The Joy of Smart Cooking

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Abstract

The internet of things has brought technology and connected devices into many new areas of personal life, such as voice assistants and home automation. A growing area of connected technology is in the home kitchen, primarily in the form of smart cooking devices such as sous vide cookers. Smart cooking devices allow part or all of cooking to be managed through an app on a smartphone or tablet, and in the case of sous vide, have created widespread access to a previously rarefied professional cooking technique.

The aim of this study is to understand sous vide users - and their home cooking practices as it relates to these devices - and provide insight into the growing culture of smart cooking devotees, as well as their personal relationships and domestic responsibilities.

Introduction

The intention of our study was to learn about the attitudes, behaviors, responsibilities, and interpersonal relationships of smart cooking device users:

- Attitudes: what they think, feel, and say
- Behaviors: what they do and how they act
- Responsibilities: their responsibilities and accountabilities within their households
- Interpersonal Relationships: how they relate to and interact with others in their households

Background

Within this article, we refer to our overall research approach methodology as Grounded Theory and we discuss smart cooking technology as it applies to sous vide precision cooking. Since there are several definitions for Grounded Theory and different definitions for smart cooking technology we are including interpretations as follows:

For our research, we defined smart cooking technology as including cooking appliances and cooking gadgets that use Wifi or Bluetooth to connect to other devices, such as a smartphone, a companion app, the internet, or another appliance or smart device. Sous vide precision cooking involves heating meat or produce (protected by a plastic bag) using a digital thermometer that can be monitored and controlled remotely via a companion app throughout the cooking process.

We approached our research of people who use sous vide smart cooking technology using Grounded Theory Methodology [1]. Our approach to using Grounded Theory involved identifying our area of interest, avoiding preconceived theories, focusing on data only, and the use of open coding to define and develop the categories of our research [2].

In general, our open coding approach included taking notes based on observation, recording interviews, gathering photographs, and often marking important sections and adding descriptive names or codes to it as a way to sift through the data (i.e. interviews) in effort to break it down into pieces —enabling our team to discover key relationships, similarities, and dissimilarities. Throughout our process, different parts of the data were marked with appropriate labels or codes to identify them for further analysis and allow our team to affinitize similar information and concepts to better understand the data and report those findings [2].

Methods

Recruitment/Participants:
To recruit participants for this study, we used a combination of purposive and quota sampling methods. We created a screener survey and distributed it to our personal networks. We recruited 6 individuals between the ages of 22 and 55 who owned a smart cooking device and had a minimum of 1 month of experience using smart cooking technology. During our recruitment phase, we chose to narrow our focus to sous vide technology users since our screener revealed that most respondents used sous vide devices.

Methods:
We utilized three primary methods for capturing data: experiential research and observation, photographic diary studies, and interviews.

Experiential research and observation consisted of our four researchers preparing a meal with a sous vide device and capturing personal observations about the experience. This researcher-led method was instrumental in helping us develop a better understanding of the technological landscape before engaging with our participants.

Participants were asked to cook with their smart cooking device at least once in the week before their interview and take photos of the experience with their camera or phone. They uploaded their photos onto a cloud-based storage platform, where we were able to access the photos.

We conducted in-person interviews with participants for 60 minutes about their attitudes, behaviors, responsibilities, and interpersonal relationships as they related to smart cooking technology. The interviews were followed with a 30-minute discussion of the photos provided by each participant. Interviews consisted of at least two researchers - one leading the interview and one capturing notes - and were also video-recorded for reference in the analysis phase.

Analysis:
The interview data was transcribed and coded to prepare for thematic analysis and categorization to identify prominent themes, both dominant and outliers. We used Atlas.ti Cloud to code the interview notes and observations.

Attitudes	Behaviors	Relationships	Responsibilities
Confidence	Meal prep	Hosting while cooking	Division of labor
Quality	Planning	Gift-giving	Independent
Long cooking time	Photograph results	Share results with others	Family responsibilities
Convenience	Pre-planning	Take care of others	
Love of cooking	Daily habits	Recommendations	
Time for things that matter	Decision-making	Novelty	
Experimentation	Passivity	Family doesn't get it	
Showing off	Childhood/ethnic meals	Family support	
Small kitchen	Minimize waste	Encourage cooking in others	
Healthiness	Multiple methods	Family contributions	

Table 1: Top codes for four primary themes (duplicates removed)

The photographs from the participants were also coded and placed into common categories or themes based on the participants' intention to share with others and the descriptors used when referencing the photographs during the interviews.

Figure 1: Collage of photos from participant photo diaries

After the category analysis, we constructed the insights into a theoretical framework and key supportive findings.

Findings

Joy in Cooking:
Our participants universally expressed their enjoyment and love of cooking, both before and after they acquired their sous vide devices. For some, cooking was "a reminder that [they're] self-sufficient" (P3) and they "aspired to cook more often" (P6). Several participants noted they spend significant time each week researching new recipes and consuming cooking-related media to inspire future cooking projects. Many participants had specific cooking-related goals for the future, such as trying a home smoker (P3) or "to be more efficient, spend less time, achieve better results" (P1).

The sous vide device was viewed as a means to pursue their cooking experiments and make previously inaccessible recipes - "I like cooking so much, now I feel like I can make stuff that was a little out ... on the boundary - I would never have tried to make pork tenderloin [without the device]" (P3).

While sous vide devices provided a means to try new and unique recipes, it was not a dramatic shift for cooking skill and attitudes. Participants felt the sous vide was a welcome addition to the kitchen, but it did not impact their perceptions of their own cooking ability or enjoyment. The device is "just another tool in the arsenal" (P1) that could be leveraged to provide unique cooking opportunities and gain time back when desired.

Food Quality with Sous Vide Technology:
Sous vide was generally considered by our participants to consistently produce high-quality results without some of the inherent risks and challenges of other cooking methods. For many participants, we observed that 'quality' was associated with achieving a desired 'doneness' of the food rather than a certain flavor profile or taste.

Many of our participants were averse to ruining food, often through incorrect doneness, and highly sensitive to wasting money or time on an unsuccessful cooking endeavor. These negative cooking

experiences led to feelings of anxiety, frustration, shame, and disappointment. One participant noted that "on steak nights I would always be biting my nails about it. 70% of the time, I cook a steak perfectly, but ... it's mostly disappointing when it goes wrong. I have to eat this tough, gristly steak, even if I paid a lot for it" (P4).

The slow and precise nature of sous vide technology appealed to participants as means to ensure the results they wanted. Participants perceived sous vide to create results that were more consistent, predictable, and trustworthy than other cooking methods - and also considered sous vide to be a more precise, scientific approach. "It was a neat mixture of chemistry and cooking ... Coil-based stoves suck. You don't know what temperature you have in the pan" (P4). Sous vide was considered to be "kind of foolproof" (P4).

With fewer variables and potential points of error using sous vide, participants felt more confident in their ability to deliver satisfactory results. One participant explained that "it makes me feel confident. Happy ... You know what you're going to get at the end. It takes the whole mystery out of cooking. I'm not worried about how long I need to cook pork anymore because the numbers are dialed in and I know I can trust them ... I have this extra layer of comfort that I'm not going to screw up the food" (P3). Another participant noted that "the quality of the things we make is always really good. I've never had a mistake with the sous vide" (P2).

The ability to deliver consistently high-quality results using sous vide enabled participants to provide others in their lives with a positive eating experience - cooking with sous vide technology "makes me feel confident that I'm not going to put something over-cooked on the table. I don't want to give the family bad food" (P2).

However, while sous vide cooking was perceived to deliver predictably high-quality results executed at precise doneness, the long cook time did not always pay off. One participant cooked bacon for eight hours using sous vide - but ultimately felt that the results were not worth the wait. "It just tasted like normal bacon that I waited eight hours for" (P3).

Convenience/Ease:
Our participants felt that sous vide was "really convenient and easy" (P4) and less complicated than other cooking methods. Sous vide technology was perceived to be simply "an easy button for perfectly cooked food" (P3).

While the actual sous vide cooking process often takes longer than other cooking methods, the amount of active time is reduced, so participants perceive sous vide to be "more convenient than conventional cooking" (P1). One participant noted a lifestyle shift - "the devices have changed how we eat because we can make more complicated things faster and easier, with a lot less engagement in the kitchen. It takes the marathon down" (P4).
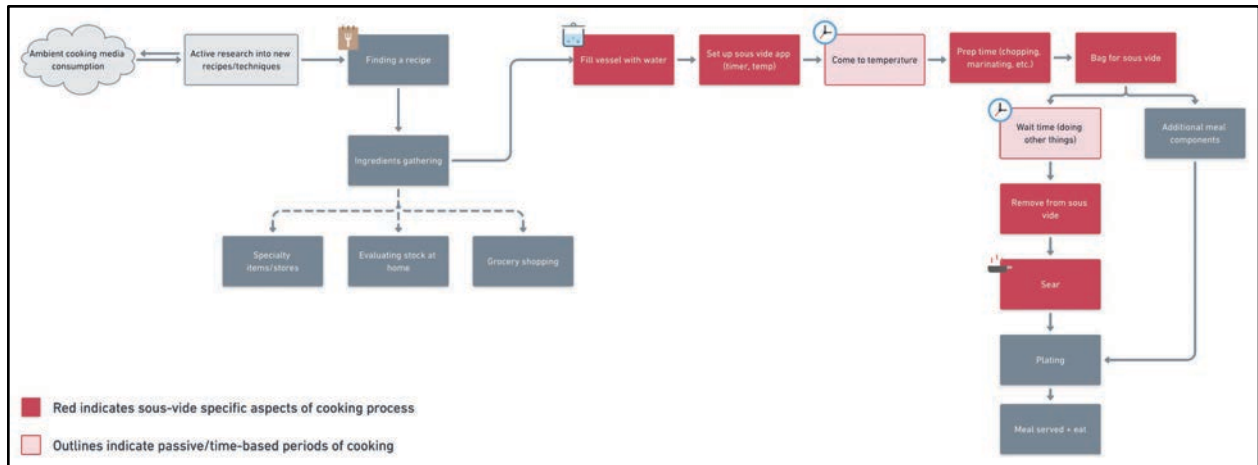
Figure 2: Generalized Sous Vide Cooking Process Flowchart
Link to detailed flowchart available at: https://whimsical.co/QmT37rgv5VB9QMFRuVstHN

Time for things that matter:
Due to the slow nature of the sous vide cooking process, participants found themselves with unexpected free time uncommon in other forms of cooking. Most of our participants saw this "set and forget" (P4) aspect as a perk of using sous vide technology. Participants told us that they'd "rather be playing video games. It lets [them] focus on what [they'd] like to be doing" (P3).

By allowing participants to disengage from the kitchen, sous vide cooking gave them more time for things that matter such as "setting something and then sitting on the floor with [their] baby and building train tracks" (P2). That time was spent focusing on their guests when hosting dinner or pursuing other personal activities such as working out, playing games, watching television, and connecting with family members.

Planning Meals:
Sous vide users plan their meals diligently. While all home-cooked meals require some level of planning and preparation, the slow cooking process of sous vide adds an additional dimension to planning considerations. With sous vide, participants noted a rigorous planning process including considerations such as available cooking time, how long the sous vide requires to cook a particular protein, and what proteins the participants had available that would work best with sous vide methods.

This often means thinking more intently about meals. Participants told us that it "takes a long time to set up, takes a long time to cook" (P1). In some cases this meant planning or preparing those meals the morning of or the night before, finding specific recipes that call for sous vide, and occasionally cooking "anything that produces lots of leftovers" (P2) so that large amounts of food can be eaten over the course of several days in hope to mitigate the frequency of sous vide use and thus daily amounts of time needed for sous vide slow cooking.

Limitations / Constraints

One of the major constraints we faced was the inability to observe participants cooking in their homes. This might have helped us gain a better understanding of how participants behaved in their home environment. However, our experiential research provided us with some understanding of what the home cooking process with sous vide actually looked like.

In terms of our participants- most of our participants were single and living on their own, so we did not get to explore much of the interpersonal relationships and cooking responsibilities of the participants. We would have also liked to interview more people living with their families.

All of our participants were based in the Pacific Northwest (Seattle and Portland), so we did not get to interview participants from different regions. We feel that there is an ongoing opportunity to explore ethnic and age diversity among our participants.

We selected our group of participants on the basis of their usage of sous vide devices. Research on smart cooking with other devices is also a rich area for future exploration, as well as the intersections of sous vide use with other smart cooking devices.

Discussion

As researchers, we entered the research process with some operating assumptions, including: (1) the long cook time of sous vide is an inconvenience for users, (2) sous vide devices are primarily purchased to assure consistent doneness, and (3) sous vide is a method used by beginner cooks, particularly those interested in technology. Some of these assumptions (2) were validated, but others (1, 3) were not.

Since consumer sous vide devices are a relatively new technology, this research helps lay a foundation for better understanding the people who choose to purchase and use these devices.

What is known	What this study adds
- Most users have positive perceptions of Smart Home Technology [3]. - The smartphone is becoming the ultimate sous-chef for Smart Tech users in the kitchen [3]. - Smart cooking technology allows for more quality time with friends and family [3].	- Smart cooking changes the way people plan their meals. - In sous vide, the "doneness" of food is a more important indicator of quality than the the taste of it. - The consistency that smart technology provides leads to a positive cooking and eating experience. - Many current sous vide users are experienced home chefs looking for new ways to cook and experiment.

The five key findings of our research provide insights into the attitudes, motivations, and behaviors of sous vide users. However, we did not learn as much as we expected about the interpersonal relationships and cooking responsibilities of sous vide users throughout our research process - this might have been due to the fact that we only talked to two participants who were in relationships with other people or lived with family. This topic is an area of potential future investigation.

Our findings pointed to a larger theory: sous vide is often adopted by people who enjoy cooking as a way to ensure consistently high-quality results. Sous vide delivers on this expectation, and has an additional benefit - it gives people time back for other important activities in their lives.

There is still much to be explored in this domain - especially around other smart cooking devices beyond sous vide (smart burners, smart ovens, connected thermometers, etc.). Whether or not this research can be transferred to other contexts likely depends on population sample being studied and whether the other smart cooking methods involve a similar "low maintenance" style of cooking.

Future Implications

This study provided insight into the lived experiences of active sous vide users, and may provide significant value in the marketing and product development of future sous vide devices.

Current messaging for the Chefsteps Joule and ANOVA (two major sous vide manufacturers) focuses primarily on "pro-level results" [4] and "perfect food, every time" on their promotional websites [5]. Experienced home cooks may not respond to messaging about succeeding in the kitchen, as it is not a pain point for them. Marketing towards convenience and freedom for other activities may be more relevant and desirable for this audience.

Additionally, our study indicated that participants use many other techniques and cooking instruments alongside their sous vide devices, and they frequently multi-task between the sous vide and other methods to create full meals. These findings may lend themselves to the development of future products or integrated services that guide home cooks through creating meals leveraging both smart technology and traditional cooking methods.

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AUTHOR CONTRIBUTIONS

Kelly - contributed to development of research question, research plan, interview guide, paper outline, recruiting, interviewing, note-taking, onboarding the team to Atlas.ti, coding, photo analysis, findings write-up, discussion, future implications of the research, editing of the final paper, and creation of the table and diagrams.

Dave - contributed to development of research question, research plan, interview guide, paper outline, observation plan, interviewing, note-taking, video capture, photo analysis, discussion, research paper presentation, research paper; findings, introduction, background as well as the creation of the 'What is known versus what are study adds' table.

Megh - contributed to development of research question, research plan, interview guide, paper outline, drafting screener survey and sending out to personal network, recruiting participants, interviewing, note-taking, video capture, photo analysis, discussion, research paper presentation, findings write-up, final drafting for presentation slide, and limitations of the research.

Gabi - contributed to development of research question, research plan, interview guide, paper outline, drafting screener survey and sending out to personal network, recruiting participants, interviewing, note-taking, video capture, photo analysis, discussion, research paper presentation, findings write-up, final drafting for presentation slide, creation of photo collage, and discussion section.