Developing a Reliable and Economical Web Portal for Meals on Wheels

(Technical Paper)

An Analysis of Actors in the Nutrition Policy-Making Process

(STS Paper)

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Introduction

In the last several decades, there has been explosive growth in the ease of access to published studies discussing the proper way to be physically, emotionally, and mentally healthy (Garza et al., 2019). Seemingly every day, there is a new study that contradicts conventionally held beliefs, causing consumers to become unsure about what actions to take to best maintain their health. For example, in the last two decades, several diets have become the dominant, central standard, recommended by health agencies and groups, only to be later usurped by newer studies which decry the effectiveness of previous recommendations (Lang, 2005); this confounds normal citizens who rely on clear, stable guidelines to trust.

Broadly, this proposal explores the acceptance of information that becomes common knowledge in society. Specifically, I will focus on investigating the factors that affect nutrition policy-making in order to discover how the research-to-guidelines process can be better understood by everyday citizens. After these actors are analyzed, I will briefly discuss further post-policy-making influences that further affect consumer perception of health. From both an engineering and societal perspective, the proper communication of research into rule is critical to ensure that solutions are effectively implemented and carried out. Furthermore, this process cements societal trust, thereby solidifying the respectability and believability of institutional guidelines. Thus, the various influences on the development of nutritional science policy will be explored and communicated.

As part of the technical project, our capstone team will redevelop the Meals On Wheels portal in order to better serve volunteers, staff, and clients in the greater Charlottesville area. The current portal is slow and inefficient to use by both staff and volunteers. In order to ultimately improve the meal-distribution process, we will focus on the previous design decisions that have

left the portal in this opaque, cumbersome state. Like in my STS research, I will investigate the different components and actors in the system, in order to fully address the current portal's problems and to better design our replacement for future use.

Developing a Reliable and Economical Web Portal for Meals on Wheels

Despite America being one of the richest countries in the world, an estimated eight million of its aging citizens face the threat of hunger (World Bank, 2019; NCOA, 2015). Meals on Wheels is America's oldest and largest organization dedicated to mitigating this issue through community chapters (MOWA, 2019). The non-profit's local chapter delivers meals to disabled or elderly people in the Charlottesville-Albemarle area who cannot cook or buy food themselves. With the help of volunteers, the organization packs, labels, and distributes meals to customers via various delivery routes. In addition, volunteers drive a few shuttle routes to deliver meals to locations outside of the Charlottesville-Albemarle area (A. Dudley, personal communication, September 27, 2019).

A small team of paid staff administers Charlottesville's Meals on Wheels chapter by managing delivery routes, maintaining current and prospective customer information, and ensuring that all daily jobs are filled by at least one volunteer (S. Bayker, personal communication, September 13, 2019). These administrative tasks can get rather complex due to a combination of daily, weekly, biweekly, monthly, and one-time volunteer shifts and customer needs. Also, most of the meals delivered are sourced via donation, which makes predicting supply difficult.

The greater U.S. Meals on Wheels organization sells professional software to help staff manage the complexity of their tasks; however, the Charlottesville office cannot afford it (A.

Dudley, personal communication, October 11, 2019). Thus, staff managed volunteers, customers, and routes by hand until approximately three years ago, when a University of Virginia computer science capstone team created a web portal for them. Adopting this web portal gave Meals on Wheels' staff more time to focus on essential tasks by automating physical reports and tedious manual tasks.

A subsequent capstone team updated the web portal to its current state, but Meals on Wheels' staff still desires improvements. First, staff complained that the web application has become increasingly slow over time. After examining the current codebase, we believe this slowness is likely due to its cluttered, unclear data storage and the use of an inexpensive hosting solution. Second, staff identified several organizational oddities within the app layout, making some tasks take longer than necessary. Finally, staff requested the addition of new features, including historical report generation and general search functionality.

It is clear that the system needs an update; however, the technical debt accumulated by the separate capstone teams developing features over a two-year period necessitates a rewrite. Our capstone team's goal, therefore, is to write a new application that satisfies Meals on Wheels' needs and has a more reasonable and maintainable backend for long-term deployment, including state-of-the-art modularity via Docker, normalized database models, and cost-effective cloud deployment via Amazon Web Services. By redesigning and modernizing from the ground up, our project should enable Meals on Wheels to operate at lower costs and function more quickly; the organization should have more time and money to help customers in need. We aim to provide a minimum viable product including features such as account creation, assigning volunteers to routes, and volunteer substitution by the end of the current year. We plan on releasing the complete, working product by May 2020.

Requirements for a Minimum Viable Product

- All Users
    - As a user, I should be able to create my own account (including custom username), so I can log in and see personalized information.
    - As a user, I should be able to request to change my password in case I forget it.
- Volunteers
    - As a volunteer, I should be able to release my route on a day, so someone else can substitute for that job.
    - As a volunteer, I should be able to pick up a released route on a particular day, so no routes go without a volunteer.
    - As a volunteer, I should be able to pick up a new route that has not been assigned to any volunteer, so I can plan my hours in advance.
- Staff
    - As staff, I should be able to create clients, so I can accommodate a growing client base.
    - As staff, I should be able to generate reports, so I can prepare daily operations.
    - As staff, I should be able to manually create delivery routes, so I can customize the volunteer's tasks.
    - As staff, I should be able to manually delete delivery routes, so I can avoid cluttering the portal with unused routes.
    - As staff, I should be able to assign volunteers to recurring routes, so I can plan delivery.
    - As staff, I should be able to substitute one-time volunteers for jobs, so I can ensure that all necessary jobs are filled.
    - As staff, I should be able to release volunteers from their recurring routes, so I can assign another volunteer to the recurring route.
    - As staff, I should be able to one-time release volunteers from their routes, so I can allow other volunteers to substitute.
    - As staff, I should be able to print reports that have been generated by any staff, so can have physical report copies.
    - As staff, I should be able to see who is volunteering on a particular day, so I can stay organized and communicate as necessary.

An Analysis of Actors in the Nutrition Policy-Making Process

In abstracting away the furious frenzy amongst competing interests and inherent complexity, national nutrition guidelines disguise the enormous maelstrom behind the development of health policy. Nutritional science research, the earliest step in that long chain of development, is an extremely thorny research area, given the human body's complexity and the difficulty in measuring long-term reactance to a single set of causes. Alone, the complexity of

the research area itself is difficult enough to inhibit the development of universal guidelines for people to live healthy lives. Furthermore, additional factors such as industry-funded studies, historical biases, and scientific consensus all further steer nutrition policy development to their own interests and thus affect millions of Americans' health (Carpenter et al., 2016).

Nutrition policy in the United States can be explored from the earliest formal recommendations "Dietary Guidelines for Americans" presented in 1980 ("Dietary Guidelines for Americans—History," 2005). These early guidelines served as the basis for many of the familiar recommendations presented by the Department of Health and Human Services (HHS) and the Department of Agriculture (USDA). The guidelines, updated every five years, were the culmination of an enormous amount of effort invested in nutritional research, policy development, case studies, test programs, and health legislation (Fogli-Cawley et al., 2006). Although scientific progress continues to unearth new, microscopic subtleties in human health, these guidelines have slowly updated, creating historical biases that persist in the common populace. The advent of the internet spurred an exponential amount of knowledge transfer between individuals. Such growth also specifically fueled the ability to conduct scientific research, including nutritional science, with better tools and prerequisite knowledge; increases in federal expenditures allowed the number of nutritional studies to double between the mid-1980s to the mid-2000s, leading to more conflicts and less scientific consensus (Kuchler, 2015). Large stakeholders, whose profit is directly affected by policy, including those in the dairy and sugar industry, have further added to the confusion by funding studies whose results were later found to be untrue (Soares, 2019).

I plan to analyze these multiple factors effects on nutrition policy through the Actor-Network Theory framework. This theory is often used in science and technology studies to

analyze the relationship of different components, known as actors, within a system, known as the network (Cressman, 2009). Relationships and motives between actors are often discovered and analyzed through this framework. In this nutrition policy analysis, the actors are the aforementioned factors that shape the research and guideline-development process. Valid critiques of the ANT establish the theory as overly broad because of the endless possible connections that can be generated between large numbers of actors. In order to address these criticisms, I will focus exclusively on a select few actors: nutritional science complexity, industry-funded studies, historical biases, and scientific consensus.

However, in order to further contribute to the discussion, I also plan on briefly discussing a few post-policy factors separately, including media misinterpretation, institutional trust, and traditionalism. For example, media misinterpretation has skyrocketed because as more Americans have shifted their priorities to becoming more health conscious, the wellness industry, including health information distribution, has exploded in growth, often through non-institutional sources including for-profit companies, advertisements, and personal blogs (Nagler, 2014). Even after policy is published, it is clear that numerous actors still confuse citizens.

Nutrition Policy Research Question & Methods

What are the factors and motives that affect the nutrition policy-making process, including research, development, consensus, regulation, and guidelines?

Answering this research question will inform everyday citizens of a research-to-guidelines process that is critical to their health. I will collect reputable material related to nutrition policy using documentary resource methods and organize this material using network analysis (Seabrook, 2019, Slide 4). The former involves exploring current, published literature

highlighting the actors in the nutrition policy network (Seabrook, 2019, Slide 5). A number of well-established research papers discussing some of the facets of the problem exist and will serve to illustrate influence on the policy-making mechanism. Many of these documents will provide strong, quantitative evidence that support the strength of connections between factors and policy. In contrast, I will use network analysis to identify and explore the relationships between all of the different actors in the nutrition sphere (Seabrook, 2019, Slide 14). This method neatly aligns with the ANT framework that I plan to perceive the nutrition policy-making process through, and thus will be useful from both an evidence-gathering perspective and a socio-technological lens. Ultimately, both of these methodologies will convey clarity about the mechanisms behind the nutrition policy-making process.

Conclusion

This STS investigation into nutrition policy should yield a transparent discussion about the many forces that mold institutional guidelines. The factors and their relationships, motives, and goals, will be analyzed through the Actor-Network Theory; this theory will focus exclusively on the most important factors and the strongest relationships in order to provide a focused argument about the actors' influences in the nutrition policy network. By shedding light on these factors, I seek to deliver clarity to the general public about the often confusing and opaque nature of nutrition policy, so that the public is knowledgeable about the best actions to take for their health. Ultimately, I strive to reaffirm the strength of institutional guidelines and societal belief in clear, evidence-based scientific policy.

Conjunctively, I will perform a similar analysis of different actors in the current Meals on Wheels portal, so that my team can design and develop a new, fully-functional, quick application

with all of the necessary capabilities to serve meals to Charlottesville residents. The application will be developed and deployed for MOW staff to use in their day-to-day operations of packing, scheduling, and delivering meals to clients. Furthermore, the portal will improve upon its predecessor by removing non-essential functionality, speeding up the aggregation and generation of reports, and increasing the ease of in-built use. In the long run, the portal will be error-free, fast, and easily maintainable for future volunteers to continue their mission.

References

Allman, E. (2012). Managing technical debt. *Communications of the ACM*, *55*(5), 50. https://doi.org/10.1145/2160718.2160733

Carpenter, D. M., Geryk, L. L., Chen, A. T., Nagler, R. H., Dieckmann, N. F., & Han, P. K. J. (2016). Conflicting health information: A critical research need. *Health Expectations*,*19*(6), 1173–1182. https://doi.org/10.1111/hex.12438

Cressman, D. (2009). A Brief Overview of Actor-Network Theory: Punctualization, Heterogeneous Engineering & Translation. https://collab.its.virginia.edu/access/content/group/484deb3f-d8f1-405a-8b1c-5541ca7dd540/Readings/Cressman%20-%20Overview%20of%20ANT.pdfDietary

Guidelines for Americans—History. (2005). Retrieved October 23, 2019, from https://health.gov/dietaryguidelines/history.htm

Facts About Senior Hunger. (2015, June 4). Retrieved October 31, 2019, from NCOA website: https://www.ncoa.org/news/resources-for-reporters/get-the-facts/senior-hunger-facts/

Fogli-Cawley, J. J., Dwyer, J. T., Saltzman, E., McCullough, M. L., Troy, L. M., & Jacques, P. F. (2006). The 2005 Dietary Guidelines for Americans Adherence Index: Development and Application. *The Journal of Nutrition*, *136*(11), 2908–2915. https://doi.org/10.1093/jn/136.11.2908

Garza, C., Stover, P. J., Ohlhorst, S. D., Field, M. S., Steinbrook, R., Rowe, S., … Campbell, E. (2019). Best practices in nutrition science to earn and keep the public's trust. *The American Journal of Clinical Nutrition*, *109*(1), 225–243. https://doi.org/10.1093/ajcn/nqy337

Kuchler, F. (2015). USDA ERS - Federal Support for Nutrition Research Trends Upward as USDA Share Declines. Retrieved October 23, 2019, from USDA Economic Research Service website: https://www.ers.usda.gov/amber-waves/2015/june/federal-support-for-nutrition-research-trends-upward-as-usda-share-declines/

Lang, T. (2005). Food control or food democracy? Re-engaging nutrition with society and the environment. *Public Health Nutrition*, *8*(6a), 730–737. https://doi.org/10.1079/PHN2005772

Microsoft (2017). Description of the database normalization basics. https://support.microsoft.com/en-us/help/283878/description-of-the-database-normalization-basics.

Nagler, R. H. (2014). Adverse Outcomes Associated With Media Exposure to Contradictory Nutrition Messages. *Journal of Health Communication*, *19*(1), 24–40. https://doi.org/10.1080/10810730.2013.798384

National Office. (2019). Retrieved October 31, 2019, from Meals on Wheels America website: https://www.mealsonwheelsamerica.org/learn-more/national

Seabrook, Bryn (2019). Methods Workshop [PowerPoint slides]. https://collab.its.virginia.edu/access/content/group/484deb3f-d8f1-405a-8b1c-5541ca7dd540/Presentations/Methods%20Workshop.pptx

Soares, M. J., Müller, M. J., Boeing, H., Maffeis, C., Misra, A., Muscogiuri, G., … Zhu, S. (2019). Conflict of interest in nutrition research: An editorial perspective. *European Journal of Clinical Nutrition*, *73*(9), 1213–1215. https://doi.org/10.1038/s41430-019-0488-8

Traill, W. B. (2012). Economic Perspectives on Nutrition Policy Evaluation.

Journal of Agricultural Economics, *63*(3), 505–527.

https://doi.org/10.1111/j.1477-9552.2012.00356.x