important role in the decision-making process for determining whether information is adequate or inadequate. A few of the authors main results and conclusions which they believe “can help shape information design guidelines” are as follows:

1. Information designers need to use design that stimulates (or is associated with) positive emotions such as joy and pleasure, avoiding negatives ones such as pain, sorrow or anger. “Emotions are powerful mechanisms for customers to connect and build relationships with (or revulsions to) products, services, events, brands, or organizations.” (Shedroff & Lovins, 2009, p. 199). Providing an uplifting experience to the user through careful use of design elements would help towards achieving meaningful user engagement with the interface.

2. Higher degree of cultural relevance and significance increases the chances that the information is perceived as adequate but there is a danger of using visuals that are too specific to one cultural group. Danger also exists in adopting excessive semantic metaphors for signifying cultural significance through visuals / visual design as other users from other contexts may also need acknowledgement.

3. Adopting high degree of aesthetic creative expression enhances positivity in emotional stimulation improving perceived adequacy of information.

4. Besides augmenting attractiveness, CCID improves user perception on cognitive aspects such as interpretability, accessibility, understandability, and lack of errors.
5. However, in appropriateness and objectivity, which form the pragmatic/rational aspects of information design, CCID is seen to be least beneficial (You et al., 2016).

Factors / attributes such as accessibility, relevance, completeness etc may also be considered in this research to achieve a CCID of the interface that promotes positive emotional user experience. Also, being able to leverage the benefits of positive color associations (Sutton and Altarriba, 2016) while aiming to achieve culturally appropriate design of the interface would be in keeping with the goals and objectives of this research.

It cannot be denied that primary importance remains with the value and meaning provided to the user through the content available in the community research repository. As Shedroff & Lovins, (2009), go on to explain further, ‘meaning’ (reality) becomes the deepest level at which users engage with a service or product. Users would have deeper connections and find satisfaction when they feel more accurately represented by the literature housed within the appealing design.

2.3.3 Geographical visualizations in the form of community maps

Community mapping is a method used to understand how communities view their own spaces and to empower them to contribute to the ways in which their communities are viewed and managed. It draws upon the tacit knowledge that members hold about their communities and the connections they have with community places. Callaghan (2018) writes about community mapping in research, connecting it with the notion of empowerment. Recognizing that communities already have the power to be self-governing and self-sustaining, they may resist exploitative policies and practices. She believes that a democratic space needs to be created where communities decide if the perspectives and methods of the researcher are relevant or useful.
Sampson, Morenoff and Gannon-Rowley (2002), have noted that geographic “hot spots” exist through a concentration of “multiple forms of disadvantage” bringing in spatial clustering consideration requirements to community-based research. They take a new direction in studying neighborhood processes which is to consider spatial interdependence among neighborhoods. They provide an example of spatial advantages derived from residential proximity to parks or good schools. In the same vein, examples are also provided for disadvantaged environments that face spatial disadvantages such as segregation, disorder etc. In this context, community or neighborhood mapping is becoming a common practice in community development projects. These maps can illustrate the spatial clustering of social, economic and health-related problems, along with the availability of resources in specific neighborhoods. Community mapping also helps to give a more holistic picture of the community needs and resources to politicians, policy maker and service providers.

Hawthorne and Kwan (2012), suggest that community maps fill the need for a contextualized representation of how space is experienced by the members of the community. They also introduce the concept of “perceived distance” which combines experiences such as wait time, quality of care etc to geographic distance of the service providers. Preparation of community maps needs authentic and sustained dialogue between community members and researchers, more so since they represent the lived experiences of a community. However, as the next best alternative, efforts will be taken in this research to identify geographical locations that are important in the eyes of the community through their previous representations as found within community-based research.

A geographical-based visualization thus arrived at, is proposed to be used as an interactive (hyperlink-embedded) interface for effecting engagement with community users. It is
anticipated that selected geographical locations would serve as interactive nodes acting as entry points for community members to gain access to relevant research. Options wherein community members are encouraged to provide user-generated content may also be considered. The city of Vancouver has produced graphical representations of DTES community identified critical assets (as shown in figure 2) in the Social Impact Assessment (SIA), 2013. They have also produced maps showing community-based development area indicating community assets and some locations designated as the heart of the DTES community as shown in figure 3.

Figure 2 DTES community identified assets
Image source: (City of Vancouver, p 9, 2018) [https://vancouver.ca/home-property-development/44450.aspx](https://vancouver.ca/home-property-development/44450.aspx)
2.3.4 Searching as learning

Rieh, Collins-Thompson, Hansen and Lee, (2016), look at different approaches that focus on the intersection of searching and learning in their critical review. They highlight exploratory search as a type of search behaviour motivated by the desire to explore, overcome uncertainty and eventually learn. A “searching as learning” approach to search interface design will be used as a model, since it combines search and browsing behaviour to “navigate, understand and better interpret the meaning of retrieved information.” They also “argue that, when designing these navigational structures as well as designing the search functionalities, support for learning behaviours should be acknowledged.” (Rieh et al., 2016).
In the context of this research, it is expected that during their initial interaction with the research interface, community users could adopt a cognitive learning mode labelled by Lee, H., Lee, J., Makara, Fishman and Hong (2015), as “receptive”, being to a lesser degree “critical” or “creative”. Learning behaviors during their search process could be labelled as “recalling, identifying, matching, comprehending”. Their search behaviors could fall under categories such as “known-item searching, specifying, obtaining, selecting, acquiring and judging relevance” (Rieh et al., 2016). On subsequent interactions it they may adopt ‘critical’ or even ‘creative’ learning modes, with learning behaviors that could grow through “separating, sorting, contrasting, probing, discovering” possibly leading up to “inventing, composing and building” (Lee et al., 2015; Rieh et al., 2016).

In an effort to offer adequate space to experience such growth, it is believed that the user interface could also be designed to incorporate search behaviors that could be labelled as “evaluating usefulness, assessing credibility, comparing, differentiating, prioritizing and sense-making”. Currently it is conceived that this can be done through providing a variety of browsing or searching options (with suitable cues) on the interface which give the user some choice as to use either the receptive, critical or the creative learning modes through the system. The general model of searching and learning as understood from this study helped inform the design of tasks during the usability study on the interface prototype.

2.4 DTES as seen in prior research

The Downtown Eastside, one of Vancouver’s oldest neighbourhoods with a population of around 18,000 (based on 2011 census, as recorded in the City of Vancouver, 2018) is located on the unceded territory of the Coast Salish Nations. It has long been the urban home to Indigenous
communities and residents of Chinese and Japanese ancestry, among immigrants from many regions. The DTES currently comprises seven communities; Chinatown, Gastown, Industrial area Oppenheimer, Strathcona, Thornton Park and Victory Square.

Figure 4 Downtown Eastside Local Area Plan Areas


The needs of the communities at DTES have been categorized as falling under housing, community well-being, safety, child vulnerability, heritage among others. The City of Vancouver has developed two action plans in the form of the DTES plan and the SIA (Social Impact Assessment). The City of Vancouver, (2018) has focused on aspects such as housing and substance use, working towards social and economic revitalization in their efforts for the DTES. There are new long-range planning and development schemes that propose to build on all past plans, policies and programs. They have recognized that innovative approaches are needed to build community capacity and resilience and reduce barriers to social services, housing and economic sustainability, while also acknowledging the resourceful, social and spiritual initiatives.
by many committed residents, non-profit agencies, community organizations, faith-based organizations and private sector partners who are active in the area.

Liu & Blomley, (2013) bring to our attention the negative portrayal of the DTES in three frames of medicalization, socialization and criminalization. They argue that the DTES community has been negatively represented as consisting of drug addicts and news coverage has been sensationalized to create fear about the members, as if they are all criminals. They conclude that the media has stigmatized an already marginalized neighbourhood, resulting in further disempowerment of its residents. This type of stereotyping also can cause accelerated decline and abandonment of the area by certain segments of society.

Damon et al., (2017) present the views of PWUD (people who use drugs) on their experiences as peer researchers in the context of community-based participatory research in the DTES. They expose the issue of stigma as related with health, socio-economic status and drug-use. Peer researchers living in the DTES were able to develop a sense of trust with research participants owing to their familiarity with the social norms and the absence of the distorting effects of stigma. In the background of a heavily researched neighbourhood, research participants cite from their experiences, the “night and day” kind of difference between participatory and non-participatory research projects in terms of their satisfaction and trust in the research. There are ample examples of interactions where participants express their anger at being exploited in a context of research that had no bearing or accountability with community interest.

Positive research experiences are those in which the voices of the participants are heard through CBPR. Participants have become wary of detached, unaccountable and non-transparent research that could finally be harmful to their community. Over time, participants have developed the ability to sense when research is being non-participatory and where their
involvement is just to make up numbers. This “tokenizm” approach to community-based research has been also criticized by Boilevin et al., (2018) who reason that while it helps the research look good on paper, it restricts space or power for peers to make important decisions in the project.

Liu & Blomley, (2013) express their displeasure at the DTES being shown as a problem in need of a solution and argue that the journalists, researchers, NGOs and even the government ignore the assets of the DTES and give importance to certain voices only. They see moral and political nuances behind these three framings of the DTES and would rather see this as a “place of community, characterized by solidarity, resourcefulness, ingenuity, resilience, determination, strength, defiance, and resistance” (Liu & Blomley, 2013). They also refer to some geographical locations such as the ‘Carnegie Community Centre’ with its long-running ‘Carnegie newsletter’ where the DTES is portrayed as a “strong tight knit community based, in part, on commonly shared hardship and estrangement.”

It is this general idea that is carried forward in this research utilizing visual geo-spatial representations (maps) that show places that have meaning and value to the communities. These locations could be social housing units, health care centres, parks and open spaces, schools, community facilities, cultural / heritage facilities, local business areas, facilities for safety, transportation etc. It suggests also, that care be taken in the use of metadata and labelling to ensure that the representations of the community do not add to stigmatization of the DTES.

This geographical analysis of the community at DTES is proposed to be carried out through the analysis of existing DTES-based research available at the InfoHub to become an important feature in the design of the community knowledge exchange interface. Cues will also be taken from other relevant sources such as the community asset mapping exercise undertaken
by the City of Vancouver in their Downtown Eastside Social Impact Assessment Study (2014). Both of these projects were carried out with substantial community involvement, thus, while the current project is constrained in terms of direct user input, it consciously builds upon work that has been informed by community perspectives and voices.

2.5 Summary of research-based findings

The findings from the review of relevant literature could be summarized as follows:

**Conceptual and cognitive requirements**

1. Avoid semantic metaphors focusing on one culture / user group. (You et al. 2016)
2. Aim to make the searching process into a learning experience. (Rieh et al. 2016)
3. Offer progressive aid to users on their explorative journey. (Boilevin et al. 2018)

**Metadata and representation requirements**

1. Aim for accurate and efficient representation of included material.
2. Avoid or minimize complex terminology and jargon. (Fitzpatrick et al. 2016)
3. Explore avenues to extract metadata from in house materials.
4. Aim for completeness and avoid stigmatization in representation through metadata. (Shedroff and Lovins 2009)

**Geographic-based visualization requirements**

1. Aim for holistic representation of the community needs and resources. (Callaghan 2018)
2. Use community mapping principles to express users’ point of view. (Hawthorne and Kwan 2012)
3. Highlight places deemed relevant and important to the community. (Sampson et al. 2002),

4. Use spatial attributes to display other knowledge. (Valerio 2014)

**Interface design requirements**

1. Adopt simple, easy and non-cluttered visual design. (Fitzpatrick et al. 2016)

2. Use an inclusive interactive design approach displaying cultural sensitivity.

3. Avoid design elements that express negativity or complexity. (Sutton and Altarriba 2016)

4. Use design that promotes positivity and delightful exploration. (Shedroff and Lovins 2009)
Chapter 3: Methodology

3.1 Overview of the design thinking methodology adopted

This research will be carried out through a design research approach, guided by a design thinking model as recommended by the Hasso-Plattner Institute of Design at Stanford (d.school). A pictorial representation of the five-stage design thinking model is as shown below. (Terrar, 2018)

![Design Thinking Model](https://dschool.stanford.edu)

**Figure 5 Stanford d.school design thinking process**

Image source: [https://www.enterpriseirregulars.com/125085/what-is-design-thinking/](https://www.enterpriseirregulars.com/125085/what-is-design-thinking/)

While each of the stages are unique and clearly defined, there is an expectation of re-visititation and re-utilization of stages within the limitations of time and scope of each project. It is hence an iterative design process with iterative progression of stages featuring intermittent repeat of earlier stages as directed by the subject and nature of the design challenge. One such iterative adoption of the design stages with iterations shown through dashed lines and arrow heads is shown below (Dam & Siang, 2019).
Figure 6 Possible iterations within design process

Image source: https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process

### 3.2 EMPATHIZE stage: Understanding user needs

Being a human-centered design process, the empathize stage of the design thinking approach involves practices and methods that are designed to gain insight into the needs of users in the context of the research. Observations drawn from interactions with users are typically used to understand the issues involved. However, in this study, empathizing with users through direct interactions is not possible due to reasons of research participant fatigue as discussed earlier. This limitation has necessitated the use of existing literature from community-based DTES research and results from an unpublished prior study (interview) conducted on a member of the DTES community as a means of deriving user’s expectations and needs in connecting with community research. Although limited data exists, user needs and goals as extracted form
existing literature and the prior unpublished interview shall be used for the creation of realistic use-case scenarios and user personas that aid in the design and development of the interface prototype. DTES-related research literature will also be analyzed for identifying metadata in the form of primary and secondary subject areas, location-based information, abbreviations, author affiliations among others.

3.2.1 Deliverables from EMPATHIZE stage

1. Derive user needs and expectations through analysis of prior studies
2. Obtaining information on the existing structure of the DTES-research database
3. Identification of specific focus within available literature types
4. Metadata categories chosen for textual analysis

3.3 DEFINE stage: Refining research question

In this stage core issues of the study will be defined through the analysis and synthesis of observations made in the previous stage. Here, the goal of the research is refined for better clarity and detail. Also, user experience design ideas as related to features, functions and other areas of focus are collected from existing systems in use by the community.

3.3.1 Deliverables from DEFINE stage

1. Identify DTES locations associated with selected literature type
2. Develop refined realistic use-case scenario(s) for the interface
3. Identify benefits of using location-based search for users
4. Refine the original research question(s)
3.4 **IDEATE stage: Maximizing ideas**

This stage is where new design ideas are generated through brainstorming or other similar exercises. The aim is to arrive at a maximum number of ideas from which the few best and most feasible ones may be selected.

3.4.1 **Deliverables from IDEATE stage**

1. Generating interface ideas promoting interaction, engagement, learning, discovery and exploration.
2. Generate a list of possible subject/location-based navigation icons.
3. Explore geo-visualization options including base-map, filtering, results page etc.
4. Arrive at preliminary ideas for interface design

3.5 **PROTOTYPE stage: Hands-on prototyping process**

Producing simple, inexpensive, scaled down prototype versions of the interface. User experience is sought for observing real-time issues related to the look, feel and use of the interface. Key aspects as specified in the research question are considered for study during user study through the prototype version. Design ideas could be added, revised or rejected during iterations in this stage.

3.5.1 **Deliverables from PROTOTYPE stage**

1. Finalize location/subject-based metadata categories that represent DTES research
2. Finalize design look/feel for query/exploration page
3. Finalize design look/feel of preview/results page
4. Developing a lo-fi or med-fi prototype

3.6 TEST stage: Understating the product and users

This stage is set up for testing the prototype and gaining more understanding on the needs of the users. Alterations and refinements on the prototype version are possible for immediate or future consideration. The aim is to arrive at a deeper understanding of the product and its users.

3.6.1 The issue of usability

Nielsen, (2012) of the Nielsen Norman Group, in his web-article introducing ‘usability’, defines it as “a quality attribute that assesses how easy user interfaces are to use.” As an internationally recognised expert on the topic of ‘usability’ for the web, he vouches that ‘usability,’ relies on 5 ‘quality components’, namely learnability, efficiency, memorability, errors and user satisfaction. He states that ‘Learnability’ addresses the ease with which first time users of the system complete their tasks, while ‘Efficiency’ defines the time required for tasks by familiar users. ‘Memorability’ relates to the ease with which returning users re-establish their proficiency on the system. ‘Errors’ establishes the number, severity and recoverability from errors made on the system, and ‘Satisfaction’ makes the user judge the pleasantness of the system design.

3.6.2 Deliverables from TEST stage

1. Conduct as pilot study (with secondary user group) to precede a detailed usability study.

2. Conduct a user interaction/usability study of the prototype with primary users.

3. Offer recommendations for refining prototype.
3.7 Current limitations of the study

The following are some of the perceived limitations in this study which shall be addressed by adopting suitable alternative methods as elaborated below;

1. The concept of adopting a geographical (location-based) visualization to engage with the UBC-led DTES-based research has been conceived out of perceived benefits from such a system. These have not been proposed through recommendations from user studies but arose from the strong place-based identity of the user community as extracted through review of DTES-based research. The general concept also has arisen out of the benefits seen in community mapping activities which bring out the importance of physical locations to members of a community. In order to mitigate this apparent limitation, a lightweight prototype has been built to be used to prompt feedback and response.

2. Inability to connect with proposed users of the interface in the empathize phase is acknowledged as a limiting factor in this study. In place of direct interaction, we have drawn upon existing research conducted within the same community. Further, a user interaction study has been carried out on the prototype of the interface.

3. Another observation that came to light during the analysis of the research articles was that a significant number of them were either devoid of DTES-based locational references or were found referencing locations outside the DTES.

4. There were a few instances where individual research articles referenced more than one DTES-based organization or study, bringing up the question of how the results would be represented on the map in these instances.
Chapter 4: Outputs of the design process

4.1 Empathize process outputs

4.1.1 User needs and expectations through analysis of prior studies

The empathize stage in the design process entails interaction with proposed users to elicit their needs and expectations in the designed product. Owing to the restricted direct access to the proposed primary users of the interface, it was decided to use a prior unpublished user study conducted regarding a new feature of the InfoHub (Making Research Accessible, 2017). Some observations were drawn from this interview conducted with a DTES community member by a researcher as part of the Making Research Accessible project at UBC’s learning exchange. The study was done to evaluate an earlier version of the DTES Information Hub.

Questions posed to the DTES community partner covered the following areas;

1. User’s common information seeking task (area and type)
2. User’s online search methods and information source preferences
3. Opinion on existing layout and interaction with DTES InfoHub
4. First impression on using tabs within the existing interface
5. User’s approach on search tasks to be performed on the interface.

The feedback given by the community member gives us some indication on user needs and perceptions on the interface and the information provided. Some inferences drawn through user responses and interactions, tie in quite well with the current study on possible use of geographic visualization to access DTES-based literature.
Some key observations as derived from the unpublished study are as follows;

**Barriers to satisfactory access to information**

1. Pay wall to viewing full article
2. Inaccessible language (or jargon)
3. Text heavy presentation
4. Journal articles heavy on statistical information

**Positive experience**

1. Increased navigational interactivity through hyperlinks
2. Additional information through hyperlinks
3. Pictorial (graphical) representation of categories through icons (as in LinkVan/bc211)
4. Clean (uncluttered) layout of the interface
5. Simple and clear navigational tabs on the interface
6. Quality tied in with source of info, recency and author’s expertise (or reliability)

**Digital and informational literacy**

1. Expected experience similar to that on LinkVan app or the bc211 website, both of which include icon-based interactions and location-oriented results.
2. Familiar with scrolling down to search for relevant information
3. Familiar with a few organizations and services offered

**User’s preferences**

1. Special events held by organizations
2. Search feature by ‘author’ and ‘date’
3. “Search this guide” feature
4. Audience-based organization of information on interface
Inferences drawn with reference to current study

1. Minimize jargon and text on the homepage and results/preview page
2. Provide navigational and informational interactivity (dynamic links)
3. Provide clear and simple to understand icons (with tool tips) to show categories
4. Provide alternative options for search other than locational search (through subject tags)
5. Provide a clean and simple navigational interface
6. Draw best ideas from existing apps and interfaces like LinkVan and bc211.

4.1.2 Overview of materials housed within DTES InfoHub

The empathize stage being an early exploratory stage, the aim was to perform an overall content inventory on the research database before proceeding with the identification of geo-markers in the documents housed therein. The following are some of the outputs arrived in this stage in the study and these include personal observations, design ideas from online sources, all duly referenced and attributed. A search for DTES-based content housed in the information hub revealed 445 documents within the date range of 1979 to 2019. The metadata contained the following information.

- **Type:** Text 447; Still image 2; Sound 1; Moving image 1
- **Genre:** Article 283; Postprint 103; Thesis/Dissertation 81; Other 69; Graduating project 8; Report 2
- **Subject:** Injection drug use, HIV . . . Homelessness etc.
  (Subject tags were found to be generated by the system based on keywords)
- **Affiliation:** Faculty & departments within UBC, Non-UBC and Alumni
- **Campus:** UBC Vancouver 80; UBC Okanagan 1
• **Degree:** PhD 44; MSc 13; MA 11; MSW 3 etc.,

With an aim of only considering documents within a recent 10-year period, the search criteria were refined to reveal details as follows.

Date range: 2008 to 2019 (to obtain results including 2018)

• **Type:** Text 375; Still image 2; Sound 1; Moving image 1

• **Genre:** Article 283; Postprint 103; Thesis/Dissertation 80; Graduating project 8; Other 5; Report 1

It was thus noted that at the time of retrieval 99% of DTES-related Thesis/Dissertations (80 out of 81) were from the last 11 years. Also, articles in that time amounted to 98% (277 out of 283). It was hence decided that the study could be done on DTES related publications in the InfoHUb covering the years from 2008 until 2019. Documents were analyzed on a yearly basis and the year-wise split up of the DTES-related theses / dissertations and research articles are as shown below.

**Table 1 Year-wise DTES-based research in database**

<table>
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<th>Theses and dissertations</th>
<th>Articles</th>
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</tr>
<tr>
<td>2008</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>80</strong></td>
<td><strong>283</strong></td>
</tr>
</tbody>
</table>
It was decided to focus the study on research articles published between 2018 and 2008 totalling 283 documents and analyze them for locational references. This was done by noting references to organizations and studies within the DTES contained within these research articles. All sections of the articles such as acknowledgements, author details/affiliations etc., were analyzed to gather locational information. Abbreviations and references to specific treatments, tools/techniques, theories, non-DTES locations etc., were also noted in the hope of expanding the existing list of metadata used. The detailed metadata study and extraction was at a later stage restricted to 136 documents (covering the recent 4 years), after observing that research areas already covered were found to be repeating in research articles of subsequent years.

4.1.3 Observations from the preliminary analysis

A preliminary analysis of documents published in 2018 was done using manual observations with minimal and supplementary use of NER (Named Entity Recognition) software. An online version of the Stanford CoreNLP 3.9.2 (with limited functionality) was used for highlighting entities such as organizations and locations. The preliminary study yielded the following observations.

1. DTES-based locational references were found to be in varying degrees or levels of importance. Some documents contained passing mentions while other documents revolved around whole neighborhoods or sometimes specific locations within the DTES.
2. Some of the documents contained references to non-DTES locations (based on authors’ or researchers’ affiliations depending on the area and topic of study).
3. References to specific projects, agencies, treatments, theories, tools / techniques, health issues etc., were observed with appropriate abbreviations; some of these have associated geo-locations.

4. The most common DTES locations mentioned were agencies, organizations and community centres. The exact locations of these were obtained from their websites so that these locations could be marked for location-based interaction at the final phase of the study.

5. Three methods of hyperlinking to respective documents were observed and noted: through the DOI link (through share feature in the InfoHub), in the URL containing the handle of the document, and through the open collections link found in the search bar on opening the document. It was planned to use the most appropriate / feasible of these hyperlinking methods to form topical and organizational connections with the journal articles during the development of the interface prototype.

4.1.4 Questions arising from the preliminary document analysis

The preliminary analysis has brought out questions in the following areas which need to be clarified to achieve the goals of this research.

1. Could a heat map kind of visualization be used to store and mark locational significance to a document?

2. How many documents can be shown to a user as they click or hover over one node in the DTES base map?

3. If many documents are to be shown will they be listed (in the same view) or will they be taken to another page (with a possibility of return to the geo-viz home page)
4. If only one document is to be shown per location what is the criteria for the choice of display. Will it be based on;
   i. Genre of the document
   ii. Locational centrality to the document

4.1.5 Summary of the empathize stage

The empathize stage had a primary objective of deriving user needs and expectations and a secondary objective of conducting a preliminary exploration on the research database. The aims of the exploration were to gain an understanding of the overall structure and metadata. The main challenge facing the achievement of the primary objective in this stage of the project was the restricted access to the primary users, namely the members of the DTES community. In this context, the inferences drawn through the analysis of the prior unpublished user study gained significance in providing user’s perspective having implications running through all stages of the study. Going through the preliminary study of the research database brought with it a lot of unanswered questions related to various aspects of the research. Some of the major ones were on the topic of locational and organizational referencing of the research articles while some others related to possible navigational and interactional challenges.

4.2 Define stage outputs

The define stage is a stage in the design thinking process which is designed to bring clarity and refinement to the questions generated in the preceding empathize stage. In this project, textual analysis of the journal articles to extract DTES-based locational references and
developing realistic use case scenarios forms the major part of this stage. The research goal was also revisited and refined following this stage.

4.2.1 Metadata considered during analysis of DTES literature

To enable easy generation of location-based results through the proposed visual map-based interface, the following metadata fields were planned for extraction from the journal articles.

<table>
<thead>
<tr>
<th>SI No</th>
<th>Title</th>
<th>Creators</th>
<th>Year</th>
<th>URL</th>
<th>DOI link</th>
<th>Snippet indicating location</th>
<th>DTES locations</th>
<th>Subject-primary</th>
<th>Subject-secondary</th>
<th>Subjects in existing metadata</th>
<th>Level of locational reference</th>
<th>Level of subject reference</th>
<th>Abbreviations</th>
<th>Addresses in authors affiliations</th>
</tr>
</thead>
</table>

Figure 7 Metadata recorded during analysis of literature

These metadata are expected to be useful in presentation of results as the users click on locational icons on the base map of the interface.

**Title:** Recorded to be presented in the preview window (bold and also may be italicized)

**Creators** (Authors): Needs to be shown along with (or below) the title for completeness of result and knowledge and copyright attribution.

**Year of publication:** This is essential information bringing out recency information and could be used to tie subjects to certain time periods.

**URL / DOI link:** Either of them could be used for hyper-linking the document through the interface.

**Snippet indicating location:** A few lines from the document containing reference to or mention of the agency (organization) to be shown below the title of the document in the results page.

There were two issues regarding the use of these snippets;
1. Due to limitations of the prototyping software, instead of user generated results (including location snippets) as originally planned, the articles themselves were brought up as results.

2. There were a few research articles that referenced more than one DTES-based location in the context of the research work undertaken. Therefore, we assigned only one location to each article, using the single or most frequently mentioned one. Future, operational versions of the system may need to consider multiple locational referents for each article.

**DTES locations:** The address (mostly street address) of the organization referred in the document. These details help in fixing place-markers on the base map for providing results based on locational referencing within the documents.

**Subjects:** These are the topic-wise subdivisions to which the documents are assigned to so that the referencing is made more specific and easier. Considering the visual navigational method adopted in this interface, icons representing subjects/organizations/locations shall be used on the Vancouver DTES base map on the homepage. Since one document could cover two or more subject areas subject-wise references are being studied along with locational references.

**Level of locational reference:** Ranking of documents based on level of locational reference was thought to be required assuming that there could be many documents referencing each location. To aid this the following method was adopted during the text-based analysis of these documents. Words such as high and medium were noted alongside the documents based on their level of locational referencing under high level (more than twice) or medium level (once or twice). This method of ranking was not found to add much value to the system and was not implemented in later stages of prototyping.
Level of subject reference: Some levels of subject-wise referencing of documents were also considered and recorded during the textual analysis of research documents. However, they did find much application as later found during the prototyping stage.

Addresses in author’s affiliations: These addresses were noted during the analysis; however, they were found mostly referencing locations outside the DTES.

4.2.2 Topical metadata analysis on the existing DTES Research Access Portal

An analysis was made within the current research database on the keyword-based algorithm-generated subject tags representing research articles. The top 24 subjects covered in text-based research articles between the years 2008 and 2019 within the DTES Research Access Portal (RAP) from a list of more than 320 subject tag occurrences are as shown below.

Table 2 Top 24 subjects covered by journal articles

<table>
<thead>
<tr>
<th>Injection drug use 36</th>
<th>Street youth 12</th>
<th>Antiretroviral therapy 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV 35</td>
<td>HIV/AIDS 11</td>
<td>sex work 9</td>
</tr>
<tr>
<td>Canada 24</td>
<td>Drug use 11</td>
<td>Overdose 9</td>
</tr>
<tr>
<td>Vancouver 21</td>
<td>Youth 10</td>
<td>sex workers 8</td>
</tr>
<tr>
<td>Harm reduction 20</td>
<td>Street-involved youth</td>
<td>Mortality 8</td>
</tr>
<tr>
<td>injection drug use 15</td>
<td>Illicit drug use 10</td>
<td>violence 6</td>
</tr>
<tr>
<td>Sex work 15</td>
<td>Homelessness 10</td>
<td>drug use 6</td>
</tr>
<tr>
<td>Substance use 6</td>
<td>Methadone 6</td>
<td>Female 6</td>
</tr>
</tbody>
</table>

It was noticed that the key-words used as subject tags exhibited anomalies, as separate subject tags were generated based on keywords and keyword combinations or even spelling errors.
To illustrate this, the subject of ‘drug-use’ was available in around 27 different ways as highlighted in a merged screenshot shown below.

Table 3 Occurrences of ‘drug-use’ in existing subject tags

<table>
<thead>
<tr>
<th>non-fatal drug overdose</th>
<th>Drug seeking</th>
<th>People who use drugs</th>
<th>Culture of drug use</th>
<th>Illicit drug use</th>
<th>Drug use</th>
<th>Drug users</th>
<th>non-fatal drug overdose</th>
<th>Illicit drug users</th>
<th>Drug dealing</th>
</tr>
</thead>
<tbody>
<tr>
<td>illicit drug users</td>
<td>Drug scene</td>
<td>Drug policy</td>
<td>Injection drug use</td>
<td>Injection drug users</td>
<td>injection drug use</td>
<td>Injection drug users</td>
<td>drug dealing</td>
<td>People who inject drugs</td>
<td></td>
</tr>
<tr>
<td>drug dealing</td>
<td>Drug checking</td>
<td>Drug law enforcement</td>
<td>Drug use</td>
<td>Illicit drug use</td>
<td>drug dealing</td>
<td>People who inject drugs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>People who inject drugs</td>
<td>Drug cessation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug dealing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subsequently other keywords were tried on the system to see keyword combinations or associated subject areas. The results are as given below;

Table 4 Occurrences of ‘Health’ in existing subject tags

<table>
<thead>
<tr>
<th>Health services</th>
<th>Health care policy</th>
<th>Attitude of health personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health service access barriers</td>
<td>Health access</td>
<td>social determinants of health</td>
</tr>
<tr>
<td>Health promotion</td>
<td>Health Policy</td>
<td>Sexual health</td>
</tr>
<tr>
<td>Health equity</td>
<td>Barriers to health care</td>
<td>Public Health</td>
</tr>
</tbody>
</table>

Table 5 Occurrences of 'inject' in existing subject tags

<table>
<thead>
<tr>
<th>Supervised injection facility</th>
<th>Injection</th>
<th>Injection drug user</th>
<th>Assisted injecting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection initiation</td>
<td>Injection prevention</td>
<td>Injection cessation</td>
<td>Injection drug use</td>
</tr>
<tr>
<td>Supervised injection facilities</td>
<td>Injection initiation</td>
<td>Injecting</td>
<td>injection drug use</td>
</tr>
<tr>
<td>People who inject drugs</td>
<td>Injectable hydromorphone</td>
<td>Injectable diacetylmorphine</td>
<td>Injection drug users</td>
</tr>
</tbody>
</table>

Table 6 Occurrences of 'HIV' in existing subject tags

<table>
<thead>
<tr>
<th>Plasma HIV- RNA Viral Load</th>
<th>HIV test</th>
<th>HIV risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV transmission</td>
<td>HIV infections</td>
<td>HIV</td>
</tr>
<tr>
<td>HIV prevention</td>
<td>HIV risk behaviours</td>
<td>HIV testing</td>
</tr>
<tr>
<td>HIV risk behaviours</td>
<td>HIV disclosure</td>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>HIV risk behaviour</td>
<td>HIV Infection</td>
<td></td>
</tr>
<tr>
<td>Injectable diacetylmorphine</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7 Occurrences of 'homeless' in existing subject tags

<table>
<thead>
<tr>
<th>Homeless persons</th>
<th>Homelessness</th>
<th>homeless youth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeless Youth/psychology</td>
<td>homelessness</td>
<td>Homeless youth</td>
</tr>
<tr>
<td>Homeless Persons/psychology</td>
<td>Homelessness</td>
<td>Homeless youth</td>
</tr>
</tbody>
</table>
4.2.3 Main and sub-topics identified through textual analysis

The most frequently used keywords as brought up through the algorithm used in the research database matched with those discovered during manual and software-based textual analysis of the research articles. Main topics and sub-topics were identified for future use on the interactive prototype also bearing in mind the need to use neutral or positive terms to represent the research. In this process, which involved manual and software-based textual analysis, ‘drug-use’ and ‘health-care’ were identified as prominently occurring main topics within the research articles. A few documents were also found addressing topics such as ‘sex-work’, ‘community housing’, ‘employment’ and ‘community research’. Narrowing down from a probable list of around 36
main and sub-level subject areas, the following topics were considered to represent most of the journal articles in the research database;

1. ‘Drug-use’ with sub-divisions as ‘Injection’ and ‘Overdose’
2. ‘Health-care’ sub-divided as ‘HIV/Hep-C’ and ‘Women/Youth’
3. ‘Sex-work’ with sub-categories as ‘Violence’ and ‘Assault’
4. ‘Community’ sub-divided into ‘Housing’ and ‘Research’
5. ‘Youth’ with a sub-category of ‘Employment’

These topics and sub-topics were selected for inclusion as topical filters in the prototype of the interface.

4.2.4 Possible additional metadata tags for researchers and academic users

**Abbreviations:** Also found in the journal articles, were abbreviations that referred to either health conditions, medications, specific people/user groups, treatment methods, agencies etc. A few examples would be VPD, VANDU, PWUD, ART, NEP etc. With the hope of using these abbreviations as possible access points for academic professionals and researchers, these were also extracted from the journal articles.

**Theories and methods:** Some theories related to psychology, medicine, statistics, research, community living etc have been dealt with in the research documents. In the initial stages of textual analysis of the journal articles, these theories were also thought of as a possible access point for interested users. However, with text-based search not being proposed to be a key feature in the visual interface prototype, both abbreviations and theories were not considered in later analysis.
4.2.5 Use case scenarios

Two hypothetical use case scenarios were developed based on limited available evidence of user needs and interests. The use case scenarios were used as input to the menu and navigation features of the interface and in the design of the user testing tasks.

4.2.5.1 Organizational / agency-based search

Searching for organizations within the DTES to learn more about their connections with research is a use case associated with the primary user group, community members living and working in the DTES. We developed an associated persona (Homer) based on the observations derived from the unpublished interview with a member of the DTES community regarding a new feature of the InfoHub as discussed in section 4.1.1.

Persona 1: Homer the hopeful artist

Homer is

• a single middle-aged male and a recent resident of the DTES
• digitally literate artist
• is currently facing financial struggles due to irregular employment
• Wants to understand his new surroundings and gain stable employment

Figure 8 Homer

More about Homer

• aims to gain familiarity about DTES-based organizations and their recent research
• is often frustrated with interfaces that provide insufficient location or organization-based information
• wants to gain useful information on what is happening in his new neighborhood
• feels frustrated navigating text-heavy interfaces or those that need payment for full access
• is looking for information to secure stable employment and better housing.
• was recently introduced to websites such as LINKVAN and BC211
• often finds himself wondering if information provided is reliable / up-to-date

Implications for the interface

• interface must be simple, easy to navigate and less text heavy
• preferably imitate Homer’s favourite app with graphic based navigation
• interface could give different zoom / filter options
• interface should give map-based locational information
• should give up-to-date organization-wise research information
• provide free access to community-based research
• is intuitive to navigate and requires zero level of training

Homer’s ideal experience on the interface would be as follows;

1. Arrives at DTES geo-viz interface

2. Sees the base map with the zoom/filter options somewhat like this

Figure 9 Possible interface layout
3. Tries out filter options to see research overview, by neighborhood and by organization.

4. Selects a specific organization to see details of the research.

5. Is presented with a preview window with first result as shown below.

![Image](image.jpg)

Figure 10 Section of the proposed results page

6. Homer is happy with the information on the organization while hovering over areas of the results

7. Plans to visit the website again and exits from browsing the interface.

4.2.5.2 Subject-based locational search

The second use case scenario for the interface is based on a persona (Sarah) developed with the secondary user (researcher) in mind. This scenario is based on the researchers’ own experience and that of fellow graduate students who are working or conducting research in the DTES through connections with the UBC Learning Exchange.

**Persona 2: Sarah the engaged junior researcher**

**Sarah is**

- a graduate student in the iSchool of UBC
- she plans her thesis to be a CBPR at Vancouver’s DTES
- she has a genuine interest in helping and working for people
she wants to gain understanding on prior research at the DTES
she is under a time crunch as she needs identify her thesis topic within a fortnight

More about Sarah

• wants to know key DTES-based organizations and their recent research
• is versatile with information seeking procedures and search interfaces
• prefers to have all the information she needs from one website
• seeking for some locational and some subject-wise information
• aims to avoid areas of over-research
• would like to have contact details of researchers working on specific areas
• is looking for a simple and yet informative search experience
• prefers simple, intuitive and informative navigational experience

Implications for the interface

• website must have subject area search feature
• error-free and show results in all attempts
• faceted navigation feature would help in narrowing down her subject area
• should provide contact information for researchers and organizations
• needs some simple statistical data to identify over-researched areas
• would love a single page website offering quick, useful and responsive results

A typical interaction experience that Sarah has with the interface could be as follows;

1. Sarah opens the DTES geo-viz webpage
2. Sees the base map and hovers over the map to know aggregation of research by location.
3. She also uses the subject tags and finds distribution of study areas.
4. She zooms in on a location of interest and gets contact details on organization and researchers
5. She gets an overview of prominent and least researched subject areas
6. She also gets a sense of understanding on the levels of involvement required from community-based organizations
7. Feeling more knowledgeable after her search experience she exits the website confident about her impending deadline.

4.2.6 Summary of the define stage

The threefold objectives of the define stage were, to extract project-specific metadata from the research articles, generate realistic use-case scenarios and to use the knowledge gained to refine the original research questions. Since this project aimed at the development of a location or map-based research interface, extraction of locational metadata from the research articles formed the focal point of this stage in the research project. Other metadata extracted included authors, topics, DTES-based organizations, addresses of organizations, snippets of locational references etc. These metadata fields were important in generating location and topic specific results for the users of the interface. In this connection, the study conducted on the uncontrolled list of DTES-related subject tags available in the research database resulted in valuable insights into some of the existing problems that face the users of the database.

This stage was later found to be key to the development of the topic-wise filters on the interactive version of the interface prototype. Use case scenarios were developed considering user interactions through organizational or topical searches through this interface. Some projected implications of these scenarios on the design of the interface also helped in
preparations for the prototyping stage of this research. Another valuable by-product of this stage was the refinement on the original research questions which were crystallised into their current form following the results of this stage.

4.3 Ideate stage outputs

The ideate stage of the project was the divergent stage wherein the researcher explored existing interfaces, websites, base-map options, icons and other visualization ideas which could be applied in part or could inform the subsequent prototyping stage.

4.3.1 Base map for interface

The DTES base map being a key element of the interface, the design goals and results of the empathize phase were taken into consideration when deciding on possible options. A number of factors were considered:

1. Accuracy of locational representation
2. Clarity and readability of labels indicating different neighborhoods
3. Aesthetic and visual appeal through use of colour

Based on these criteria, a possible contender emerged out of the maps that were considered. Maps included within the City of Vancouver’s Downtown Eastside Plan were found to be accurate in scale, clear in details and visually appealing in the choices of colours used. From among the 15 available maps in the document, the base map selected for use in the location-based visual research interface was map 6.1 in the CoV’s Vancouver’s DTES Plan available at vancouver.ca/dtesplan. Some key features that brought this map into consideration were as follows;
1. Clear visual demarcation of neighborhoods through use of contrasting colours
2. Labels identifying DTES neighborhoods
3. Clear / visible street names showing transit routes to help locate places within DTES and
4. A clear overall boundary that offered visual separation for DTES from remaining areas

![Figure 12 Base map selected for the interface](image)

### 4.3.2 Place-marker icons for possible use in the map-based interface

Since this is a visual map-based interface which connects the user with community-based research, it is expected that icons shall play a vital role in reducing the amount of text in every page. Some of the icons would serve as place-markers, others as identifying organizations and still others could provide links to users for research articles or for purposes of navigation. The issue of copyright also played a part in the final choice of icons. Thus, while searching for suitable icons, free-to-use icons or images in public domain gain precedence over those that may even be more appropriate for the cause. Some other guiding principles while choosing icons, was
the need to be culturally sensitive (as brought up through review of literature) while still being
accurate in representing the subject at hand.

**Table 12 Some free to use place-marker icons**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Icon</th>
<th>Attribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="https://commons.wikimedia.org/wiki/File:Google-location-icon-color_icons_green_home.png" alt="Icon" />, bakib20 (<a href="https://creativecommons.org/licenses/by-sa/4.0/legalcode">https://creativecommons.org/licenses/by-sa/4.0/legalcode</a>)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><img src="http://pngimg.com/download/46292" alt="Icon" /> from <a href="http://pngimg.com/imgs/miscellaneous/gps/">http://pngimg.com/imgs/miscellaneous/gps/</a>; Creative Commons 4.0 BY-NC</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><img src="http://pngimg.com/download/46280" alt="Icon" /> from <a href="http://pngimg.com/imgs/miscellaneous/gps/">http://pngimg.com/imgs/miscellaneous/gps/</a>; Creative Commons 4.0 BY-NC</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><img src="http://pngimg.com/download/46292" alt="Icon" /> from <a href="http://pngimg.com/imgs/miscellaneous/gps/">http://pngimg.com/imgs/miscellaneous/gps/</a>; Creative Commons 4.0 BY-NC</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Icon</th>
<th>Attribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td><img src="http://pngimg.com/download/46292" alt="Icon" /> from <a href="http://pngimg.com/imgs/miscellaneous/gps/">http://pngimg.com/imgs/miscellaneous/gps/</a>; Creative Commons 4.0 BY-NC</td>
<td></td>
</tr>
</tbody>
</table>

**4.3.3 Other icons for possible use in the geographic visualization interface.**

Since this interface is being designed to provide an exploratory search experience to the
user, icons are likely to play a vital role in the design. The use of icons in websites and apps
serving the same user group has also been studied. Icons have been introduced as visual aids in
these websites to give the user a quick and easy method of identifying services by organizations.
Icons have been used along with appropriate fixed labels (for example in bc211) or such text also
appearing as interactive tool tips (or drop-down menus) as users hover over them (as in
During this process, icons, symbols and logos that were tied to DTES-based organizations and agencies were not included based on copyright considerations. Simple and appropriate free to use icons, obtained from online sources such as the noun project, pixabay etc. have been grouped together in the table shown in Appendix A.

4.3.4 Summary of ideate stage

The ideate stage had the main objective of generating ideas that contributed to the following prototyping stage. Arriving at the base map to be used on the visual map-based interface and obtaining necessary icons for use on the system were some of the main concerns in this stage. Interactions and design of websites such as bc211, linkvan app, real estate websites, travel websites and even some commercial websites were studied to brush up on the current options and ideas for navigation, filtering, exploration etc. A sample of these icons and place-markers have been shown here and in Appendix A, including those that did not find their place in the final version of the interactive prototype of the interface.

4.4 Prototype stage outputs

4.4.1 Concept map based on intention of the interface

Since the goal of this research is to improve access for members of the DTES community to research on the DTES, a simple concept map was drawn to visually represent the connections expected in the interface design as found within the research question.
The concept map gives visual reference on how community research brings authors, organizations and eventually the community together through a common connected cause. It was therefore key to this research that the final prototype made these connections clear to the users from the community, enabling them to see themselves within the umbrella of community-based research with connection made either through organizations, authors or even the topics of their interest.

4.4.2 **Factors shaping prototype design**

A few factors influenced the design of the prototypes for the interface, both in paper versions and in subsequent online interactive versions. These were;

1. The original research questions
2. Considerations and constraints borne out of the literature review
3. Desirable connections as shown in the concept map above
4. Some aspects drawn from personas and their use case scenarios and
5. Usability criteria, components and heuristics considerations also reflected during usability studies conducted at a later stage.
4.4.3 Paper prototype mock-ups

A few versions of paper-based mock ups were drawn up to address the goals of the research in light of perceived user needs and goals as derived through the empathize and design stages of the study;

4.4.3.1 Paper prototype - Version 1

Figure 14 Paper version 1 - Overall layout

The overall layout of the first (feature rich) paper version, includes a vertical search pane on the left, with a horizontal map having three zoom levels on the right. A results pane that is in horizontal alignment with the map area comes below the map zone as show in the above figure. It can also be seen here that navigation is achieved through appropriate icons which are used in conjunction with simple labels on the subject pane. The search pane also features an expandable view mode. The map zone is built on three layers activated through
tabs as DTES, Neighborhoods and Location. These layers provide the users with varying levels of zoom within the dynamic base map. There is an optional method of zooming with + and – on the top right corner of the map which in turn switches the user to the different tabs at pre-defined zoom levels. The results area provides user with the list of results which may be saved, downloaded, printed or sorted as per the interest and convenience of the user.

Figure 15 Paper version 1 - Subject page

Subject-wise interactions

On the subjects’ page, when subjects were selected, they would open up in an accordion style and also show up in locations on selected map layers. Each level of subject interaction was designed as producing different results on the map. On selecting location of
interest, the results for the location are listed in the results pane

Figure 16 Paper version 1 - Location page.

Location-wise search

In the locations page of this paper version, locations are provided as layers with DTES as top layer. Selecting ‘DTES’ shows first tab in map layer. Selecting ‘Neighborhood’ takes user to the next tab. Selecting the ‘location’ changes the zoom level on the map. Results are generated automatically as user narrows down through the location filter pane.
Author-wise search

In the authors page, authors are listed in a sortable list. Author selection generates locational place markers according to places where the author has conducted each study. Further, as user clicks on a particular location, the results are listed as works by the author in the selected locations.
Figure 17 Paper version 1 - Extra features

In this paper version, the extra features of the interface were designed to be activated, when results were being viewed in full view mode. In this mode, an additional vertical pane expands from the left showing a sub-list of locations, authors and subjects connected to the results provided. There are options for having a record of saved, downloaded, shared or printed documents for users who opt to sign-in to use the system.
4.4.3.2 Paper prototype - Version 2

Figure 18 Paper version 2 - Overall layout

The overall layout of the interface displays, three vertical panes for the search, map and results, each expandable if required by the user. This version was developed to offer personalised views to users of the interface.

Figure 19 Paper version 2 - Heat map based on subject frequency

A visual method of comparing frequency of subjects studied in locations using heat-map visualization on the base map.
The flexibility or expandable feature in all the panes is explained through this page. This feature could help users to focus on the area of their choice. The other features are planned to follow the design of the first version of the interface.
4.4.3.3 Final paper version

The paper versions of the proposed prototype were presented individually to faculty members supervising the project, who provided expert feedback on the design and navigation features. A final paper version was developed incorporating their feedback. Other variations of features and interfaces were developed and shared but have not been included as they did not make it into the final design. In this version, the authors page presents an interactive list of authors where users’ selection of authors brings up related locations of research on the map while also presenting the journal articles by the author as a scrollable results pane alongside the locational reference on the base map. A partial implementation of this idea was done in the

Figure 21 Final paper version - Authors page

FINAL VERSION - AUTHOR BASED SEARCH
interactive versions developed later. The interactive versions featured organization icons alongside author names with results being displayed as planned in this paper version.

Figure 22 Final paper version - Locations page

The locations page as shown above features a sortable interactive drop-down menu. As the user clicks on the name of a location, a relevant icon appears on its position in the base map. A scrollable list of research articles pertaining to the selected location appear in the form of an adjustable and movable pop-up window on the base map itself. Clicking on any of the articles within the list takes the user to the main link for the article within UBC’s open collections. This idea was also partially implemented in the interactive version with the drop-down menu and locational icons without the display of results within a map pane.
The subject page was envisioned to have an interactive exploding pie chart that takes the user to sub-categories in a visual and animated display as shown above. However, this idea was rejected based on feedback that users may be led to assume weighting of research categories based on the size of each piece of the pie displayed (as also discussed earlier).
Another filtering possibility was considered in the final paper version anticipating user’s interest regarding the recency of the research article. The concept was to use a slider control that gives users the option to narrow down results on the basis of the years of interest. It was planned that real-time changes occur in the results pane based on user’s choice on the year(s) of research. However, this filtering option was not perceived to be of much value in the context of a map-based search as it could detract the users from the main function of the interface which was to provide a location-based search experience. It also would add to the complexity of the design of the interface prototype without adding much value for the primary users who are the members from the DTES community.
4.4.3.4 Feedback on paper prototype mock ups (to be included)

The paper versions were discussed with the faculty supervisor and committee members. There were clear suggestions that came out of all the interactions. There was a common observation that some of the aspects included in the design such as the idea of personalising results or user preferences would not be beneficial to users who do not wish to sign in or who use the interface infrequently. The design ad interactions planned for the authors page and the organizations page (locations page) seemed reasonable and were carried over without much changes to the interactive version of the prototype. The idea to include year-wise filters and heat map visualizations were set aside as user benefits were not perceived as comparable to the efforts required in incorporating them into the interactive version. These features were also not in direct alignment with the user needs and design goals.

4.4.4 Interactive versions of the prototype

Based on the ideas generated and narrowed down through the feedback obtained on the paper mock ups of the interface an initial interactive version of the interface was developed using the latest version of the AxureRp prototyping software (version 9). The various pages and interactions planned in the versions are explained in the following pages.
4.4.4.1 Interactive prototype - version 1

The navigation pane in the home-page of the system features a three-button navigation system in a pale blue background. The clickable navigation buttons are labelled ‘Organization’, ‘Topic’ and ‘Author’. The map zone of the home-page features a static base map showing DTES neighborhoods *(from CoV’s DTES plan © 2018)*.

Some considerations based on usability heuristics included the need to present a clean and non-cluttered look and a minimalistic design. Icons were used in conjunction with appropriate text to reduce the cognitive load on the users while promoting user memorability.

Some of the observations and issues that came up during interactions with faculty were that the interface not being inviting for the user. There was also a lack of clarity over the navigation method adopted.
The user was also expected to rely on just three buttons to begin interactions with the system. There was also an observation regarding the lack of textual clues on the interface. Since the base map used was a static representation of the DTES, there was a feeling that users might expect a dynamic experience on the map with the facility to zoom in and out based on the level of locational detail needed at any time.

Organization page

Organization (Step 1):
On left-clicking the ‘Organization’ button. User sees six DTES organization options pop for further interaction.

Organization page (Step 2):
User selects organizations using mouse clicks (here Vandu is selected). The selected item is colored with individual identifying colors.

Figure 26 Interactive prototype Version 1 - Organizations menu

Vandu selected
Organization page (Step 3)

An icon appears indicating the location of the selected organization on the map along with a window containing a scrollable list of research articles referencing the location as shown here.

Figure 28 Interactive prototype Version 1 - Organization page - results window

Topic page

Main level of the topics page showing the 6 categories under which the research articles have been classified. In this instance, cursor hovers over the topic of drug-use changing the color of that box.

Figure 29 Interactive prototype Version 1 - Topic menu
In this instance, user selects the topic of drug-use by clicking on that category. The current level is indicated through color and icon use. The 6 available sub-categories are shown to the user.

In this instance, the user selects the sub-topic ‘harm-reduction’ using a mouse click, initiating a change of color in that category.

A window containing the organization website and another with a list of article references show up on the base-map upon user’s selection of ‘harm reduction’.
Author page

Figure 33 Interactive prototype Version 1 - Authors menu

The author menu showing the possibility for bringing up list of authors alphabetically sorted by last names. In this instance the mouse hovers over the A-E author list option thereby highlighting the selection.

Figure 34 Interactive prototype Version 1 - Authors list

List of authors with last names starting with alphabets A-E sorted in ascending order (A-Z). A highlighted sentence informing the user’s selection.

A-E

Figure 35 Interactive prototype Version 1 - Author page - result on author selection

On selection of author using mouse clicks, an icon appears on organizations involved in author’s research. The location icons show appropriate tool tips and also link to the organization’s page in the current window.
4.4.4.2 Interactive prototype - Version 2

Home page

The home page of the interactive prototype has been designed to orient the user to the main functions of the interface. The main method of interaction through this interface which is through mouse clicks is highlighted and advertised on the home page. Distinction is also made here that users can filter through the topics and authors pages and explore through the organizations and community spaces pages in this system.
**Organizations page**

Figure 37 Interactive prototype Version 2 - Organizations page

The organizations page is the first page on the main navigation menu of the interface. It features a drop-down menu with a list of organizations commonly referenced in the DTES community-based research articles. These include agencies and study projects actively involved in or contributing to research within the DTES. Clicking on each agency in the list brings up a label near an existing place-marker locating it on the base map. A window showing the organization website pops up on the map at the same instant as shown below.

Figure 38 Interactions on organizations page
Second on the main navigation menu is the topics page. Clicking on this page brings up an accordion menu showing 5 main topics, namely Drug-use, Health-care, Community, Sex-work and Youth. Up to two sub-topics are listed under each main topic. Research articles are presented as number icons on the base map. Each of the numbered boxes around a location contains a link to a research article associated with the topic and the associated organization. Filtering is done by clicking on the topics to the level of choice. There are three levels for the user: an overall level, a main topic level and a sub-topic level. Drilling down to a lower level narrows down the number of research articles on the base map. Each research article is linked with its original location on UBC’s open collections website.
**Authors page**

The authors page features a scrollable interactive list of authors and corresponding number of research articles. The organizations associated with the author’s research are also shown alongside through icons (if available). Labels of all DTES research organizations are made visible on the base-map in this page. Clicking on an author (in blue text) presents a window showing the list of the author’s research articles in order of recent to oldest using the filter feature of the DTES Research Access Portal (RAP) as in an example shown below.

**Figure 40 Interactive prototype Version 2 - Authors page**

**Figure 41 Sample results generated through interaction on authors page**
Community spaces page Version 2 (revised)

This is the current look of the community spaces page that was revised following the feedback obtained during the pilot study on the prototype (earlier one shown under 4.5.1.2). While the earlier version relied on mouse hover interactions on the place-markers themselves, the new version utilizes a drop-down menu which locates the desired space using a label and an organizational website window that appears in the bottom half of the page as in the example shown below.

Figure 42 Interactive prototype Version 2 - Community spaces page

Figure 43 Community spaces page - with interaction activated
Help page

Figure 44 Interactive prototype Version 2 - Help page

Following the opinion of Neilsen, (1994), in the 10 usability heuristics, the help page was envisioned as a mere supporting tool to provide guidance for any new user of this system. Again, in keeping with a usability heuristic, namely consistency, this page was designed along the theme followed in the other pages of this interface. Navigation was through clicks over the labelled buttons situated over a black and white version of the DTES base map.

Figure 45 Interactive prototype Version 2 - Help page - About
A few of the available sections of the help page are shown below.

Figure 46 Interactive prototype Version 2 - Help page - Topics

Figure 47 Interactive prototype Version 2 - Help page - Authors

Figure 48 Interactive prototype Version 2 - Help page - Contact
4.4.5 Summary of the prototyping stage

The prototyping stage required the application of the concepts and ideas gathered through the preceding stages to produce simple scaled-down versions of the interface in paper and online forms. The main challenge of this stage was to maintain realistic expectations based on the research questions. Following feedback obtained with the paper prototype mock ups, work on the design of the interactive version commenced. This proved to challenging as it first involved the identification of the software that best suited the research needs. Finally, AxureRp was chosen and used in developing the med-fidelity prototype. Two versions of the interactive prototype were developed based on feedback with faculty supervisor, committee members and student volunteers who pretested the prototypes. It is to be noted here, that some of the originally planned features such as the integration of the location snippets in the results could not be implemented due to limitations of the software.

4.5 Test stage outputs

The aims of the test stage of the interface design process is to get the feedback from the target users on ease of use, usability and usefulness of the prototype by means of hands on interaction through specific tasks. The tasks were designed to answer the research questions. The results of the test stage contributed towards recommendations and possible modifications, revisions and alterations on the prototype. The test stage included a pilot study involving three participants which preceded the actual usability study conducted with four participants from the primary user group, which is the DTES community.
4.5.1 Pilot study on interactive prototype Version 2

The pilot study was set out to mimic the user study and included a demonstration of the prototype, four tasks on each page of the prototype (using a concurrent think aloud protocol) as well as a brief questionnaire designed to elicit user feedback on issues related to ease of use and usefulness. The full methods of the study are described in section 4.5.2. Three users participated in the pilot study which was also audio recorded (along with note taking) to extract maximum benefit from the user's interaction on the prototype.

4.5.1.1 Inferences drawn from the pilot study

Feedback from P1

P1 wanted to know how icons represented the organizations. P1 was also excited to see how drilling down the topics changed the available documents shown on the DTES-base map. P1, wanted to see the keywords used to pull up the results under the various topics and sub-topics. There was also a suggestion that using differently colored numbers could enable easier association of the numbers with organizations. In the authors page, P1 felt that scrolling left to right through the author list was difficult, especially when trying to find the organizations connected to author which was a part of the specified tasks on this page. P1 felt that having a drop-down list in the community spaces page could help in avoiding clutter that existed when too many windows were opened by the hovering interaction.
Feedback from P2

P2 preferred to see a visual representation of connections between topics and sub-topics similar to a Venn diagram. P2 also wanted to see a numerical representation of the number of articles for each topic. P2 preferred being able to sort the authors based on number of publications and also found scrolling left to right difficult. P2 was of the view that having columns to sort through organizations could be a useful feature here. P2 felt that the tool tip that appeared on hovering over icons could include more information about the purpose of each location. P2 also felt that clicking would be a better option that the currently used hovering method of interaction and believed that it would reduce the clutter on this page.

Feedback from P3

P3 thought that using a color-coded method of connecting topics (numbered hyperlinked boxes) with associated organizations would be clarifying for the users of the interface. P3 also suggested using a box around numbered article boxes for better association in the topics page.

P3 saw the need for horizontal scrolling through the author list as a limitation in the authors page of the system. P3 echoed the view of the other participants in the pilot study that the hover interaction did not seem to be the best way to bring up the websites in the community spaces page. Instead P3 recommended adopting click interactions as already used in the organizations page.
4.5.1.2 Changes incorporated in the system based on pilot study

Some suggestions that came out during the pilot study have been incorporated into the system. This resulted in a new look and feel for the community spaces page. The previous version of this page (with all interactions activated through mouse hovers) is shown below.

![Old community spaces page (all interactions activated) - before pilot study](image)

This earlier version of the community spaces page was designed to show a hidden window (small size as shown above) of the website as the user hovered on the place-markers with the mouse. The interaction was designed to be toggleable which meant that hovering again on the place-marker would again hide the window. However, although there were tooltips that appeared on the map as the users hovered on the place-markers, users felt that the system of finding the location through hover interaction, did not seem to be working well for them. Also, hovering once on many markers left a lot of the windows open (as shown above) resulting in clutter and confusion for the users. One of the users in the pilot study, suggested
that a system of having a drop-down menu, as used in the organizations page would go well with the intentions of this page. User feedback was considered, and a revision was done on this page as shown in the prototype chapter with interactive version 2.

4.5.2 User study on interactive prototype Version 2

Following the pilot study on the second version of the interactive prototype, a small-scale usability study of the system with users working or living in the DTES was planned to evaluate the current design and identify areas for improvement. The user study came under a behavioral type of study being classified as minimal risk based on participant vulnerability and research risk. A human ethics application was submitted for approval by the UBC Behavioral Research Ethics Board (BREB). Subsequently, the project was awarded the certificate of approval, UBC BREB number H19-01613.

4.5.2.1 Study participants – basic requirements, recruitment and remuneration:

The user study was planned to be done through volunteer participants forming a sample of convenience. Around three to five participants were planned for the usability study in keeping with the usability testing guidelines by Neilsen (2012). The target population was individuals with direct experience of the Downtown Eastside, including those currently or formerly living and/or working in the community. In addition, the sample was restricted to those at least eighteen years old, fluent in English, and computer literate (possessing a basic working knowledge of web-based applications). Recruitment of participants was facilitated through the UBC Learning Exchange located in the DTES. The study was designed to avoid the collection of personally identifying information. Also, the tasks to be undertaken by the participants on the
visual map-based search system prototype were designed to be information seeking tasks. Sessions were 40-60 minutes and participants were to be compensated for their time with 25$ gift cards.

4.5.2.2 Study procedure

In each individual user study session, the following steps were planned for sequential implementation and executed with carefully prepared scripts.

1. Welcoming the participant
2. Reading out the consent form and obtaining verbal consent. Handing over a printed copy of the consent form to the participant.
3. Commencing audio recording on receiving participant’s consent.
4. Asking a few demographic questions to determine participant’s connection to the DTES as well as their interests in DTES-based community research.
5. Brief demonstration of the prototype system given by the researcher.
6. Following this the participants were given 4 tasks to be performed on the interface (with one task being given to them at a time). The participants were asked to think aloud as they performed the tasks with prompting from the researcher whenever needed.
7. After completion of the tasks a verbal post-study questionnaire was read out to the participants with questions that focused on the ease/difficulty of use and the perceived usefulness/value of the system and interface.
8. Each study ended with the researcher thanking the participants and providing the honorarium (gift card) and obtaining a signature confirming receipt.
Participants were labelled as P1, P2, P3 and P4 to avoid identification in notes and audio files during storage, transcription and analysis of the data.

4.5.2.3 Data collection – Pre-study verbal demographic questionnaire

A pre-approved verbal demographic questionnaire was used to collect information on the nature of connections that the participants had with the DTES community. The questionnaire elicited no identifiable information from the participants and centered around ascertaining their basis for involvement in the DTES neighborhood arising either through residence, employment, volunteering interests etc. A question on their interests on DTES-based community research and how they search and retrieve such relevant research related information was also included.

Regarding connections with the DTES, it was learnt that P1 and P4 had lived in the DTES for more than 10 years, while P2 and P3 had working and volunteering experience at the DTES for 10 and 2.5 years respectively. On connections with research, P1 and P3 had active experience in seeking research in general, which also included DTES-based research. P2 and P4 on the other hand, had experience being involved in DTES related research either as study participants or as volunteers in organizations which sponsored community-based research.
4.5.2.4 Data collection – Tasks

4.5.2.4.1 Background - Tasks

The feedback from the participants during their performance of tasks on the system was considered to be vital to understand aspects where the system made sense and where it did not seem to be working for the users. Participants were given a guiding scenario with appropriate background information prior to receiving their specific tasks. A mixture of information seeking, finding, navigational and exploratory tasks were given to the participants. Tasks mostly included simple and close-ended search tasks with a few open-ended ones. The participants received one task (each containing 3 or 4 sub-tasks) at a time. The full task descriptions are included in the presentation of results, in the next section.

4.5.2.4.2 Usability metrics - Tasks

Mifsud, (2015) cites the ISO 9241-11 standard definition for usability as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” ‘Effectiveness’ as defined within the ISO 9241-11 standard is, “the accuracy and completeness with which users achieve specified goals”, and ‘Efficiency,’ becomes “the resources expended in relation to the accuracy and completeness with which users achieve goals.” ‘Satisfaction’ is simply “the comfort and acceptability of use.” Effectiveness is measured using the rate of task completion, while efficiency is calculated using the time that each user takes for the given task. User satisfaction on the tasks was recorded (in audio and transcribed) as they thought aloud during each task.
The usability metrics were calculated as follows:

Task completion rate or effectiveness: $2.3 = \frac{\text{Number of tasks completed successfully}}{\text{Total number of tasks undertaken}} \times 100$

Time based efficiency: $2.3 = \frac{\sum_{j=1}^{R} \sum_{i=1}^{N} \frac{n_{ij}}{t_{ij}}}{NR}$

Where:
- $N$ = The total number of tasks; $R$ = The number of users
- $n_{ij}$ = Task completion $i$ by user $j$; if user completes the task, then $N_{ij} = 1$, if not, then $N_{ij} = 0$
- $t_{ij}$ = Time on task by user $j$ to complete task $i$. If task is incomplete, then time is measured till user exits the task

It is important to note that participants were required to adopt a concurrent think aloud protocol while performing their allotted tasks on the interface. Some voluntarily provided helpful comments and suggestions for the prototype even while carrying out their tasks. Both, are seen affecting time on tasks, resulting in time-wise outliers under certain sub-tasks. Two subtasks provided instances where participants completed their tasks taking $1/10^{th}$ or even $1/13^{th}$ the time taken by another participant. Time-based efficiency, hence, may not be applied in its entirety as a measure of usability within this study.
4.5.2.4.3 Task 1 – Organizations Page

Task Description: “Using the organizations page,

1. Find the names of the four organizations that are geographically closest to each other which you might go visit.
2. Also in the organizations page, find the street address and working hours of the organization located in Victory square.
3. Using the drop-down menu, find the full list of organizations and locate VANDU on the DTES-base map.
4. Find the partners and funders for the study ARYS.

Table 13 Task 1 - Usability analysis

<table>
<thead>
<tr>
<th>Sub-task number &amp; type</th>
<th>Applicable measure(s)</th>
<th>Time on task (sec)</th>
<th>Task completion *(0 or 1)</th>
<th>Notes: Observations and circumstances (if any)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-task 1 - Informational (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 76</td>
<td>1</td>
<td>Difficulty related to tool tips and hover interaction</td>
<td>Time-based efficiency = 0.031 tasks/sec, Task completion rate = 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 22</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 172</td>
<td>1</td>
<td>User was exploring and commenting on results</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 17</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-task 2 - Informational (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 28</td>
<td>1</td>
<td></td>
<td>Time-based efficiency = 0.042 tasks/sec, Task completion rate = 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 62</td>
<td>1</td>
<td>Scrolling down through webpage result took time</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 10</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 58</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-task 3 - Navigational (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 15</td>
<td>1</td>
<td></td>
<td>Time-based efficiency = 0.048 tasks/sec, Task completion rate = 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 38</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 22</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 18</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-task 4 - Informational (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 25</td>
<td>1</td>
<td></td>
<td>Time-based efficiency = 0.026 tasks/sec, Task completion rate = 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 103</td>
<td>1</td>
<td>Confusion between ‘studies’ and ‘agencies’</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 28</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 52</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(0 = task incomplete and 1 = task complete)* *Only partly applicable as a usability measure (see 4.5.2.4.2)*
4.5.2.4.4 Task 1 – discussions on usability (Organizations page)

Results of the usability assessment for Task 1 are presented in Table 13. For this task, out of the 4 sub-tasks, 3 were informational and 1 was navigational in nature, with all of them being simple and close ended in type. A completion rate of 100% was observed for all sub-tasks here. However, there were a few outliers in the time taken for the tasks in sub-tasks 1 and 2 which had an impact on the time-based efficiency of these tasks. In sub-task 1, we had P3 exploring and commenting on the results while performing the task, extending the time of task completion to 172 seconds. While performing sub-task 4, P2 reported a confusion between ‘studies’ and ‘agencies’ and preferred a delineation between them in the drop-down list.

4.5.2.4.5 Task 1 - Feedback from study participants

A few participants had difficulty associating the icons with the associated organizations. One participant suggested using the same icon to represent organizations with similar services such as ‘Vandu’ and ‘Insite’. One participant recommended a delineation between the agencies and studies in the drop-down menu. This suggestion was found to be pertinent and involved minor adjustments in the prototype and hence implemented in the system following the user studies. Participants took a while to find that the tool tips displaying the name of the organization (agency / study) appeared while hovering over the icon (and not the place marker) placed on the base map. This too can be fixed easily by combining the place-marker and the organizational icon before assigning the appropriate tool tip.
4.5.2.4.6 Task 2 – Topics Page

Task Description: Using the topic page,
1. Explore the sub-topics under each of the five main topics.
2. Which main topic seems to include the highest number of journal articles?
3. Have any studies on HIV/Hep-C been carried out as part of the ACCESS project at the BC Centre for Substance Abuse?
4. Find one article that you might be interested in reading under any topic.

Table 14 Task 2 - Usability analysis

<table>
<thead>
<tr>
<th>Sub-task number &amp; type</th>
<th>Applicable measure(s)</th>
<th>Time on task (sec)</th>
<th>Task completion * (0 or 1)</th>
<th>Notes: Observations and circumstances</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-task 1 – Exploratory (Simple open ended)</td>
<td>Task completion rate</td>
<td>P1 28</td>
<td>1</td>
<td></td>
<td>Task completion rate = 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 118</td>
<td>1</td>
<td>User happy to explore</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 360</td>
<td>1</td>
<td>User excited to explore and comment on interaction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 37</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-task 2 – Exploratory search (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 50</td>
<td>1</td>
<td></td>
<td>Time-based efficiency = 0.031 tasks/sec Task completion rate = 66.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 30</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 -</td>
<td>-</td>
<td>Task missed by oversight</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 8</td>
<td>0</td>
<td>Participant provides answer without using the system</td>
<td></td>
</tr>
<tr>
<td>Sub-task 3 – Navigation (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 76</td>
<td>0</td>
<td>Issues of question clarity and tool tip while hover</td>
<td>Time-based efficiency = 0.001 tasks/sec Task completion rate = 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 80</td>
<td>0</td>
<td>Navigational difficulty inducing trial and error</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 168</td>
<td>1</td>
<td>Navigational difficulty inducing trial and error</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 80</td>
<td>0</td>
<td>Navigational difficulty</td>
<td></td>
</tr>
<tr>
<td>Sub-task 4 – Finding (Simple open ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 25</td>
<td>1</td>
<td></td>
<td>Time-based efficiency = 0.072 tasks/sec Task completion rate = 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 35</td>
<td>1</td>
<td>User excited to explore</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 -</td>
<td>-</td>
<td>Task missed due to oversight</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 108</td>
<td>1</td>
<td>User excitedly explores research articles</td>
<td></td>
</tr>
</tbody>
</table>

*(0 = task incomplete and 1 = task complete) # Only partly applicable as a usability measure (see 4.5.2.4.2)*

90
4.5.2.4.7        Task 2 – discussions on usability (Topics page)

Results of the usability analysis for Task 2 are presented in Table 14. Two close ended and two open ended sub-tasks were given as Task 2 for the participants. Of these two were exploratory (1 & 2) with one each of finding (4) and navigational (3) in nature. The open-ended sub-tasks (1 & 2) had a completion rate of 100%, while the close ended sub-tasks had completion rates of 66.7% (2) and 25% (3). Sub-task 3 with a time-based efficiency of 0.001 tasks/sec and a task completion rate of 25% revealed difficulties in this page due to over reliance on hover-based tooltips displaying agency name for associated icons. Participants also found an unintended ambiguity in the questions due to the words “BC Centre for substance abuse” in connection with the project ‘ACCESS’. There were two instances of participants missing a sub-task due to oversight (2 & 4). The sub-task 4 shows the highest time-based efficiency of 0.072 tasks/sec among the sub-tasks here, even accommodating the extended the time of completion with P4 exploring more articles.

4.5.2.4.8        Task 2 - Feedback from study participants

Users had a lot to say regarding this page ranging from their interpretation of the icons, intuitiveness and visual appeal. Most of the users found this page to be the busiest among the pages used in this interactive prototype. The use of similar numbered boxes (numbers up to 20) situated at various locations on the base-map, proved to be confusing for all the users. Participants commented on a lack of intuitiveness voicing their struggle in connecting research articles attached to the numbered boxes. Connecting the numbers to the organizations was also not intuitive for all the participants. One user suggested that some method of indicating a
connection to the organization would be required for each set of numbers. There were a few questions also about the research articles under the ‘all DTES’ umbrella in the base map.

4.5.2.4.9 Task 3 - questions (Authors page)

Task description: Using the authors page,

1. Which of the listed authors seem to have the highest number of DTES-related research articles in the DTES Research access portal?
2. When was the earliest publication by the author “Brissette, Suzanne”?
3. From a quick look through the list, which organization(s) seems to be the most commonly used for research.

Table 15 Task 3 - Usability analysis

<table>
<thead>
<tr>
<th>Sub-task number &amp; type</th>
<th>Applicable measure(s)</th>
<th>Time on task (sec)</th>
<th>Task completion * (0 or 1)</th>
<th>Notes: Observations and circumstances</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-task 1 – Finding (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 79</td>
<td>0</td>
<td>Scrolling &amp; Memory related issues</td>
<td>Time-based efficiency = 0.008 tasks/sec Task completion rate = 50 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 56</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 79</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 52</td>
<td>0</td>
<td>Scrolling &amp; Memory related issues</td>
<td></td>
</tr>
<tr>
<td>Sub-task 2 – Finding (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 43</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 37</td>
<td>1</td>
<td>Search option enquired</td>
<td>Time-based efficiency = 0.022 tasks/sec Task completion rate = 100 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 40</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 68</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-task 3 – Finding (Simple open ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 48</td>
<td>1</td>
<td>Icons + Memory issues</td>
<td>Time-based efficiency = 0.019 tasks/sec Task completion rate = 100 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 49</td>
<td>1</td>
<td>Icons + Association</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 69</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 54</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(0 = task incomplete and 1 = task complete) # Only partly applicable as a usability measure (see 4.5.2.4.2)*
4.5.2.4.10 Task 3 – discussions on usability (Authors page)

A summary of the usability analysis for task 3 is presented in Table 15. This task had three ‘finding’ sub-tasks of which two were simple close ended and one simple open ended. No major outliers were found based on the time taken for completion of these sub-tasks by the four study participants. Sub-task 1 taking the most time 0.008 tasks/sec, also revealed issues related to scrolling and user memory as reflected in the 50% task completion rate. Sub-task 2 was marginally ahead on time-based efficiency with 0.022 tasks/sec as compared with sub-task 3 with 0.019 tasks/sec. However, all the participants completed both these sub-tasks.

4.5.2.4.11 Task 3 - Feedback from study participants

The authors page evoked mixed reactions from the participants. While one participant felt the most drawn to this page on the system, a few others offered suggestions for improvement while carrying out tasks on this page. A feature that enabled sorting the author list by the number of research articles was thought to be convenient in the context of one of the assigned tasks requiring the identification of the author with the highest number of research articles. One participant felt that including a right-click or Cntrl+F (‘find on this page’) option could add to the usefulness of the system. Having the labels of all organizations visible on this page seemed to be helpful for users.
4.5.2.4.12 Task 4 - questions (Community spaces page)

Task Description: Using the community spaces page,

1. Find the location of the **Carnegie Centre** on the map.
2. Find a designated **gathering place for Seniors** on the map.
3. What is the service offered by the **Dugout** at the DTES?

Table 16 Task 4 - Usability analysis

<table>
<thead>
<tr>
<th>Sub-task number &amp; type</th>
<th>Applicable measure(s)</th>
<th>Time on task (sec)</th>
<th>Task completion * (0 or 1)</th>
<th>Notes: (if any) Observations and circumstances</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-task 1 – Navigational (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 12</td>
<td>1</td>
<td></td>
<td>Time-based efficiency = 0.055 tasks/sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 13</td>
<td>1</td>
<td></td>
<td>Task completion rate = 100 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 48</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 27</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-task 2 – Finding (Simple close ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 25</td>
<td>1</td>
<td></td>
<td>Time-based efficiency = 0.046 tasks/sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 14</td>
<td>1</td>
<td></td>
<td>Task completion rate = 100 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 37</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 -</td>
<td>-</td>
<td>Task missed due to oversight</td>
<td></td>
</tr>
<tr>
<td>Sub-task 3 – Informational (Simple open ended)</td>
<td>Time-based efficiency &amp; Task completion rate</td>
<td>P1 27</td>
<td>1</td>
<td></td>
<td>Time-based efficiency = 0.042 tasks/sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 19</td>
<td>1</td>
<td></td>
<td>Task completion rate = 100 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 28</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 -</td>
<td>-</td>
<td>Task missed due to oversight</td>
<td></td>
</tr>
</tbody>
</table>

*(0 = task incomplete and 1= task complete) # Only partly applicable as a usability measure (see 4.5.2.4.2)*

4.5.2.4.13 Task 4 – discussions on usability (Community spaces page)

A summary of the usability analysis for Task 4 is included in Table 16. Participants were given simple navigational, finding and informational task on this page of which two were close ended and one open ended. While the task completion rates were 100% on all sub-tasks, with a time-based efficiency of 0.055 tasks/sec, sub-task 1 took less of the user’s time than the others.

Two sub-tasks were missed for P4 due to oversight.
4.5.2.4.14  Task 4 - Feedback from study participants

All participants revealed that they learnt something new about the community spaces through this page. They discovered new places (and connected services) within the community on exploring through this page on the system. One participant suggested that including a link to the google maps for each location on this page could provide the user with added benefits of directions and hours of service.

4.5.2.4.15  Verbal post-study questionnaire

Participants were asked to verbally choose their option on a 5 level Likert-scale post-study questionnaire as six questions were read out to them. Participant comments (if any) were recorded along with their choice on the scale for each question. Some inferences have been drawn based on their feedback during this stage following the study.

Table 17 Verbal Post-study questionnaire

<table>
<thead>
<tr>
<th>Post-study questions</th>
<th>Participant responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P1</td>
</tr>
<tr>
<td>1. How easy was it to find <strong>specific</strong> information using this system?</td>
<td>4</td>
</tr>
<tr>
<td>2. How easy was it to <strong>browse and navigate</strong> through this system?</td>
<td>3</td>
</tr>
<tr>
<td>3. How would you rate the <strong>learning experience</strong> (based on content) from your interaction with the system?</td>
<td>4</td>
</tr>
</tbody>
</table>
### Post-study questions

<table>
<thead>
<tr>
<th>Post-study questions</th>
<th>Participant responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. To what <strong>extent</strong> did you have a sense of <strong>discovery and exploration</strong> as you used this interface?</td>
<td>P1 5  P2 4  P3 5  P4 2</td>
</tr>
<tr>
<td>5. Do you <strong>prefer</strong> this type of <strong>map-based</strong> system to a <strong>regular search system</strong>?</td>
<td>P1 5  P2 4  P3 5  P4 1</td>
</tr>
<tr>
<td>6. Do you have any <strong>comments</strong> or <strong>suggestions</strong> about the system or the study?</td>
<td>Comments recorded  Comments recorded  Comments recorded  NA</td>
</tr>
</tbody>
</table>

#### 4.5.2.4.16 Inferences drawn from the participant responses and comments during the post study questionnaire

**Question 1: How easy was it to find specific information using this system?**

With scores of 4, 3, 3-4 & 3 participants felt that finding specific information on the system was not difficult while also not being too easy. Two participants (P2 & P3) recommended the inclusion of a text search option to facilitate specific searches.

**Question 2: How easy was it to browse and navigate through this system?**

Scores of 3, 4, 3 and 3 reflect the perception of the participants that browsing and navigating through the system was easy without being the easiest. P1 felt it was easy and confusing sometimes. P2 said “everything popped up really well . . . it didn’t take you on any wild goose chases . . . it was pretty clear,” while adding that the user however was expected to remember the different areas and topics.
Question 3: How would you rate the learning experience (based on content) from your interaction with the system?

Participants rated their content-based learning experience with scores of 4,5,5 and 4. P2 said “learned a lot . . . and you could learn more if you could spend a long time using this (system).” P3 echoed saying “O I definitely learnt a lot . . . yeah!”

Question 4: To what extent did you have a sense of discovery and exploration as you used this interface?

Participant scores were 5,4,5 and 2 indicating satisfaction on discovery and exploration except for P4. P1 said while giving a 5, “I wanted to move around on the map”. P2 declaring “definitely a lot of discovery going on there”.

Question 5: Do you prefer this type of map-based system to a regular search system?

Participant scores were 5,4,5 and 1 indicating preference for a map-based system except for one participant. P2 while giving a 4 said “I really like things that are really visual and interactive like this . . . but I do get kind of sometimes a bit confused if there are too many bells and whistles”. P3 declared “this is a really good way to find articles in general . . . if I don’t really know what I am interested about for that area or organization” and opined that this using a system like this could be a “really good way for someone who is just getting their feet into community work or activism.” P3 still felt that there could be some “tweaking done in the visual way that it is presented.”
Question 6: Do you have any comments or suggestions about the system or the study?

Comments from P1:

P1 made the following comment on the design: “I think that there are a few pieces that can get confusing for people, if they have a low literacy level”. Also giving an example of the topics page, P1 said, “all of these numbers come up . . . . it’s not intuitive as an individual that you would click on those to get the article”. Remarking that seeing numbers 1, 2,3, 4 repeated on the page created confusion regarding uniqueness of the articles and their organizational connections, P1 felt that this was “not very intuitive”.

Comments from P2:

P2 felt that the interface was “a bit busy . . . . and a bit competing. . . . the different icon colors, the different size of the icons, with the pop ups of the names with the map of the different areas” Also pointing out to the way the areas of the base map are highlighted, P2 said that from “a visual point of view this is a little bit overwhelming” P2 also preferred the inclusion of “some search tools” while searching for “specific information” or “looking for things”. Here P2 echoed the perception of P1 about the topics page saying “I might not know what all these numbers meant . . . . or that they were even placed in a certain particular area that these articles are related to this organization.” P2 expressed a preference to have clear separation between agencies and studies in the organizations page.

Comments from P3:

Participant 3 recommended the use of a “heat map based on the tendency for a demographic to use a space” or “the tendency . . . for something to be researched or not researched” while also adding “I am not really sure if that would work for everybody.”
however believed that it would be . . . “kind of interesting to see the hits . . . . this particular place has this much activity generated”.

Comments from P4:

Participant 4 did not add any new comments or suggestions following the post-study questionnaire.

4.5.3 Revisions to interface following the usability study

Some of the pertinent suggestions given by the participants of the study involved minor modifications in the interface and were implemented as follows;

1. Participant observation that colors dividing neighborhoods on the topic page of the interface were strong. Participant felt that it added to the busyness of the topics page.

Implementation steps taken on the interface:
A semi-transparent layer was introduced between the numbered icons and the base map layer itself. This softened the colors of the base map while also bringing the numbered icons into more focus for the user as can be seen below.

![Figure 50 Topic page - before (strong colours)](image1)

![Figure 51 Topic page - after (soft colours)](image2)
2. Participant wanted to see additional means of identifying the numbered boxes (containing links to topic-specific research articles) to associated organizations:

*Implementation steps taken on the interface:*

It was decided that tool tips could be used to denote associated organizations on numbered boxes found on the main levels of the topic page. This was done here, due to the abundance of the research articles which reduced the sense of intuitively while promoting clutter.

3. Participant thought that introducing a simple visual way of segregating research articles under different topics and organizations would be useful on the topics page.

*Implementation steps taken on the interface:*

It was decided to use simple straight lines to demarcate topical and organizational boundaries and thereby provide the visual separation expected by the users, as shown below.

![Figure 52 Topic page – before (no line)](image1)

![Figure 53 Topic page - after (line separation)](image2)
4. Participants reported that the topics page was not as intuitive as other pages in the system. Implementation steps taken on the interface:
A simple legend box has been introduced in the topics page as shown in the next page, to provide clarity to the users on what the boxes represent and what can be expected through interactions using these numbered boxes on this page.

![Legend box introduced in the topics page](image.png)

Figure 54 Legend box introduced in the topics page

4.5.4 Recommendations for future versions of the system

Some of the suggestions by the study participants at the pilot and usability study stages which involve more elaborate changes in the design of the interface are as follows;

1. Feature to sort authors by number of articles and by associated organizations
2. Including a heat map to differentiate between the levels of research in organizations and to identify tendencies to research in certain topics or subject areas.
3. Utilizing different shapes of numbered boxes to differentiate between research articles of different organizations.
4. Including links to the google map as an alternative in the organizations page and community spaces page. This may be implemented by adding separate interactions for
the place-marker and the icons below. Clicking on the place-marker could bring up the google maps page, while clicking on the icon below brings up the organization’s website (as before).

5. One recommendation from a participant of the pilot study was to develop a mobile friendly version of the interface with due considerations about the demands of the user group that could benefit from such a version.

6. In response to a feedback from the user study, while it was evident that studies and agencies cannot be grouped together, more work in this direction would be needed to address this limitation of the current prototype.

7. One possible method of addressing the issue of scalability of the visualization used in the topics page, could be a vertical results pane which appears bringing up a list of articles as the user clicks on a location within the DTES map as discussed in the paper versions of the prototype.

4.5.5 Summary of the test stage

The test stage was designed to conclude the design process featuring three salient milestones, with a pilot study, human ethics application for approval of user study, concluding with the usability study itself where the target users interact with the online prototype. The pilot study was conducted on the second online version of the interactive prototype with the help of three student volunteers. It was designed to mimic the usability study with minor exceptions. Some feedback generated during the pilot study resulted in a redesign of the community spaces page of the interface.

One of the major learning experiences in this stage was the process of applying and conforming to the standards and expectations of the BREB committee that scrutinized the
application for human ethics approval prior to the actual usability study. Once it was approved, the usability was conducted with four participants, two residents and two with working experience at Vancouver DTES. The study yielded many valuable inputs which brought to light some strengths and limitations of the designed prototype.

Some of these recommendations may be implemented without much difficulty in the current version and some require radical modifications. These are being given as recommendations for future consideration in the hope of actual implementation of the prototype in the development of a visual map-based DTES research interface.
Chapter 5: Challenges, findings and conclusions

5.1 Challenges

Every challenge in this project became a learning opportunity as and when it was overcome. Consequently, learning opportunities were a plenty at each stage of this research project. Following a general concept and research questions, the initial phase involved the selection of relevant and relatable literature that provided adequate justification and food for thought to take this project further. With literature drawn from varied instances of community research, each conducted under different contextual settings and possessing unique central objectives, deriving relevant and useful conclusions was the first major hurdle within this research.

On summarizing the reviewed literature and deriving meaningful conclusions, it was then the time to refine the original research questions. It was seen that the research questions were multi-dimensional and involved examination of metadata, exploration of visualization alternatives and also aspects related to interface design. This necessitated the implementation of the iterative 5 stage design thinking methodology as the overlying process guiding the design stage of this research.

There were unique challenges and conquests in each stage of the design process. The first stage of the project being the ‘empathize’ stage, the major issue was to identify ways of understanding the needs of users through their voices as heard within the reviewed literature including DTES and non-DTES contexts. In this stage, some observations drawn from an unpublished interview conducted with a DTES community partner on the same research database provided insight into user’s needs and perspectives. This also helped in crystallizing the research question and narrowing down the needs and expectations of the proposed users, which was the
requirement of the define stage. The refined research question following this stage (within the overarching goal of improving access to research on the DTES), necessitated the design of an interactive geographic visualization-based interface offering an exploratory learning experience, location-based research resources while connecting topics and organizations within the DTES.

The main issue in the ‘define’ stage was to derive locational connections (through organizations) referenced within the journal articles. This presented a few challenges as the researcher at this stage was not clear on the method with which this connection was to be made apparent through the design of the interface. The challenges in the third ‘ideate’ stage of the design process were to stay focused while exploring various options that could help users in connecting with community-based research.

The fourth stage of this research project, namely the ‘prototyping’ stage offered unique challenges as the researcher had to identify and learn the software that best suited the needs of this research. This stage yielded the most surprises as so many options tried out within paper versions of the prototype had to be abandoned for not being realistic in the context of the technology at hand. The final version of the prototype thus differed from the design plans, although primary goals and objectives were met through the design in the eyes of the researcher.

The final stage of the project, the ‘testing’ stage included the preparation of documents and procedures to apply for a human ethics application to gain approval from the behavioral research ethics board. This stage developed a systematic / methodical approach for the user study bringing into consideration many factors. The feedback and input obtained from the faculty supervisor has been invaluable in providing direction and nurturing critical thinking throughout this study. The timely suggestions and observations made by the members of the examining
committee have instilled confidence within the researcher, offering validation when needed the most.

The researcher has gained much through the varied perspectives with which the research questions were looked at in various stages of this project. What seemed to be a straightforward research question focusing on user experience, metadata and geographic visualization is now seen as a complex puzzle needing more than what was proposed at the start of the project. The experience of seeing through the eyes of the users at different stages of the project especially during the usability study has been a real eye-opener for the researcher in many ways. Users voiced their excitement on learning through exploration which fulfilled the first aim of the research question.

While facing some challenges during their navigation of the interface, users provided some ideas that could help make connections between topics and organizations more visible and more intuitive. These interactions with community users provide insight that such connections made through community research are a step in the right direction. The researcher was also pondering on the question raised by a community member requiring a definition of who they are, and the role played by community members in the context of community research. There can be no simple answer to this question, and it is the fond hope of the researcher that this study becomes a clear step in bringing the community within the reach of the answers that they crave, from researchers and organizations alike.
5.2 Findings and conclusions

The research question addressed in this project was;

How to best meet user goals and needs while accessing DTES-based research through the design of an interactive geographic visualization-based interface, which;

a. offers users an explorative learning experience

b. provides location-based resources on DTES-based research

c. connects topic-based metadata to location or agency-based research within the DTES.

The participants of the user study revealed that they gained new knowledge while exploring through organizations, authors, topics and community spaces while using the interface. They saw the map-based approach as a novel way of accessing community-based research and were interested to see the connections between topics, authors and organizations. Users also found the click-based method of interaction and navigation easy to use throughout the interface. Exploring through community spaces within the DTES was also an enjoyable experience as expressed by the users.

It was surprising to learn that geographic connections as derived from the journal articles were mostly through organizations and projects situated within the DTES. There were instances of author affiliations to organizations outside the DTES which were not considered during the study. A few research articles contained locational references to two or more studies or organizations. Some features planned for inclusion in the results such as location-based snippets (as extracted from articles) were not implemented due to software-based limitations.

It was also seen during the textual analysis of the research articles that health related research formed a major portion of the DTES-based research. The user study also revealed user’s curiosity regarding the amount of research under each topic and on the DTES organizations that
were connected with selected topics of research. The prototype in its current form has the limitation of scalability with regard to the number of articles that can be referenced on a topic-wise basis. Another suitable approach is to be identified for accommodating a larger collection of research articles. Another area that could be addressed in the future versions of this interface would be the way of representing articles that deal with multiple topics or subtopics. It was observed during the usability study that most people were able to use the system effectively in their efforts at getting the information that they sought or desired to explore.
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Appendices

Appendix A  Icons obtained for incorporation in geo-viz interface

The icons used in the interface were carefully chosen from free for use and some public domain online sources. It was noted that in most cases, that attribution was not required by these hosting agencies, (like the noun project) if sizes at which the icons shall be used were less that 100 pixels. It may be noted that some of the icons listed in the appendix and the within the main document, have not been used on the final version of the interactive prototype of the interface.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Theme</th>
<th>Icons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Community</td>
<td><img src="image" alt="Community by Oksana Latyshova" /> from the Noun Project</td>
</tr>
<tr>
<td>2</td>
<td>Location</td>
<td><img src="image" alt="Location by supalerk laipawat" /> <img src="image" alt="Location by Arafat Uddin" /> <img src="image" alt="Location by Dev Patel" /> from the Noun Project</td>
</tr>
<tr>
<td>3</td>
<td>Subject</td>
<td><img src="image" alt="subject by BombsSymbols" /> from the Noun Project</td>
</tr>
<tr>
<td>4</td>
<td>Content creator / author</td>
<td><img src="image" alt="content creator by Aneeque Ahmed" /> <img src="image" alt="Book Author by Alfredo" /> from the Noun Project</td>
</tr>
</tbody>
</table>
5 Year

6 Company

7 Search

8 Drug-use

9 HIV/AIDS

10 Employment

11 Homelessness
12 Health-care and health services

13 Legal services

14 User log / history
Appendix B  User study documents

B.1  Structure of pilot study

1. Welcome to the study
2. Verbal consent received for participation in study and for being audio-recorded.
3. Brief overview of the project given by the researcher
4. Demonstration of the interface prototype given by the researcher.
5. Guiding scenario given to pilot study participants for assuming the intended user’s role while performing tasks on the interface.
6. Four written tasks given to the participants to be carried out on the interactive prototype. Participants requested to follow concurrent think aloud protocol as they performed the tasks.
7. Verbal post-study questionnaire given to pilot study participants and feedback obtained.
8. Closing study and thanking participants

B.2  User study – Letter of initial contact

Initial Contact by Email:

Date:

Dear ________,

Thank you for your interest in participating in our research study to evaluate a map-based search system. Please find attached the consent form for the study, which contains additional information about the goals of the study and what you will be asked to do. If you decide to participate, we will review the consent form and give you the opportunity to ask any question at the start of the session.
We are currently booking participants for 45-minute sessions at the following dates and times:

- X day, X time
- X day, X time

Please let us know when you are available so we can schedule a time for you to participate.

Please note that we will keep your email contact information confidential and separate from the study data, and we will not ask any identifying information in the study itself. You will receive an honorarium of $25 (gift card) for taking part.

If you have any questions in the meantime, please be in touch by email or phone. Our contact information is provided below.

Sincerely,

Billy Augustine

Principal Researcher: Dr. Luanne Freund, iSchool, University of British Columbia.

Phone: _______; email: _______

Student Researcher: Billy Augustine, Graduate Student, iSchool, University of British Columbia.

Phone: _______; email: _______

Sponsor: This project is funded by the Social Science and Humanities Research Council (SSHRC) and the Natural Science and Engineering Research Council (NSERC).
Tired of text-based search?

Want to be the first to try a new map-based search?

If so, we would like to hear from you.

You are invited to participate in a 45 minute user study where you will be given an opportunity to explore a location-based search interface and asked some questions on your interactive experience.

You will receive a 25 $ honorarium for your time.

The researchers conducting this study are Dr. Luanne Freund, @ubc.ca, Phone and Billy Augustine, @ubc.ca Phone from the school of the University of British Columbia.

To learn more about the Geographic Visualization interface project please contact the UBC Leaning Exchange by email @ubc.ca or call.

This project is funded by the Social Science and Humanities Research Council (SSHRC) and the Natural Science and Engineering Research Council (NSERC).

Version 1 : 13 July 2019
B.4 Consent form used in the study

Principal Researcher: Dr. Luanne Freund, iSchool, University of British Columbia. Phone: _______ ; email: _______

Researcher: Billy Augustine, Graduate Student, iSchool, University of British Columbia. Phone: _______ ; email: ______

Sponsor: This project is funded by the Social Science and Humanities Research Council (SSHRC) and the Natural Science and Engineering Research Council (NSERC).

Study Purpose: This project aims to develop map-based visual interface to a community information resource—the Downtown Eastside Research Access Portal (DTES-RAP). There is a great deal of published research about the DTES that is not easily findable or usable by members of the community, and we are developing this interview to make that process easier. This is a small-scale usability study to evaluate the current design of the system and identify areas for improvement.

Study Procedures: Your participation will involve an individual session with the researcher, in which the researcher will ask you to carry out a few searches using the system and talk out loud as you search, explaining how you are using the system. You will also be asked a few questions by the researcher about how you find information about the DTES and your impressions of the system. The session will be audio recorded.

Project Outcomes and Benefits: Results of the study will be reported in Researcher Billy Augustine’s master's thesis. The Research Access Portal already exists and is available through the UBC Learning Exchange Website. This study will provide input to the future development of the portal, which may increase the usefulness of the portal for community members. This study gives you the opportunity to provide input into the development of a tool that you may use to learn more about the DTES. A summary of the study results will be shared on the STOREE Project website (storee.ubc.ca/).

Potential Risks: There are no anticipated risks of the study. You can leave the session at any time and you do not have to answer any questions or perform any tasks that make you feel uncomfortable. You can withdraw your participation at any time.

Confidentiality: We do not ask any identifying information and all copies of documents and recordings will be identified only by code number and kept securely stored on the Researchers’ computers. Participants will not be identified by name in any reports of the completed study.

Open access: We do not intend or anticipate any future use of the data obtained from the study. Only members of the research team and STOREE researchers will have access to the data as part of the broader study. Audio recordings and notes taken by member(s) of the research team shall not be made publicly available. The written summary of the results of the research shared on the (STOREE) website shall not contain any identifiable information regarding the identity of the study participants.

Compensation: In order to acknowledge the time you have taken to be involved in this project, each participant will receive an honorarium of $25 in the form of a gift card.

Contact for Information about the study: If you have any concerns or complaints about your rights as a research participant, and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at _________ or if long distance e-mail to _____@ors.ubc.ca or call toll free 1-877-__2-___8.
Consent: Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time.

A recording of verbal consent indicates that you consent to participate in this study, and you have received a copy of this consent form for your own records.

Verbal Consent Received ☐

B.5 User study structure and details

Proposed structure of the user study (45 min estimated time)

1. Welcoming participant to the study – (2 min)
2. Consent form read out and obtaining verbal or signed consent of the participant – (6 min)
3. Brief verbal questionnaire for eliciting demographic information – (3 min)
4. Demonstration of the interface prototype by a member of the research team – (6 min)
5. Four exploratory tasks read out by the member of the research team and attempted on the interface by the participant one at each time. Think aloud protocol is used and audio recording is used with permission from the participant. (4 x 5 min = 20 min)
6. Verbal post-study questionnaire (7 min)
7. Closing study, thanking participant for participation and handing over gift card. (1 min)

Detailed stages - User study

1. Welcome to the study – 2 min

   Hi (Participant’s name), thank you for participating in this user study. The main part of this study will be performing some tasks on an interactive community research interface. I will have a few questions for you before you begin using the system, and after you are done.

2. Consent form: We need to start by giving you some information about the study and getting your agreement to participate. Shall I read it out to you, or would you prefer to read? – 6 min
During this time the consent form is read out and the participant is asked for verbal or written consent. The consent form contains a brief overview of the project. The remainder of the study is conducted (along with recording of audio) if the participant consents to participate voluntarily.

3. **Brief verbal questionnaire for eliciting demographic information** – 3 min

1. Can you tell me about your connections with the DTES? For example, do you live or work here?
2. How long have you had connections with the DTES neighborhood?
3. Have you ever gone looking for information or articles describing research studies done in the DTES? If you have, can you talk a little but about how you have found this information?

4. **Demonstration of the interface prototype by a member of the research team**: (5 minutes)

   The member of the research team gives a hands-on demonstration of the various pages, features and navigation methods to be adopted on the interface. Pages of the interface namely organizations, topics, authors, community spaces and the help page will be shown and explored as an orientation to the system for the participant.

5. **Exploratory tasks for participant**: (4 x 5 = 20 min)

   *Instructions to the participant: I am going give you some tasks to do and ask you to think aloud while you do each task; just letting me know .... What is going through your mind, how you decide to choose something or click on something, and I might jump in and ask questions as you go. Remember that there are no right or wrong answers here – we are not testing you but testing how well the system works for you.*
GUIDING SCENARIO

Imagine that you newly moved to live in Vancouver’s DTES and have heard about some challenges that the neighborhood faces. You are interested in knowing and learning more about these issues and about the organizations and people within the community that study and provide support or services on these issues and challenges.

Start by taking a few minutes to explore the site.

Task 1: (a written task sheet is also provided):

Using the organizations page,

1. Find the names of the four organizations that are geographically closest to each other which you might go visit.

2. Also in the organizations page, find the street address and working hours of the organization located in Victory square.

3. Using the drop-down menu, find the full list of organizations and locate VANDU on the DTES-base map.

4. Find the partners and funders for the study ARYS.

Task 2: (a written task sheet is also provided):

Using the topic page,

1. Explore the sub-topics under each of the five main topics.

2. Which main topic seems to include the highest number of journal articles?

3. Have any studies on HIV/Hep-C been carried out as part of the ACCESS project at the BC Centre for Substance Abuse?

4. Find one article that you might be interested in reading under any topic.
**Task 3:** *(a written task sheet is also provided):*

Using the authors page,

1. Which of the listed authors seem to have the **highest number of DTES-related research articles** in the DTES Research access portal?

2. When was the earliest publication by the author “Brissette, Suzanne”.

3. From a quick look through the list, **which organization(s) seems to be the most commonly used for research.**

**Task 4:** *(a written task sheet is also provided):*

Using the community spaces page,

1. Find the location of the **Carnegie centre** on the map.

2. Find a designated **gathering place for Seniors** on the map.

3. What is the service offered by the **Dugout** at the DTES?

**6. Verbal post-study questionnaire:** *(7 min)*

*On a scale of 1 to 5 where 1 denotes the lowest and 5 the highest value for each question, please answer the following questions related to this map-based visual search system. We shall read the question and circle the number that you choose.*

1. How **easy** was it to find **specific information** using this system?

   - Difficult 1  2  3  4  5 Easy

2. How **easy** was it to **browse and navigate** through this system?

   - Difficult 1  2  3  4  5 Easy

3. How would you rate the **learning experience** (based on content) from your interaction with the system?

   - Did not Learn 1  2  3  4  5 Learned a lot
4. To what **extent** did you have a sense of **discovery and exploration** as you used this interface?
   - Low 1 2 3 4 5 High

5. Do you **prefer** this type of **map-based system** to a **regular search system**?
   - Not at all 1 2 3 4 5 Yes sure

6. Do you **have any comments or suggestions about the system or the study**:

   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

   **Thank you for your participation! Have a great day!**

**Closing study** (1 min): Thank you for your time and involvement in this study. Your input and feedback are valuable for further revisions on the interface. Please receive this gift card as a token of our appreciation in this study. Thanks again and hoping you have a great rest of the day!

(Following the user study, the audio recording is stopped, and a receipt is made for the gift card transaction.)