North American Animal Disease Spread Application

Design Research Report

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RESEARCH SUMMARY

Preliminary ethnographic user research on the NAADSM application was conducted using the Contextual Inquiry methodology with four participants from varying fields of expertise. The primary goals of this endeavor were to: Identify critical pain points in the legacy application; Define generalized use-scenarios for different user types; Identify key areas of the application with which users interact most; Identify key application functionality for re-design efforts. Additionally, this method of research provides invaluable background and context for the designer, which will be continually leveraged throughout the application re-design process. It is important to note that all users involved in this small study were drawn from the same office environment and utilize the application in a broader workflow in similar ways. While this user group typically exports NAADSM data to a 3rd party application for further statistical analysis, it cannot be said for certain that other users do not relay entirely on the output data as it is produced directly from the application.

KEY INSIGHTS

Results Comparisons - For each user a primary use of the application is to compare results produced by manipulating specific parameters of interest in a particular disease spread scenario. As the application is presently designed, this functionality is extremely limited. Individuals create idiosyncratic, quirky hacks and workflows to conduct these activities, which present an enormous opportunity for the improvement of the application. It is understood that producing and storing results for different scenarios can be an immense computational task that directly impacts the ability to conduct comparison activities, but improving this functionality should be key among the re-design goals. One solution may involve offering the user two different ways of running a scenario: A small-run litmus test approach that outputs very specific and isolated results based on the user's interests and path of inquiry; A full run consistent with the current manner of processing and output that may be triggered after defining the parameters of a variety of scenarios using the small-run option. In any case, more avenues should be explored in an effort to bolster results comparison functionality.

File Handling - File handling and versioning is very quirky in the application. Adding some automation or internal support for these activities (particularly as they relate to results comparison) will be hugely beneficial.

Graphic Representations and other Resources – Each user enters the application with a specific and limited area of expertise. While this area of expertise focuses her attention to a subset of parameters and outputs of a scenario, she will likely still be interested in developing at least a coarse understanding of the associated context of the scenario. Graphic representations of equations and immediately available resources to define concepts and terms are critical in assisting the user in understanding areas outside of her realm of expertise.

Validation Messaging – Validation messaging needs a complete overhaul to make it more consistent with contemporary best practices. Messages that may be repeated should be dismissible. Addressing errors after an attempt to run a scenario can be made more efficient and interactive.

Navigation and Information Hierarchy – The present state of the re-designed ADSM application has eliminated the step-by-step wizard interaction that was core to navigating through the NAADSM application. This move to a non-linear approach to navigation is a dramatic improvement on the usability front and has taken some initial steps to creating a meaningful hierarchy of related sections. To reflect the different focus areas and fields of expertise of various users, this hierarchy should be more clearly defined in the GUI.

USER PERSONAS

Two primary user-types have been generalized from the interviews conducted during the preliminary research phase. Use Scenarios, goals, key functionality, key outputs, and specifics pain-points are described in the following pages. These details can be leveraged as starting points for design conversations, and the generalized user personas can be continually referenced as user touch-points as the design and implementation of the new application progresses.

The Epidemiologist

USE SUMMARY

Stage 1 (parameter input)– For the epidemiologist, the initial primary interaction with the application is discrete data entry; the epidemiologist conducts extensive external research in the realms of populations, disease details, etc., then opens the application to add one piece of data in a parameter field. Developing population data is a particularly time consuming process and frequently involves the sharing of data sets between other scientists and organizations. Due to security restrictions, the sharing of data (population and parameter files) requires exporting the dataset to an external file format, sharing that file, then importing back into the application at the local computer site. Of all the parameter setup sections, the epidemiologist spends the bulk of her time in the application inputting Disease Parameters.

Stage 2 (answering the question)– Once all of the parameters have been entered for population and disease, preliminary entries are made into the control parameters; Zones, Destruction, and Vaccination. The results produced by the manipulation of these parameters will typically provide the answer to the initial question that prompted the inquiry. The input is quick and the primary interest is in how changes in these parameters affect the Results. After initial input of all parameters, a short run is performed (5 – 10 iterations) and the run-map visualization provides a preliminary validation of inputs. Adjusting these parameters, running the scenario, then comparing the results from discrete changes in Zones, Destruction, and Vaccination is the heart of the work in Stage 2. The important output values are the median across runs for; outbreak duration, size of outbreak in terms of total number of infected animals, and geographic spread. The results data produced by NAADSM provides a litmus test to ensure that parameterization is correct, but the true statistical analysis is performed in a 3rd party application (R or SAS) on the exported data.

GOALS

- Input scientifically accurate data in all of the setup parameters
- Build a reliable, reusable models of a potentially threatening disease
- Validation of scenario alternatives before moving to statistical analysis
- Understand the manner in which adjusting various parameters effects other parameters within a scenario
- Produce a reliable data set that can be further analyzed to guide conclusions about control efforts related to the an initial inquiry

KEY FEATURES/FUNCTIONALITY

- Ability to import points to create a custom histogram in distribution functions
- Ability to name and re-use custom equations
- Compare results between different scenarios (current functionality is very limited)
- Run Map provided quick visual validation of scenario parameters
- Run Map to test assumptions about the relationships between various parameters
- Drop-down menu that allows the user to isolate results for a specific production type

KEY OUTPUTS – (Solely relying on the Statistics Table)

- Infected Units All
- Number of Farms Infected
- Interested in the Median (rather than the mean) results
- Outliers are noted and examined more deeply in other applications

PAIN POINTS

- Repeated validation of user choices to *not* model some specific parameters: "I don't want to simulate quail breeders to quail breeders, but I keep getting this popup asking if I want to do that. It's nice to have the reminder that you aren't modeling that, but you should be able to dismiss it."
- Filtering through extensive results output to locate the discrete piece of information the epidemiologist is interested in
- Hacking a way to compare results for different scenarios
- File management – user has developed an idiosyncratic manner of versioning. Beyond the personal impact of such efforts, idiosyncratic use of the application compounds the complexity of sharing data and scenario history with other users.

The Agricultural Economist

USE SUMAMRY

The Agricultural Economist begins a project by reviewing a specific subset of input parameters in order to develop a thorough understanding of the scenario context. She moves section by section using the wizard interaction. Specific areas of interest for understanding the scenario are: Disease Options, Production Types, Contact Spread (to a lesser degree), Tracing, Diagnostics, and Zones. The Economist will validate Tracing parameters based on her own knowledge of market practices. Tracing and Diagnostics are particularly interesting as they have a direct impact on the economics of a disease epidemic in their effect on the cost to producers and the relationship to how animals are marketed and moved. Again, the Economist validates these parameters based on her own knowledge. Zones can also have a large economic impact during an outbreak in the degree to which they might interrupt commerce and effect business continuity. In areas where distributions functions are used, the Economist will frequently look at the graphic representations of the functions in order to increase her understanding of how a particular parameter fits into the larger picture and how the progression of time effects that parameter's interaction with other parameters.

The Cost Accounting options are the Economist's particular area of interest. The outputs produced here are the "accounting" side of the overall cost of an outbreak and cannot reflect the true economic impact of a scenario. Much focus is placed on entering precise data into the cost of controls relating to different production types. The accounting output is useful in guiding the economist in assessing the cost of different control scenarios from a policy perspective, but in no way can the data be considered a "forecast."

The economist will run a variety of scenarios with different parameters inputs in the Cost Accounting fields and proceed to compare the results.

GOALS

- Develop a firm understanding of the epidemiological context of a scenario
- Validate parameters entered by other users that relate directly to the economic impact of an outbreak
- Generate preliminary data that can be used to estimate consumer response to an outbreak – did consumers withdraw, etc.
- Estimate the international trade impact of a disease outbreak
- Determine the overall accounting cost and market/economic impact of a variety of control scenarios for a disease outbreak and use that knowledge to guide policy

KEY FEATURES/FUNCITONALITY

- Visualization of distribution curves
- Validation window that guides the user to incomplete/invalid parameter inputs
- The segmenting of outputs (ability to look at results relating to specific production types)

KEY OUTPUTS

- How long is the outbreak (primary interest)
- How many animals are depopulated
- How many animals are pulled out of the system
- Stand-alone accounting costs (which ironically are not shown in the data table)

PAIN POINTS

- Lack of clarity in the way costs are calculated – the mixed nature of per unit vs. per animal parameters
- Lack of detail/quality of data in outputs related to vaccinations (as compared to destruction)
- Would like to see more of a representation of time relating to different control activities
- Lack of ability to compare across scenarios

The Trainer

Though the Use Scenario for individuals training others to use the NAADSM application was not specifically researched, the perspective of the Trainer was raised by some users and it is worthwhile to note some of the unique requirements and goals of this user type. The application should *not* be designed to the requirements of the Trainer, but keeping trainability in mind as the application is re-designed will have a positive impact on users of all classifications. Here I will forego the outline structure used for other user types and focus on some application characteristics that will support trainability.

KEY CHARACTERISTICS

- Clarity in required inputs
- Transparency in the relationship between inputs
- Clear grouping of related parameters
- Ability to run a scenario with a limited set of complete parameters
- Graphic representations of functions and processes wherever possible
- Ability to compare scenario results in order to emphasize the impact of specific parameters
- Clear and concise feedback for user input errors
- The ability to isolate a specific subset of scenario results
- Available resources to assist in the understanding of important concepts and key words