Bucketfood: A Crowdsourcing Platform for Promoting Gastronomic Tourism

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Abstract—*Food is far more than nourishment to humans; it can be a gastrimargic experience, an expressive form of art or even a social manifestation. Hence, applications that allow searching for best food options have become essential part of food experience for many. Technological advancements have brought the opportunity for custom search of food options at our fingertips. Tourist applications increasingly incorporate food search as an integral functional element, as gastronomy becomes an indispensable part of the travelling. However, most applications emphasize on the venue neglecting the menu options which is the primitive reason for food searching. The main objective of our work is to create an innovative food searching application tailored to gastronomic tourism that focuses on food rather than the venue. Our application adopts crowdsourcing principles, namely it relies on users to contribute content. Game elements are employed to motivate users in uploading accurate and qualitative food recommendations and sharing their food experiences in a social media-like fashion. The prototype implementation and the evaluation process provided us with valuable insights for the development of alike applications. Our findings are useful to application designers so as to effectively support gastronomic experiences and can be worthwhile for anyone planning to invest on gastronomic tourism or build a crowdsourcing platform.*

Keywords—Food; gastronomy tourism; culinary tourism; crowdsourcing; motivational factors; gamification; content curation; recommendation system.

I. INTRODUCTION

The local cuisine has become an essential element to be acquainted with the culture and lifestyle of a region as it integrates the values associated with tradition and authenticity. Today, gastronomy has become an important facet of the tourist product and many destinations increasingly use food (and beverage) as a source of attraction in their tourism marketing as wells as a way to differentiate themselves and broaden their market base [1]. Now, more than ever, there is need to support this market, helping tourists to explore a destination with their taste buds as well as locals to discover new spots to enjoy their favourite dishes.

There is plentiful evidence testifying that food searching applications nowadays become an important aspect of the eating experience, both for tourists and locals. A representative example of such an instance is Uber which invested in the food industry creating UberEats[1]. However, while the eating experience is influenced by the whole service (food, environment, service) [2] with the dish itself being an important part of it, the majority of existing applications are based on searching for the venue; hence, the user typically knows very little about the menu options before entering the venue. Although some applications exist that include photos of the food for specific places, sometimes even the menu, the information is not sufficient, and the recommendations usually refer to the overall experience at the venue rather than particular dishes.

The key objective of our work is to seek alternative food searching approaches that focus on the food rather than the place. This means that people will be searching among dishes rather than venues or will be exploring popular local dishes and the gastronomy of tourist destinations. In order to meet this objective we implemented *Bucketfood*, a food search application which offers several means for searching food (by dish name, by country, by distance, by category, by popularity, etc). In accordance with popular travel platforms (e.g. TripAdvisor) which primarily rely on users to accumulate content, *Bucketfood* encompasses crowdsourcing principles with respect to content curation; that is, it relies on the platform's users to upload food entries and assess entries contributed by others. In order to engage users in regularly uploading qualitative content we employ a gamification approach; that is, we incorporate game elements to promote competitiveness (rankings), goal-oriented actions (badge achievements) and the social interaction aspects. Food content recommendations are powered by an item-based context-aware recommender system, which takes into account a number of contextual parameters so as to improve the accuracy and relevance of recommended food options, including locality, seasonality, weather, popularity and user comments, etc.

The *Bucketfood* prototype has undergone thorough user evaluation trials so as to assess the new experience model and investigate the extent to which users would be motivated to use and actively contribute in such a food platform. The testing of our prototype aims at eliciting answers on the following questions: "Would users become interested in this new way of food searching and even prefer it over the existing ones?" and "Would users use the application when practicing gastronomic tourism?" The prototype implementation and the evaluation process of *Bucketfood* offers valuable insights to application designers as to how to effectively support

[1] https://www.ubereats.com/

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individuals practicing gastronomic tourism or build a crowdsourcing platform.

The remainder of this article is structured as follows: Section II reviews commercial apps and discusses research related to our work. Section III presents the application design process and analyses the core features of *Bucketfood*. Section IV discusses implementation aspects with emphasis on the recommender system, defensive mechanisms against wrong user input and spam, gamification features. Section V presents our user evaluation results. Section VI concludes the paper and draws directions for future research.

II. Related Work

A. Commercial food search applications

Through a systematic study of the state-of-the-art as regards commercial food searching applications we have identified three main application categories: (a) place-based search applications where the output includes places to visit with no detailed information about dishes except for some photos (e.g. TripAdvisor[2], Foursquare[3]); (b) delivery and takeaway applications which inform about places that offer delivery and takeaway service with detailed menu information (e.g. Takeaway[4]); as in the previous category, user ratings denote the overall quality of the venue rather than the dish with few exceptions such as UberEATS[5] where the users may indicate the best dishes in offer; (c) product-based search applications where the user is searching for the product itself rather that the place. A good example of this -quite uncommon- type of applications is Foodspotting which has been discontinued as of May 2018; no other similar widely used application exists at the time.

Although the abovementioned applications differ substantially with respect to their individual characteristics and features, some elements are commonly found in the majority of them. The creation of a user profile or the integration with other social media accounts improves the user experience as the results become more personalized. Ratings and reviews have a huge impact on people's actions as most of them trust online reviews as much as personal recommendations. Geolocation is a key component as food search is typically expected to be location-dependent. Finally, good filtering options make searching faster and more accurate, thus improving user satisfaction. Some additional elements offered include monetization, game components and push notifications.

B. Crowdsourcing, user engagement, content curation

Crowdsourcing is "the act of taking a job traditionally performed by a designated agent and outsourcing it to an undefined, generally large group of people in the form of an open call" [3]. It is a controversial model of sourcing as on one hand it has a lot to offer to individuals and organizations but on the other hand it involves several risks. Bousios et al. [4] demonstrated the use of crowdsourcing in a cooperative system to solve problems for the social good. Kleemann et al. [5] argue that crowdsourcing leads to a product that is closer to the users' needs as they become active partners in the creation process. On the other hand, there is always the risk of content explosion [6] or active members' extinction so keeping the posting frequency at a manageable level and at the same time constantly creating value is a challenge.

User engagement is crucial consideration in crowdsourcing platforms as content creation relies on the contributions of the crowd. The various types of motivation have been classified to better understand what would lead users to consistently use a crowdsourcing application and maintain a great amount of quality content. Intrinsic motivation is what makes people perform a certain task due to internal satisfaction. It exists between individuals and leads to exploratory behaviors [7] such as social activity. According to Wasko & Faraj [8], the prominent reason to participate in an online community is to give back to it, while Chandler & Kapelner [9] point out that the meaningful condition can greatly affect the quality and quantity of the crowdsourced content. Extrinsic motivation takes effect when an external reward like recognition is expected. It can occur when a platform has a competitive aspect including elements such as score and leaderboard.

Zichermann & Cunningham [10] argued that if games could motivate and engage users comprehensively and for a long period of time, incorporating game elements in non-game products and services should have the same effect. Thus, gamification has been investigated as a motivation factor and led to a thorough examination of appropriate game elements. Reeves & Read [11] describe some of them such as challenges, rewards and scarcity and state that although implementing all those characteristics will not make a game instantly successful and would potentially be high-priced, successful games usually contained several of those. The game elements used in the *Bucketfood* application are discussed in Section IV.

With a large amount of users being involved in creating a food network, thus producing large amounts of data, it is important that data may be filtered in a way that will add value to the existing information. User-generated content varies in quality [12][13] but there is also useful information created by the interactions between the users that is essential in understanding the human online behavior. According to Agichtein et al. [12] some ways to achieve content quality in social media are (a) text analysis, (b) user relationships and (c) usage statistics.

III. Application Design

The methodology adopted to pursue our research objectives involves the following phases:

- User research in order to understand the users' needs and elicit significant application requirements.
- User-centered, iterative design process of the *Bucketfood* prototype application.

[2] https://www.tripadvisor.com
[3] https://foursquare.com
[4] https://www.takeaway.com
[5] https://www.ubereats.com

- User evaluation trials to assess the usability, utility and market potential of the application.

An extensive user research has been performed to identify the user's dietary habits, motivational factors and interests. A questionnaire and several interviews determined the frequency of eating out, the factors for choosing a place and the importance of gastronomic tourism for end-users. The results collected from 113 participants indicated that the majority of users tend to hang out for lunch or dinner quite often (3-6 times per week) and would consider eating at different places as long as the quality and price is comparable, otherwise, they would be hesitant to try something new. A reliable recommendation or a special offer for food would be a strong motivator for people to try a new food venue. Last, but not least, gastronomy is regarded as an important element of the tourist experience for all participants, although only a few subjects have been engaged in gastronomic tourism.

Based on the results of the user research, a set of requirements have been extracted to guide the design process. First, we created user personas (based on the user research findings) to identify the most important needs and wants such as finding interesting dishes.

The three most important requirements are the following:

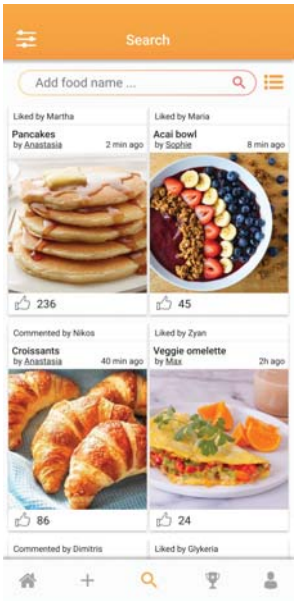
- *Bucketfood* should allow users to search for the traditional dishes of a selected country using their location. After selecting the desired country, the users should be presented with at least 10 most traditional (not-to-miss) dishes; by selecting one of them, they should be informed about which venues offer this dish.
- Users should be provided with means to discover a dish using alternative search methods; for instance, to search by category (including attributes based on cuisine, dish type and dietary preferences), by keyword, by distance or by popularity.
- Users should be provided straightforward means to contribute new food entries which will be later searchable by other users. Moreover, various methods should be employed to avoid wrong user input and intentional spam actions (see Section IV).

The identification of the most important use case scenarios has been the next step in the design process. Those correspond to the core user actions for the happy path of the application (i.e. actions featuring no exceptional or error conditions). The use case scenarios have been analyzed to identify the involved actors and interactions and analyze step-by-step the actions that would take effect between the actors and the application components. Game elements have been included to increase user engagement, as later discussed in Section V.

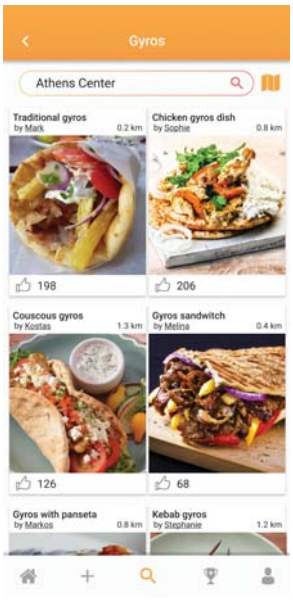
Below we list the use case scenarios which correspond to the basic actions:

- Create an account
- Receive recommendations for food offered near you from the top food category of a city
- Receive recommendations using food categories
- Receive recommendations through keyword(s) search
- Find follower's recommendations
- Follow a user
- Interact with a food entry (like, share, comment, save to wishlist)
- Add a photo to an existing food entry
- Organize the saved recommendations in folders
- Check recent notifications
- Check leaderboard
- Check badges
- Upload a new food entry

(a)



(b)



(c)

(d)

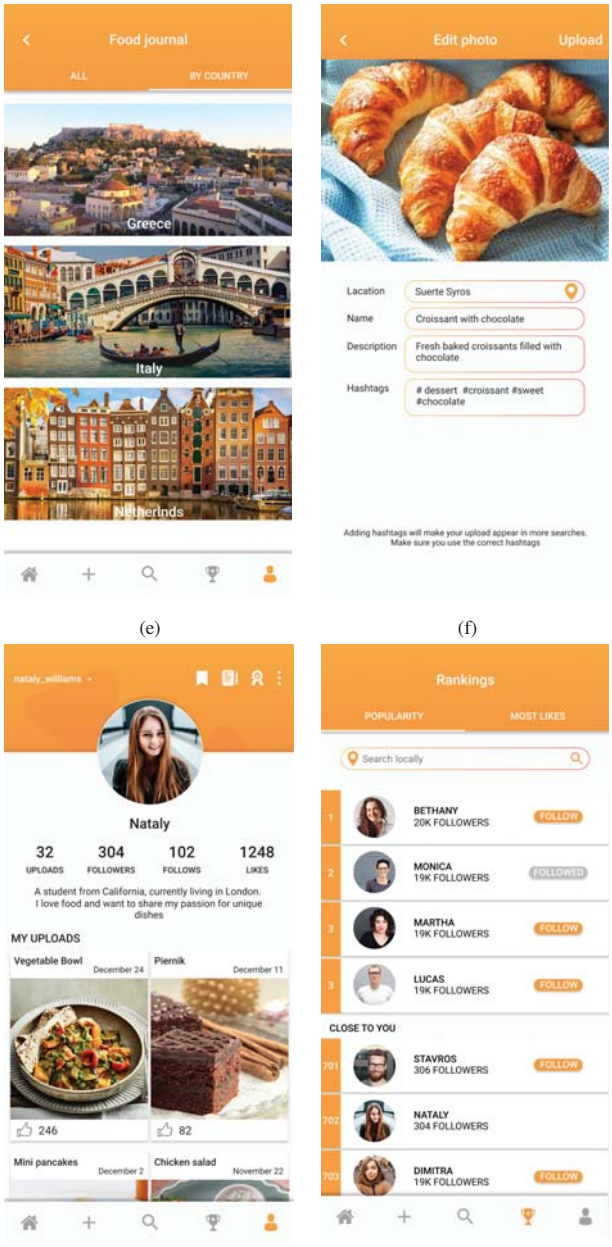


Fig. 1. *Bucketfood* application screenshots: (a) recommended local dishes; (b) food search using keywords; (c) food search by distance; (d) food search through a map interface; (e) activity history categorized by country (f) food content user input; (g) user profile; (h) rankings by number of followers.

The information has been sufficient to determine how the components would be displayed on the screen by creating wireframes, firstly on paper and then using the Adobe Illustrator software. However, mockups (i.e. high-fidelity visual representation of the application) have been created before the first phase of the evaluation process. The reason lies in the effect of the aesthetics that can also give important clues on how a user will act and how the information is perceived.

Fig. 1 illustrates representative screenshots of the *Bucketfood* prototype, as developed through the iterative design phase.

IV. BUCKETFOOD PROTOTYPE

A. *Recommender system*

Personalization is an important aspect of our food network platform as the more relevant food recommendations are, the more satisfied and engaged the users become [14]. To this end, we have implemented an item-based context-aware food recommender system, which takes into account a number of contextual parameters to improve the accuracy and relevance of recommended food options, including locality, seasonality, weather, content popularity and user comments.

Locality. Locality is probably the most essential search factor, which is about taking the user's position into account so as to recommend food that may be found in the user's vicinity. Admittedly, the preferred location could be the other side of the city or even another country that the user plans to travel soon to. To address this matter, in the future we plan to integrate a location prediction algorithm which will take into account the location history of the user to predict her future location and recommend food reachable around there.

Seasonality & whether. The timing (date, hour, weekday, season) can also affect the user's interest and food availability. For example, coffee is rarely consumed at night and some dishes are exclusively in offer during specific religious celebrations. Moreover, food consumption is influenced by weather conditions. For example, ice cream consumption rises when the weather is hot and people tend to eat more soup when the weather is cold.

Content (food) popularity. Users of social networks tend to consume content driven by the opinions of their peers. As regards *Bucketfood*, we hypothesize that dishes enjoyed by many (i.e. food options which have received many 'like' or many page views) are more likely to be appreciated by other users who have not yet considered it. Nevertheless, food options may attract traffic for the wrong reason. Analyzing the context of comments associated with food content may provide valuable information about the real attitude of users towards the commented item. To this end, we utilize the indico.io AP[6] to analyze user comments and detect emotions (anger, joy, fear, sadness and surprise from crowdsourced texts). In the future, we plan to improve the *Bucketfood*'s recommender engine by examining the identity of the users who 'like' or post a positive comment about a particular dish; a dish appreciated by popular users (those with large number of followers) or peers followed by the user herself will receive higher ranking.

B. *Wrong input and spam*

Wrong user input is another aspect considered in our crowdsourcing platform. However, not all incidents of wrong input are of equal importance or have the same effect on the overall experience. While a spelling mistake could be bothering, inserting the wrong venue location could make the respective recommendation unattainable. Preventing wrong

[6] https://indico.io/

input by limiting some options is straightforward defensive method; nevertheless, since errors cannot be avoided, several mechanisms to mitigate them have been incorporated. When dealing with a large amount of data, using the power of the crowd may be a good idea but should be used with caution as competitive elements could provoke sabotage activities.

Spam actions are also likely to occur due to competitiveness (among users or food venues). The first measure taken in *Bucketfood* against spam has been to prevent uploading a recommendation in the event that the contributor is far from the food venue. Inappropriate photos and text are automatically identified by image analysis [7] and natural language processing [8] cloud-based software. Moreover, the users are provided the means to report spam or abusive content, similarly to popular social media platforms.

C. Gamification

Game elements have been implemented to engage users in producing data by uploading food recommendations. The social aspect has been an important element as users are able to *follow* others; also to *like* and *comment* their food uploads and *share* them through other social platforms. The competitive element has been incorporated by using a *leaderboard* that indicates the number of followers and likes each user has accumulated. Last, the users can collect *badges* as a reward to their actions which motivate them to use the application more actively. For example, the upload of three dessert dishes (receiving at least a *like* each) rewards the user with a bronze badge in the corresponding category.

V. User Evaluation

The application has been evaluated at the end of each iteration of the design process. The goal of each evaluation phase has been to understand the extent to which each user found value in the application and whether it has been easy to navigate through the different functions. We have executed two evaluation rounds having the same basic structure to allow direct comparison among the two evaluated prototypes. The results of the first evaluation round offered feedback used to modify the application aesthetically but mostly in terms of functionality and usability.

The first phase involved an interview to reveal some basic dietary habits of the participants. In the sequel, participants have been invited to perform the actions listed in Section III. The whole process has been recorded to ensure thorough inspection of evaluation sessions. The users have been invited to 'think aloud' throughout the session to express their emotions, doubts and concerns. At the end of the evaluation process, the users have been handed a questionnaire assessing the usability and overall satisfaction from the application use. For each of the tasks, we have defined the correct way to perform each action to better evaluate the process, although it was flexible as there was not always a single way to successfully accomplish it. In the event that a user performed a task in an alternative way, the alternative solution was recorded for further investigation.

Bucketfood has been tested by 10 users during the first phase and by 14 users during the second one. The results of the usability tests have been distinguished in four categories: mistakes, observations, comments and alternative solutions. The mistakes consisted of actions performed differently from the predefined actions, leading to incorrect outcome. Occurrences of user's inactivity have also been counted as a mistake. The observations have been the non-verbal cues given by the participants during the evaluation. The comments included the phrases used by users to describe the functionality or suggest changes. Finally, alternative solutions have been all the unexpected actions that led to the desired outcome.

Overall, most of the tasks have been performed successfully by the majority of the users. The participants appreciated the idea to search for food by dish rather than by venue. They also did like the *Bucketfood* feature that allows them to check for the most popular food at a specific area. Furthermore, they found the recommended dishes presented to them relevant to what they were looking for, meaning that the contextual parameters of the recommender system have been properly chosen. Notably, the users made quite a lot of usability-related mistakes during the first phase and some of them requested help to finalize several tasks. The number of mistakes decreased substantially during the second evaluation. Improvements made on usability have also been evident through the questionnaire as more users expressed their eagerness to use the application again.

Table 1 presents the questions included in the questionnaire handed to the 14 participants of the second evaluation phase. The table also illustrates a statistical compilation of the responses received (average and median values). It is noted that for questions 1-8 the participants have been requested to reply using the Likert scale (1: Strongly Disagree, 5: Strongly Agree).

#	Question	Average	Median
1	The application has been easy to use.	4.0	4
2	The application has been complicated without a reason.	1.6	1
3	I think that I would need instructions to navigate through the application.	1.3	1
4	I felt sure during the use of the application.	4.4	5
5	The (recommended food) results have been relevant to what I was looking for.	4.4	5
6	The aesthetics of the application have been appropriate for the particular application context.	4.1	4
7	I would use the application again.	4.1	4.5
8	I would recommend the application to my friends.	3.9	4
9	Which application elements	N/A	

[7] https://cloud.google.com/vision/
[8] https://cloud.google.com/natural-language/

	would you use the most?	
10	Which application elements could be omitted?	N/A

Table 1. The questions answered by the 14 participants of the second evaluation phase along with a statistical compilation of their responses.

For the question #9 (i.e. most appreciated application elements) most users pointed out the *Bucketfood* feature which allowed them to search for local dishes (by country or by distance), search for food using keywords and search for dishes through the feed of random relevant options. The answers to question #10 (i.e. less appreciated application elements) mostly indicated the *badges* which have not been found as particularly motivating to further contribute qualitative content.

VI. Conclusions and Future Research

The *Bucketfood* application presents a new alternative in the way that people search for food focusing on the dish rather than the place and with emphasis on gastronomic tourism, i.e. on individuals interested in exploring the local cuisine of a tourist destination. The crowd uploads food entries as they search for the best dishes which are then recommended to a target audience using a recommender system to show relevant options. Gamification is employed to engage users so as to use *Bucketfood* consistently and over prolonged periods. The application has undergone user evaluation trials to assess its core features, usability and perceived utility.

Overall, the users have shown interest in this new model of food searching. They have appreciated the idea of searching for a specific dish and finding traditional dishes. The users have been satisfied with the results derived by the food recommendation engine which have been found as particularly relevant to their profile and usage context. The target market is probably rather broad which sets us on solid ground that the project is worth to be further investigated. Several features have been implemented to accompany the core function of dish searching; some have been found useful but others less necessary.

Although the preliminary market research is rather promising with respect to the prospects of future commercial exploitation, further work is definitely needed. We plan to apply design refinements based on the feedback received on the second evaluation phase to reduce mistakes and confusion. As for the recommender system, we plan to integrate a location prediction algorithm which will predict the future location of the user (based on her location history) and recommend food offered at suitably located venues. Furthermore, we plan to thoroughly assess some parameters by valuing more the opinions and food entries contributed by 'popular' users (i.e. the ones who have already proven themselves with consistent use and high quality content within the application).

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