A Management Optimization for Customizing Transportation: Taking Crowd Funding Train as an Example

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ABSTRACT
The most accurate demands should come from passengers and it is difficult to ensure that traffic supplies meet the travel demands. Xi’an Railway Bureau drove two crowd funding trains in 2017, but remained deficiencies. A platform pattern is built to solve deficiencies and optimize the customizing transportation management.

INTRODUCTION
It is quite difficult to ensure that traffic supplies meet the travel demands because of the irregularity and uncertainty of demands. According to relevant researches, several solutions have been built, including Traffic Management System (TMS) for optimizing traffic fluency in large railway networks [1], mixed-integer linear programming formulation for the best train routing and scheduling in case of perturbation [2], and extensions of the Fault Tree for a satellite-based railway system [3]. These solutions focus on improving inner management from the perspective of railway stations and railway bureau, however, few of them realized the proactivity of passengers and took them into consideration. The more directing, the more effective, thus the most accurate demands should come from passengers.

Crowd funding has been more and more popular in recent years, and customizing transportation has some growth as well, for instance, Crowd funding Train. China’s National Day and Mid-Autumn festival are traditional festivals in China, which are often associated with travel rushes. During the China’s National Day and Mid-Autumn festival, Xi’an Railway Bureau drove two crowd funding...
trains between Xi’an and Yulin for the first attempt in China from October 7th to October 8th in 2017, that is the event [4]. Although the crowd funding method has been applied to railway optimization by Xi’an Railway Bureau in China, some deficiencies exist. And a management optimization for Crowd funding Train is provided in this paper.

CROWDFUNDING TRAIN

Trains make profits when the ticketing income is higher than its cost, and on the contrary, trains suffer losses when the ticketing income is lower than its cost. Daily operations of the ordinary train are usually immune from passenger demands. Passengers can buy tickets successfully even though there are only few of them and the train makes no profits at all, which is like the buses on the idle time. However, it generates a dilemma when tickets of ordinary train have been sold out and there are still passengers in great demand. The operation of Crowd funding, which vary from the rule of the ordinary train, solves the dilemma above mentioned. When the funds for trains reaches the target predetermined, the activity achieves success. Otherwise, failure. Nevertheless, the failure is temporary and it can also turn into success when plenty of participants are lured to take part in before the activity termination.

A schematic diagram of this process is shown in Figure 1. In Figure 1, the big green cartoon character represents staffs of railway bureaux and railway stations, and the small blue cartoon character represents passengers. The crowd funding trains are in a red square while ordinary trains are not. And the circle with a symbol of “¥” inside represents Renminbi, a kind of currency which is widely used in China.

The crowd funding train K8188 and K8187 succeeded in achievable mode of crowd funding, suitable location of crowd funding trains, appropriate schedule arrangement, sufficient ticket income and innovative technology application. Meanwhile, deficiencies also existed, which are described as follows:

(i) Hysteretic data reaction. It is necessary for railway bureaux and railway stations to enhance their speed of data reaction, and ensure the decrease of asymmetry information. Otherwise, both of them would probably make wrong decisions.

(ii) Internet technology limitation. It is also necessary for railway bureaux and railway stations to expand the application of implements in all aspects. Otherwise, some willingly passengers may be isolated or precluded unconsciously.

(iii) Ineffective feed backs. It would be better if more effective methods were adopted to attract passengers and satisfy them in order to acquire useful information and prepare for the next time in a more comfortable way.
Figure 1. Purchasing Process of the crowdfunding train.

**OPTIMIZATION**

Crowdfunding Train consists of two parts: crowdfunding and train. There is actually a chronological order in the process. The variable $t_{sAE}$ represents the arrival point-in-time of the train at the Railway Station s. And a schematic diagram of the timeline is shown in Figure 2. In Figure 2, the whole timeline is divided into several periods by occasion, as is shown in the expression (1).

$$ t_C^x \in \begin{cases} 
\text{a, } t_C^x \leq t_B^x \\
\text{b, } t_B^x < t_C^x \leq t_D^x \\
\text{c, } t_D^x < t_C^x \leq t_{DC}^x \\
\text{d, } t_{DC}^x < t_C^x \leq t_{DE}^x \\
\text{e, } t_{DE}^x < t_C^x \leq t_{sAE}^x \\
\text{f, } t_C^x > t_{sAE}^x 
\end{cases} \quad (1) $$

In the expression (1), different periods are described as follows.

(i) When $t_C^x \in \text{a}$, everything is in preparation, demand information of passengers has been collected and analyzed by railway bureaux, platforms or both of them.

(ii) When $t_C^x \in \text{b}$, the activity of Crowdfunding Train has been published to the public, and there are passengers participating in crowdfunding increasingly. Thus, it is important to provide information and directions to facilitate their gathering. Because the temporal features obtained at the beginning stage, usually first 3 days, of each project will significantly improve the prediction performance. Besides, it is
necessary for railway bureaux and platforms to compute relevant information in time, including the quantity of sold tickets, and the total income of tickets.

(iii) When $t^C_C \in c$, the real-time information about funds needs to be released in a sustainable way, because there may exist other passengers who are willing to join in the activity. Furthermore, it is time for railway bureaux to arrange commensurable trains according to the ticket quota and quantity of train carriages, because the time of checking tickets is coming soon.

(iv) When $t^C_C \in dUeUf$, checking tickets has come to a determination, and the crowdfunding train is about to depart for the railway station. The supply of information returns to normal from then on, and meanwhile, the total profit of the crowdfunding train can be determined.

Information is essential for the process of crowdfunding trains at all times because prompt and accurate information can be conducive to the success ratio. Lagging and incomplete information should be blame for the failure of activity that statistical funds did not reach the target. Thus, it is fairly meaningful to make process optimization from the perspective of information.

Figure 2. Schematic diagram of the timeline.

Crowdfunding platform acts as bridge, and it can solve the deficiencies above mentioned by accelerating information transmission and integrating resources. In the platform pattern, both the ordinary pattern and the crowdfunding pattern are adopted. Platforms are appended in order to raise the efficiency of crowdfunding trains.

Figure 3. Schematic diagram of the platform pattern.
A schematic diagram of the platform pattern is shown in Figure 3. In Figure 3, solid lines represent the origin information, while dashed lines represent the subsequent information in return, and lines in red represent the crowdfunding pattern for distinguishing. It is a better choice to let the crowdfunding works accomplished by professional platforms compared to finishing it by themselves. Moreover, passengers may receive better services than before, while railway bureaux and railway stations themselves may gain more time for controlling and managing by the way. In addition, information will be concentrated so as to increase the success ratio of crowdfunding.

CONCLUSIONS

The first attempt of Crowdfunding Train in 2017 has some deficiencies, including hysteretic data reaction, Internet technology limitation and ineffective feedbacks. And thereafter a management optimization is provided based on the platform pattern.

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REFERENCES