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TABLE OF CONTENT

Gamification to Improve Digital Data Collection in Ecotourism Management

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Abstract—Data needs of ecotourism managers are quite high. Data is used to improve service and quality. However, there is not much data availability and tends to be difficult to collect. Even though they have used information technology to facilitate data collection, they have not yet obtained maximum results. The reason is that managers do not manage information technology properly and not many tourists participate in filling in information technology content. The advancement of information technology especially online-based social networks actually provides a lot of data. But the manager has difficulty retrieving the data, because it requires unique keywords or markers. Keywords or markers are needed for the process of withdrawing data from internet. This marker also makes it easy to cluster very large amounts of data. This paper describes how to design of digital data collection systems uses the gamification approach. Using game strategy theory and game elements such as rewards and leaderboard. The goal is to attract tourists or visitors to share photos, videos and stories through social media. This system is very simple, utilizing existing information technology and social media. Thus, more tourists are interested and motivated to share, more data collection they have, so that management and improvement of ecotourism services can run better.

Keywords—ecotourism, gamification, gamification-technique, game-theory, data-collecting

I. INTRODUCTION

Ecotourism Indonesia increased rapidly both in terms of quantity and quality. Some ecotourism has been managed well, but some are still not good, causing ecotourism to last only one or two years. One factor is the lack of management of unavailable data. For example, the number of visitors, frequency of visitors, visitor testimonials, etc.

Information technology has been used in management and services. For example a web application that contains news, galleries, testimonials, and guest books. One of the goals is to obtain and store data properly. However, the use of information technology has not been effective. Managers still cannot get the desired data. The reason is the lack of interest and motivation of tourists or visitors participating through the available system. Other causes, the existing system management is not optimal because of lack of human resources, so the content in the system is not up to date. Human resource management is limited, because ecotourism managers consist of community groups that are empowered to develop tourism potential in their village.

Actually there are a lot of data on the internet. For example, tourists who post photos, videos and testimonials through social media accounts. But it's hard to filter because it's too big and wide. Need certain keywords or markers so that they are easy to filter and collect. The next problem is how to direct visitors to voluntarily enter a sign in their posts.

The gamification approach [1] can be considered as one of the solutions to increase the motivation [2][3] of tourists to provide certain keywords or signs when posting on social media. Increased tourist motivation is expected to have an impact on the number of posts on the internet, so that more structured data can be collected.

This paper discusses how the design of the application of gamification for data collection. Gamification is made by applying the basic concepts of games, game elements [4] and Instagram social media. The implementation was carried out in Ecotourism Gunung Api Purba Nglanggeran Gunungkidul Yogyakarta Indonesia. Data collection systems are made using existing web applications and social media. The system is used to manage the game, then displays the recapitulation of data taken from social media.

II. RELATED WORK

The gamification approach increases user engagement, increases productivity, changes player habits / activities, increases loyalty, educates users [5]. Gamification has been widely used in many fields such as transportation to increase people's motivation to use public transportation [6]. Especially in the field of tourism, gamification can increase the involvement, experience, loyalty and brand awareness of tourism [7].

Previous research has designed the application of gamification on information media. But it has not been able to increase visitor participation. The previous system only applied element games in the form of rewards and leaderboard. The concept of the game should consider visitor activity. Gamification research results for tourism state that visitors (called players) begin activities by searching for information followed by other activities. In addition, social interaction also plays an important role [8].

This paper focuses on gamification for data collection. This is based on the results of research on the potential of gamification which can increase the success of online data collection for promotion purposes [9]. The involvement of tourists is the key to the success of tourism sustainability in terms of economic, social and environmental [10].

Game theory has been widely used in economics to analyze decision-making systems. Economy has long used this approach to analyze corporate behavior in the market, so that it can determine strategies for interacting in the market. Besides in the economic field, game theory has been used to solve some problems in the communication system [11][12]

and internet [13][14]. This paper explains how game theory can be applied in ecotourism data collection applications.

III. BASIC CONCEPT OF GAMES

The gamification system considers the activity of ecotourism visitors. Game is designed with three components: the player, the possibility of the player's actions and the actions the utility function. The basic concept of the game is taken from the seller and buyer game theory. Sellers and buyers as players have a range of activities that can be chosen to get a profit called payoff [15][16]. This paper determines the role of 2 players, seller are ecotourism managers and buyers are visitors. Each has a series of steps/moves in the game. This paper determines the role of 2 players, seller are ecotourism managers and buyers are visitors. Each has a series of steps/moves in the game.

- Managers requests hashtags and mentions by offering rewards.

- Managers set hashtags and mentions without offering rewards.

- Visitors posts by embedding hashtags and mentions.

- Visitors posts without embedding hashtags and mentions

The possibilities that occur in the game are shown in Fig. 1. If the manager offers rewards, chances are that visitors will embed hashtags and mentions in their posts. Managers get data even though they spend money on rewards. Visitors get great opportunities to get rewards. If the manager does not offer rewards, then it's less likely that visitors embed hashtags and mentions. In this paper the basic concept game is applied in the gamification framework using reward and leaderboard elements.

Usually in the application of game theory to get the best conditions is to analyze Equilibrium. A simple analysis performed on Fig.1 can produce simple equilibrium. It's clear that the targeted conditions are, visitors embed hashtags and mentions. The highest possibility is that managers offers rewards first. If the manager's offer of reward, then the visitor motivation to get involved in the game increased and they follow the rules of the game voluntarily. But how big and how the strategy for managing rewards will not be discussed in this paper. Further research is needed to be able to analyze the situation.

IV. GAMIFICATION DESIGN

Designing a gamification system using the D6 Design gamification Framework. As the name implies, this framework consists of 6 stages: determining gamification objectives, designing expected behavior, determining players who are directly involved, designing activity loop, determining elements of fun and deploy with appropriate tools [4].

A. Define Bussiness Objectives

The objectives of gamification data collection is to increase motivation of visitors to volunteer embed hashtags and mentions. Hashtags are determined by the manager according to the current program. Number of posts based on hashtags is used to measure achievements of objectives.
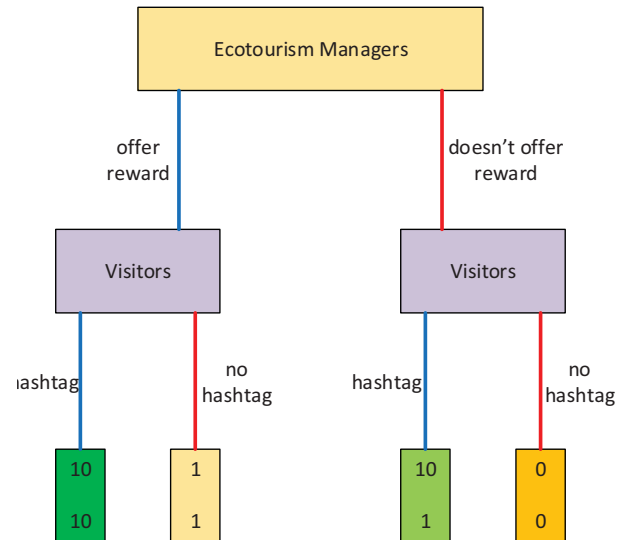
Fig. 1. Chart of possible conditions in the game concept

B. Delineate Target Behaviors

According with the concept of the game that was made before, the expected target behavior is:

- Managers requests hashtags and mentions by offering rewards.

- Visitors posts by embedding hashtags and mentions

Hashtags in accordance with the needs of the manager per month, considering the events being held.

C. Describe Player

Based on the game concept, the gamification system players are managers and visitors. Managers take moves to offer rewards, more visitor's posts tagged as payoff. Visitors take moves to embed hashtags, have greater opportunity to get reward as payoff.

D. Devise Activity Loops

Activity loops in the gamification of data collection can be seen in Table I for manager activities and Table II for visitor activities. The key of the manager's activity loops depends on the number of visitors participating. The key of the visitor activity loops depends on the opportunity to get the reward obtained. The indicator is the number of likes obtained.

E. Determine The Fun

The most important element of the game is fun. In this case fun tends to be made for visitors. Visitors try to post the best data / data by embedding the appropriate hashtag. Visitors must share their travel experience with their social media networks and get the most likes. Reward is given to media that has the most likes. Visitors must compete to get as much likes as possible to get rewards. Managers get additional benefits, in addition to data collected information on ecotourism can be spread easily on social media.

TABLE I. ACTIVITY LOOPS SCENARIO OF MANAGERS

No	Activity	Explanation
1	The manager creates and selects hashtags based on running events	Hashtag adjusted to an event which is or the type of visitor activities.
2	The manager determines the	Determination of reward is

	reward offered	immediately obtained or must meet certain criteria.
4	The manager takes and displays social media data into leaderboard	Exploring progress update data collection and provide transparency to visitors
6	The social media competition is over, the manager makes data recapitulation	The manager evaluates the results of data collection.
7	Return to step 1 with different hashtag events and formats.	Repeat with different hashtags to get more data.

TABLE II.   ACTIVITY LOOPS SCENARIO OF VISITORS

No	Activity	Explanation
1.	Visitors attending events or activities of ecotourism	Players must be visitors who have attended ecotourism events or activities
2.	Visitors get competition information	Information is obtained through social media and other media
3.	Visitors post with specified hashtag	Visitors embed a hashtag according to the manager's requirements
4.	Visitors see the leaderboard	Visitors see the status of the media / data that has been posted
5.	Visitors increase the chance of getting rewards by posting new data.	Visitors do post media / new data to increase the chances of winning reward
6.	Visitors get rewards. Return to the first activity	Motivated visitors get more rewards, by attending ecotourism events or activities

F. Deploy The Appropriate Tools

Data collection is integrated with existing information media and Instagram. Hashtag setting and period of the competition utilize web applications owned by the management of ecotourism. This web application is also used to display the leaderboard. Announcement of the competition starts and finishes through the manager's social media account.

V. EVALUATION

This section will show the results of evaluating the implementation of gamification for digital data collection. Compare the results with data without gamification. Instagram data is taken with the Instagram API, but only the number of media posts can be taken with the API. Starting August 2018, public data can no longer be accessed using this API. Total media posts is sufficient to measure the achievement of this work. The API code used to retrieve data is "tags/search" as shown by Fig. 2.

```
https://api.instagram.com/v1/tags/
search?q=tagname&access_token=access_token
```

Fig. 2.   API code to get number of media posts by hashtag

A. Basic Hashtags (without gamification)

The basic hashtag observed is "#*ayokenglanggeran*". This hashtag has begun to appear since July 2017. Data is taken from the 11 August to 30 August period. Based on this timeframe, it was obtained the acceleration of the addition of media post data with the #*ayokenglanggeran* hashtag shown in Fig. 3, on average only 5 posts per day.
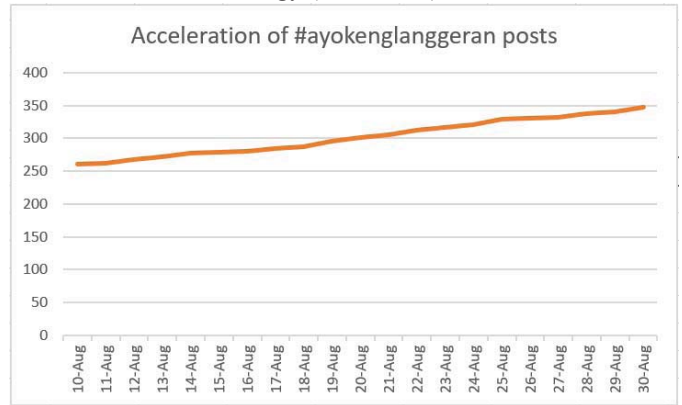
Fig. 3.   Acceleration of #ayokenglanggeran posts

B. Specific Hashtag

The implementation of the hashtag "*merah putih gunung api purba*" was chosen because coincided with the Indonesian Independence Day event. Reward offers are packed in the form of Instagram photo competitions with the theme "*merah putih*" as shown in Fig.4. Data observation period starts from August 10 to August 18. The manager offers rewards for only 3 best photo posts and has the most likes. The goal is to attract visitors to post as much as possible.

The choice of another hashtag needs to consider the event or the momentum of a particular day. Selection can be done by predicting the number of visitors based on major holidays or certain events. These jobs can run concurrently with data collection systems.

Fig. 4.   #merahputihgunungpurba photo competition brochure

Based on 21 days of implementation, the addition of the number of posts is very significant. The average increases by 20 posts per day as shown in Fig.5. The number of posts #merahputihgunungapipurba is almost 6 times compared to the #ayokenglanggeran post.

Fig. 5.   Acceleration of #merahputihgunungapipurba posts

The leaderboard is displayed in the photo gallery as shown in Fig.6. which shows the best photos with the most likes. Leaderboard is attached to the manager's website. But this data is currently difficult to collect becau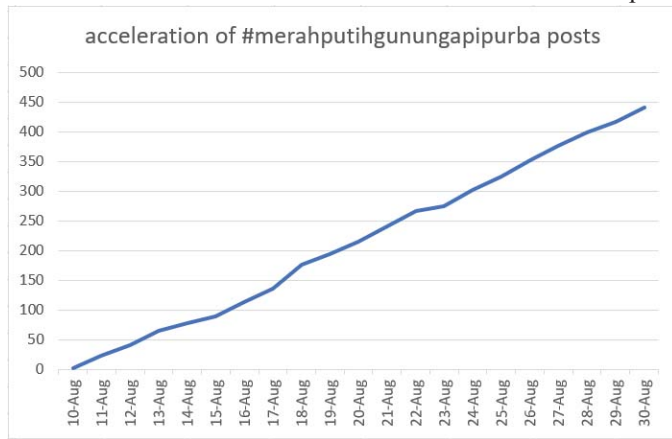se it depends on third party policies. The privacy policy applied by Instagram does not allow managers to get public content.

Fig. 6.   Leaderboard #merahputihgunungapipurba

VI. Conclusion

Gamification in the data collection system is proven to increase the amount of data. The use of social media is very influential, but has limited data access. The next job is to design a system that not dependent on third party platforms. A platform need to be built using game and gamification approaches. Need to make sure collected data can be accessed easily.

Future work should also optimizing the use of game theory in applications that are built. So that it can determine the best action strategy to increase user motivation and involvement in the data collection system.

If data can be collected, the next job is to do data analysis and data engineering to produce best decision and strategy. Hopefully, can create a sustainable system for ecotourism.

References

[1]   D. Basten, "Gamification," IEEE Software, 2017, pp. 76–81.

[2]   S. Deterding and D. Dixon, "Gamification : Using Game Design Elements in Non-Gaming Contexts," in CHI 2011: Conference on Human Factors in Computing Systems, 2011, pp. 5–8

[3]   J. Frith, "Turning life into a game: Foursquare, gamification, and personal mobility," Mob. Media Commun., vol. 1, no. 2, pp. 248–262, 2013.

[4]   K. Werbach and D. Hunter, For The Win: How Game Thinking Can Revolutionize Your Business. Philadelphia: Wharton Digital Press, 2012.

[5]   Association for Project Management, Introduction to Gamification. Association for Project Management, 2014.

[6]   Supriyanto, H. Hindersah, and A. Prihatmanto, "Designing gamification for taxi booking system (Case study: Bandung smart transportation system)" 2015 4th International Conference on Interactive Digital Media (ICIDM), pp. 1-6, 2015.

[7]   F. Xu, J. Weber, and D. Buhasil, "Gamification in Tourism," in Information and Communication Technologies in Tourism 2014, vol. 4, no. January, 2013.

[8]   F. Xu, F. Tian, D. Buhalis, J. Weber, and H. Zhang, "Tourists as Mobile Gamers: Gamification for Tourism Marketing," J. Travel Tour. Mark., vol. 8408, no. December, pp. 1–19, 2015.

[9]   S. Sever, G. N. Sever, and S. Kuhzady, "The Evaluation of Potentials of Gamification in Tourism Marketing Communication," Int. J. Acad. Res. Bus. Soc. Sci., vol. Vol.5, 2015.

[10] A. Negrusa et al., "Exploring Gamification Techniques and Applications for Sustainable Tourism," Sustain. J., 2015.

[11] A. B. MacKenzie and S. B. Wicker, "Game theory in communications: motivation, explanation, and\napplication to power control," GLOBECOM'01. IEEE Glob. Telecommun. Conf. (Cat. No.01CH37270), vol. 2, pp. 821–826, 2001.

[12] W. Huang, "Application of Game Theory in Wireless Communication Networks," vol. 95, no. February, p. 183, 2012.

[13] O. Baig, Y. Al-Harthi, and E. Al-Tubaishi, "Game-theoretic algorithm stimulating cooperation in multi-hop wireless networks " The 2014 5th International Conference on Game Theory for Networks, pp. 1-5, 2014

[14] A. Arzakov, "Usage of game theory in the internet wide scan" 2018 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering (EIConRus), pp. 5-8, 2018

[15] L. Koc, An Introduction to Game Theory. 2007.

[16] F. Carmichael, "A Guide to Game Theory," Prentice Hall, pp. 1–303, 2005.