An Exploratory Analysis of Travel-Related WeChat Mini Program Usage: Affordance Theory Perspective

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Abstract. A WeChat mini program is an application that users can use without downloading and installing. After it was officially released in 2017, many travel enterprises have launched their own mini programs. This study applies affordance theory to investigate the role of WeChat mini programs in tourism activities through social network analysis using Rstudio. The authors searched for the topic "how do you perceive travel related WeChat mini program", 200 comments were crawled and 180 comments were analysed after data cleaning. Results show that travel-related WeChat mini programs play a very important role in Chinese social network tourism activities. Moreover, the results suggest how the affordance theory has to be applied to the usage of WeChat mini programs.

Keywords: WeChat mini program · Affordance theory
Social network analysis · Rstudio

1 Introduction

In recent years, the rapid spreading of smartphones is pushing the mobile Apps market to become a fast-paced media outlet in the field of consumer technology [1, 2]. With the increasing popularity of smartphones, tourists are widely using mobile applications to book accommodations, transportation tickets, tourist attraction tickets and so on. In the mobile Apps market, travel-related Apps ranked seventh as most popular category of being downloaded [3]. As stated by TripAdvisor, 60 percent smartphone users have downloaded travel Apps and 45 percent of those individual users plan to use Apps to design their trips [2, 3]. Mobile Apps have changed the way of how Chinese tourists travel and all of those statistics can demonstrate the importance of mobile Apps in the

travel field. Based on the report of TripAdvisor, travellers from the US, UK and Italy stand out as online booking channel users, whereas the Chinese are most likely to make bookings via mobile Apps [4].

However, it is well known that travel-related Apps are used at a low frequency, but development costs are quite high (e.g., Booking.com, Airbnb, C-trip). And often, travel Apps take up lots of phone memory. According to reports of the mobile Apps analytics firm Flurry, travel Apps are used on average only 2.6 times per week and keep 45 percent of their users over a 90-day period [5]. Previous researches also studied smartphone Apps usage patterns, and most of those studies have analysed how to designed Apps to attract users [6–10]. However, not many studies focus on the low usage frequency and high storage capacity of travel-related Apps.

In view of this situation, WeChat, the giant among Chinese instant messaging and social media Apps, launched the function of mini programs in 2017. After the release, the WeChat mini program received great attention in tourism context. Meanwhile, OTAs (Online Travel Agents) and others have launched their own mini programs to attract travel users (e.g., Booking.com, C-trip, Qunar.com, Tongcheng Lvyou), which has been growing rapidly. From a theoretical point of view, some researchers believe that the WeChat mini programs not only have most of the functions of the original Apps but also integrates the advantages of authentication, payment, sharing, and communication [11]. Surprisingly, the WeChat mini programs have abandoned the cumbersome procedures of past Internet products and have leveraged user experience better than websites and general Apps [12]. In this study these mini programs are examined through affordance theory, which studies not only object itself and spatial relationships but also an interaction with the object and "action (affordances)" [13].

Most related previous studies have investigated general information systems design based on affordance [14–16] and social media affordance [17–19]. However, surprisingly, not many papers have explored the tourism context yet. Meanwhile, the WeChat mini program seem to be a "revolutionary" innovation, the potential of which have not yet been exploited so far [20]. Therefore, in this study an exploratory analysis will be conducted to test how the theory of affordance proposed by Gibson and developed by Norman (see Sect. 2.2) could fit into the WeChat mini programs among Chinese traveller networks from the users' perspective. Hence, the following research questions are proposed:

RQ1: Do WeChat mini programs play a very important role in Chinese tourism activities? If so, how do they become so important?

RQ2: Among the tourism original functions, have tourism activities been more actively fulfilled through various tourism-related interactions within the WeChat mini programs?

2   Theoretical Background

2.1   WeChat and WeChat Mini Program

Either domestic tourism or outbound tourism, China has become a huge tourism market in the world. Under the guarantee of a stable economic and social environmental change, the demand for national tourism is continuously soaring, thus, Chinese tourism consumption continues to heat up. As stated by the '2016–2017 China Tourism Consumer Market Development Report' issued by the China Tourism Academy, in 2016, the number of tourists in China's domestic, inbound and outbound tourism markets was 4.7 billion, and the scale of tourism consumption was more than 800 billion US dollars [21].

Moreover, with the rapid development of mobile smart devices, Chinese tourists intensely use smartphones for travel planning and communicating in their Chinese social networks to enhance the design of their user experience [4]. According to Travelport, the average British traveller uses 14 smartphone Apps while traveling, where maps and weather-related Apps are the most used [22]. However, the number of Apps used by Chinese traveller is on average 20 Apps [22]. In such an environment industrial investment and innovation have become extremely active, and the profit margin also can be imagined. As one of the giants in China's Internet industry, Tencent also gained its large profit in the travel industry.

WeChat is a free application launched by Tencent in 2011 to provide instant messaging services for smart devices. As of the second quarter of 2016, WeChat has covered more than 94% of the smartphones in China, with 806 million active users monthly [23]. A few years later, WeChat mini programs were released; the first batch of WeChat's mini programs was officially launched in 2017 and users were able to experience various mini programs. A WeChat mini program appears to be similar to general Apps, however, there is no need to install or uninstall them on the smartphone. They are embedded in WeChat and do not use any mobile storage, and WeChat users can access the mini programs directly within the WeChat App. As specified by the latest report of Tencent, more than 1 million mini programs have been launched, the total number of users of mini programs has reached nearly 400 million, and on average a WeChat user opens mini programs four times per day, 54% of which are active accessed [24] (Fig. 1).

2.2   Affordance Theory

The statement of "rhetoric of inevitability" makes users feel that technological change is not controllable, making people sense powerless to affect technology, or to select from various technologies [25]. Travel-related Apps not only change how travellers plan their trips; they may also change which online travel agency (OTA) a traveller chooses, how often travellers go on a trip and where they want to travel to.

Affordance theory states that perception could be explained not only by the object itself and spatial relationships but also in terms of an interaction with the object by "action (affordances)" [13]. As stated by Gibson [13], individuals are animals cognizing and acting in the specific environment [26]. Gibson proposed the concept of
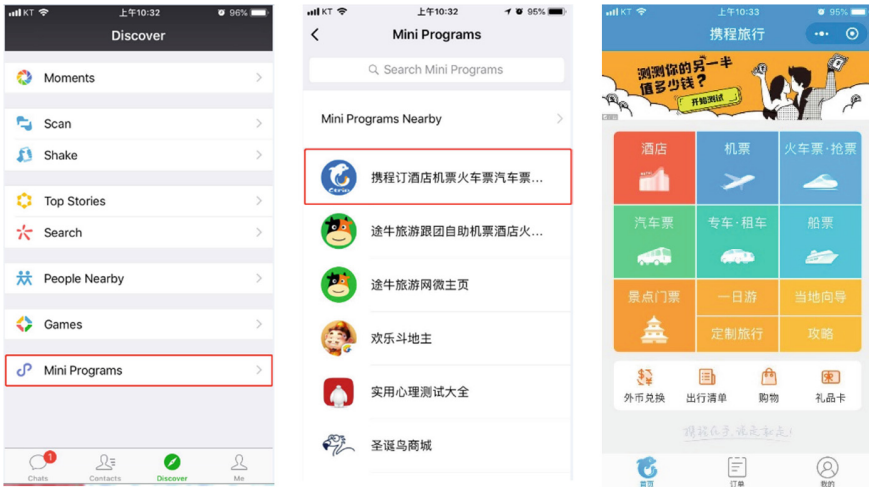
Fig. 1. WeChat mini programs

affordance, which addresses both the individuals and the environment as well as the interaction between them. The view of abilities for action offered by the environment is the central idea of the concept of affordance.

Ecological psychology and the concept of affordance have influence in many fields [25]. Hutchby [27] took the concept of affordance to technology and studied the functional aspects of affordance as possibilities for an action. Cabiddu, De Carlo, and Piccoli [19] studied the affordance of social media and identified three distinctive social media affordances. Leonardi [28] investigated the relationship between human and material agencies while in flexible routines and flexible technologies environment. Majchrzak and Markus [29] discussed the importance of technology affordance and constraints theory in management information systems. Faraj and Azad [30] argued that affordance perspective is a promising approach to study the importance of organisational technology.

Norman [31] attempted to research how individuals can interact with thousands of other objects. Norman argued that affordance provided by an object should be regarded as "real affordance" and "perceived affordance". A coffee cup, for instance, could provide a function for pouring coffee, pouring popcorn, decorating, and even being a weapon. All of those kinds of functions can be considered as perceived affordances while people using the coffee cup for different purposes. However, it does not change the real affordance of a coffee cup that is a coffee container.

WeChat, the affordance provider, is essentially an instant messaging tool. However, it provides a lot of other embedded functions. Such as payment services, instant messaging, financial management, hospital registration and so on. A WeChat mini program can be seen as an affordance offered by WeChat, however, interestingly, a WeChat mini program has been extended to other purposes by the interaction between Chinese social networks, which can be considered as an affordance sub-provider. WeChat mini program provides a platform for enterprises to release their own mini

programs to access the huge amount of WeChat users. Simultaneously, it also offers a channel for WeChat users to achieve their goal more easily. The mini programs can provide an intermediary function in travel, simplifying unnecessary processes from the travel processes. For example, travellers can easily book hotel and traffic tickets through specific interaction via mini program without downloading and installing different kinds of Apps.

3 Methods

The authors adopted a network analysis approach, which is a proper method for conducting a social network analysis of posts related to the usage of WeChat mini programs. Moreover, text mining and social network analysis enable researchers to study various topics that appear in the posts, taking into account large amounts of text data [32]. Therefore, with the goal of investigating the users' posts after using WeChat mini programs, the data was analysed using Rstudio [33], a free and open source environment for the statistical language R (https://www.r-project.org).

3.1 Data Collection

The data was crawled from Zhihu.com, a popular question and answer website where questions are asked, answered, edited and organized by the community of its users. Zhihu is more like an Internet forum where users engage in relevant discussions around a topic of interest. The topic "how do you perceive travel related WeChat mini program after using it" was searched, 200 posts were crawled and those data were stored in Excel. After the check, some duplicate posts and advertisements that use the mini program as gimmicks were found. Therefore, a total of 20 posts was removed and only 180 posts were analysed after data cleaning.

3.2 Analysis Method

The data was analysed using network analysis. In this study the betweenness centrality C_B was used to calculate network centralization indices for the nodes:

$$C_B(v) = \sum_{s \neq v \neq t} \frac{\sigma_{st}(v)}{\sigma_{st}} \tag{1}$$

where $C_B(v)$ denotes the betweenness centrality of node v; σ_{st} denotes the total number of shortest paths from node s to node t, whereas $\sigma_{st}(v)$ denotes the total number of the shortest paths from node s to node t via node v. In addition, a clustering method was adopted to classify the extracted words into groups in order to make the visualization more intuitively. The three clusters were obtained based on a walktrap algorithm proposed by Pons and Latapy [34]. This algorithm computes communities (i.e., dense subgraphs of sparse graphs) in large networks using random walks.

4   Data Analysis & Results

Before conducting the network analysis, the authors implemented a word segmentation process for the collected Chinese-written comments. The segmentation process was conducted using the "jiebaR" package [35] in the R programming language. In the preprocessing step, a user-defined stop-word list was employed for the removal of stop words. Then, the network analysis was implemented using the "igraph" package [36] in R to find co-occurence relationships among the terms of the comments. Therefore, the top 150 words (see Table 1) were first extracted. This also helps to interpret the importance of WeChat mini programs through visualization. As mentioned above, the terms were clustered into three sub-groups, which are represented by three different

Table 1. Top 150 words extracted from the comments

|				
qq	calendar	reading	fast	future
Startup	ecology	technology	install	demand
Appropriate	chance	delivery	moment	no need
produce	chat	system	development	Tencent
convenient	visiting card	related	ability	offline
associated	take-out food	Ctrip	operation	download
authentication	business	attraction	program development	time
auditing	formal	CPU	easy	phone
group	subscribe	Mini-game	open	query
information	exchange rate	latest	developer	tour
view	calculator	movie	payment	internet
venture capital investment	website	customized	choose	company
money management	bicycle	name	game	message
field	traffic	shopping	social contact	QR code
improve	food	education	recommend	share
articles	dictionary	media	promotion	tool
connect	image	release	issue	experience
remind	flight	cost	mode	scene
food and beverage	travel agency	news	data	industry
automobile	register	official	support	hotel
add	Didi Chuxing	consumption	electronic commerce	corporate
magazine	click	online	video	search
travel guide	edition	focus on	marketing	flow
train ticket	emotion	bonus	reservation	public
scan the code	manage	space	page	develop
scan	solve	travel	aid	function
restaurant	introduce	friends	content	trip
review	push	shopping mall	life	service
precise	flight ticket	customer	merchant	app
goal	brand	gain	market	program
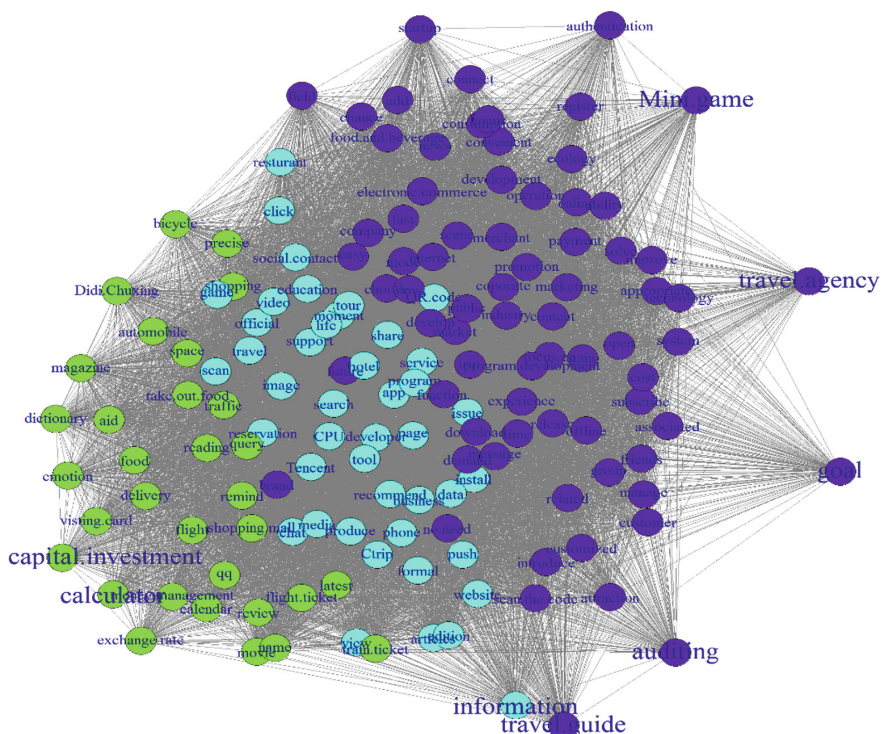
Fig. 2. Network visualization

colours in Fig. 2. The network was outlined by calculating the betweenness centrality of each node. The nodes, which betweenness centrality was larger than 500, were labelled as key nodes with larger font size. Additionally, regarding the walktrap algorithm, the authors set the steps of random walks to 30. When the number of steps is more than 30, a node will be allocated to another group. That is, the steps between any two nodes within a group are less than 30. In that way, three groups were obtained according to this threshold value.

First, regarding the results, the graph revealed the key functions of the mini programs for travellers. These functions are marked in green in Fig. 2. Many users have experienced the original functions of WeChat mini programs, which can explain it as affordance aspect itself. Likewise, WeChat mini programs have mapped the function of many Apps. For example, travellers are very easily accustomed to adopt mini programs for travel activities such as bike-sharing, shopping, hotel booking/reservation, take-out food, train tickets or flight booking, and calling a taxi, etc. Furthermore, Didi Chuxing (i.e., Chinese Uber), the most popular ride-sharing platform when calling a taxi, is widely used on WeChat. Thus, this mini program plays a critical role for Chinese tourists' preferences in many China domestic cities. In addition, the results also showed that many travellers have used reading- or language dictionary-related mini programs

on a trip. These function-based nodes are connected through two nodes ("venture capital investment", "calculator") with a higher betweenness centrality of the travellers clustering group.

Second, the WeChat mini programs provide travellers with necessary information on demand on a trip. These keywords were marked in pale blue in Fig. 2 and are connected through the node "information" in the network. In general, people search the information regarding hotels, restaurants, and attractions of a destination through images and videos on websites, and friends' moments, and online travel agencies such as Ctrip.com. From Fig. 2, the authors conclude that such travel related mini programs could share all necessary information (e.g., routes, guides) between travellers. This is another affordance aspect, of which an object (WeChat) is actionable by the travellers on instant and demand basis.

Third, drawing on the extracted keywords labelled in purple in Fig. 2, the authors also found that travellers gave some suggestions and their expectations for the development of WeChat mini programs. Theoretically, actionable affordance is made. These words were connected through the key nodes "travel agency", "travel guide", "mini-games", "goal", and "auditing". (1) Travel-agencies and some attractions were expected to develop their own style WeChat mini programs in order to provide travellers in different contextual situations with a more convenient trip. The travel agencies could promote their business through a well-developed mini program. (2) The graph showed that more mini games are involved in many comments, implying that game-related mini programs should be developed or embedded in the future. Many travellers hope to fill extra time through mini games during the trip. (3) Travel agencies are recommended to have an official account of WeChat, aiming to push more travel related news, guides, and their own business. Travellers could subscribe to the official accounts of the travel agencies to obtain more travel-related suitable information. (4) They suggested that the mini programs should simplify the procedures of auditing and authentication. However, the security and convenience of the payment system should be guaranteed, but the ability of solving problems should be further improved. Such suggestions were connected through two key nodes, i.e., "auditing" and "goal." In general, travellers pursue convenient-fast-easy payments and customized trips via WeChat mini programs.

Fourth, many users believed that the mini program development is beneficial for a startup business. It can be regarded as another perceived affordance from the perspectives of entrepreneurs and their enterprises. Relying on the huge amounts of WeChat users, those entrepreneurs and tourism organisations can receive alert and attention from their target customers relatively easy. In addition, for developers, the threshold for developing WeChat program is relatively low, the development difficulty level is not as high as that of general Apps. The WeChat program can satisfy simple basic applications and is suitable for offline service shops and non-rigid demand low-frequency applications, such as travel-related applications.

5 Discussion and Conclusion

This paper has applied affordance theory for travel-related WeChat mini programs. A WeChat mini program is not just an open platform for some quality services, but also starting point of many travel enterprises on the basis of their own WeChat mini programs. Norman [31] argued that affordance offered by an object should be regarded as "real affordance" (i.e., functioning services) or "perceived affordance" (i.e., various actions via the functions). In the context of WeChat, the "real affordance" of mini programs is that an open platform should connect users and service providers. Meanwhile, from different perspectives, "perceived affordances" would be slightly different. For instance, WeChat mini programs can be regarded as a channel for travellers to design a customized trip more convenient due to mini programs that do not have to be downloaded and installed. Moreover, a WeChat mini program is born with the label of the offline scene, and the connection between online and offline can be achieved by a simple QR code. In addition, relying on WeChat's huge database, mini programs can better combine both online scene and offline scene. For example, travellers can search for mini programs nearby when traveling to other cities or scenic spots. Mini programs also can be shared with WeChat friends and forward valuable information. General travel Apps lack an effective social channel, user sharing behaviour is limited, and the penetration range is small. However, WeChat has reached more than 94% of smartphones in China, with monthly active users of 806 million [23]. Based on the strong WeChat ecosystem, information can more easily spread in WeChat and mini programs naturally have this advantage.

Therefore, based on the results of the analysis, the research questions can be addressed. WeChat mini programs are reflecting the important role of the tourism industry and create potential tourism activities more actively through various interactions within the WeChat mini programs. The WeChat's role in the tourism ecosystem has become essential as the interaction within WeChat mini programs is expanded to go beyond tourism function services. Thus, like Google's function in the world's tourism environment, WeChat was found to play an important role in the Chinese tourism ecosystem.

In addition to the practical contributions, this study also provides some theoretical implications. This paper is based on the use of new technology. Regarding the acceptance and use of new technologies, most of the previous research approached the question by using the technology acceptance model (TAM) [37–39] and the unified theory of acceptance and use of technology (UTAUT) [40–42], or other models derived from those two. This study attempted to explore the acceptance and use of new technology from a new perspective, which jumped out of the theory about adoption. Therefore, the authors hope that this research can give some inspiration to future studies.

Since this paper is still an exploratory study, it also has its limitations. First, because the object of analysis are the 180 comments written by users who have experienced travel related WeChat mini programs, it could be very subjective and biased. Thus, future study should continue this line of research on the basis of larger datasets.

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