

A Study on ‘the Market for Lemons’ and the Strategy of ‘Unification’ in Booking Systems: A Case Study on the FAHSYSU Simulation T System of the Training Center for Clinical Skills of the First Affiliated Hospital of Sun Yat-sen University

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ABSTRACT

Based on the blueprint of the training center for clinical skills of our hospital, this paper discusses the effect of ‘the market for lemons’ in its booking system from the perspective of economics of information, uses the law of large numbers and the central limit theorem to model to carry out the case study of FAHSYSU Simulation T, and takes measures of offsetting adverse selections to increase booking efficiency. The paper also analyzes how to apply the ancient Chinese theory that man is an integral part of nature to wipe out ‘the market for lemons’.

Out of Tao, one is born; out of one, two; out of two, three; out of three, the created universe^[1].

1. The Market for Lemons^①

① The market for lemons is also known as the market for inferior products, also known as Akerlof Mode. It refers to the market with asymmetric information. In extreme cases, the market will stop shrinking and just disappear, which is the adverse selection in the economics of information. The market for lemons stems from that one side of the transaction does not know the real value of the commodities (the seller has more information than the buyer). The average quality can only be judged by the average price in the market. Because it is difficult to distinguish the good from the bad, buys are only willing to pay the average price. Therefore, sellers who provide good commodities will

‘The market for lemons’^[2] in the narrow sense exists between the trading parties, in which ‘information asymmetry’ leads to different degrees of adverse selection. However, information asymmetry is everywhere, and ‘The market for lemon’ can be found in all interactive behaviors.

This paper discusses about the ‘the market for lemon’ in the booking management module of the information

naturally suffer losses, while those who provide bad ones will benefit. Then good commodities will gradually exit. As the average quality decreases, the average price will also decline, and the commodities whose real value is above the average price will gradually exit, leaving the bad commodities alone in the market^[2].”

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system and how to achieve effective communication between administrators and users, to run the system in a way more intelligent and more stable.

2. The Birth of the Market of Lemon in Booking System

2.1 The Origin: Out of One, Two is Born

2.1.1 Information Asymmetry Caused by the System's Manual Management

(1) Original System (Figure 1): Systematic Judgement/'One' means information symmetry. Appointment (not occupied)→Succeed.

(2) System Status: Man-machine Integration (Figure 2)/'Two' means information Asymmetry.

Applicants make appointments, and the administrators carry out approvals- 'Reservable' does not represent the

final feedback.

(3) The Inevitability of 'Two Born Out of One'

Advantages: 1) Approvability; 2) Appointment priority filtering; 3) Flexibility; 4) Teaching-orientation. All these improve the management of the training center.

However, 'the market for lemons' appears.

2.1.2 The Birth of The Market for Lemons - Three Born Out of Two

(1) Prerequisite: Blind box-Information Asymmetry (Figure 3):

Blind box (approval by the training center): a. Administrators' intervention. b. Uncertain before the appointments.

(2) 'Lemons': Failed Appointments And Low Efficiency

The 'blind box' has the following effects:

1) Between appointments and approvals, the 'blind box' increases the number of appointments. The supply

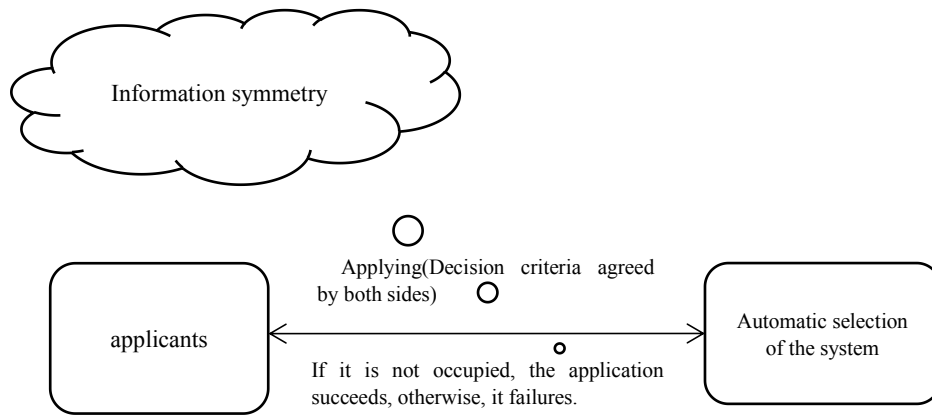


Figure 1. The original design of the system (in which administrators are not the first to make adjustments and approvals)

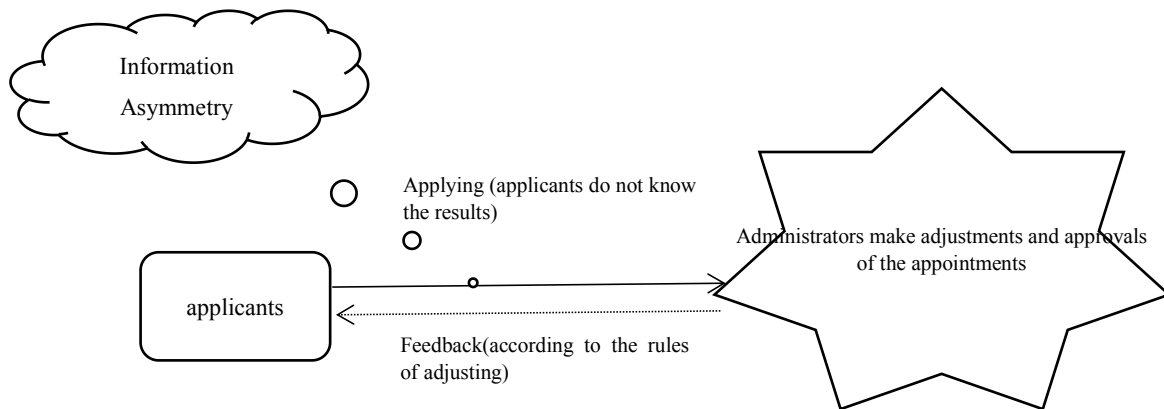


Figure 2. Current system (manual management is introduced into the system to make adjustments and approvals when there are collisions)

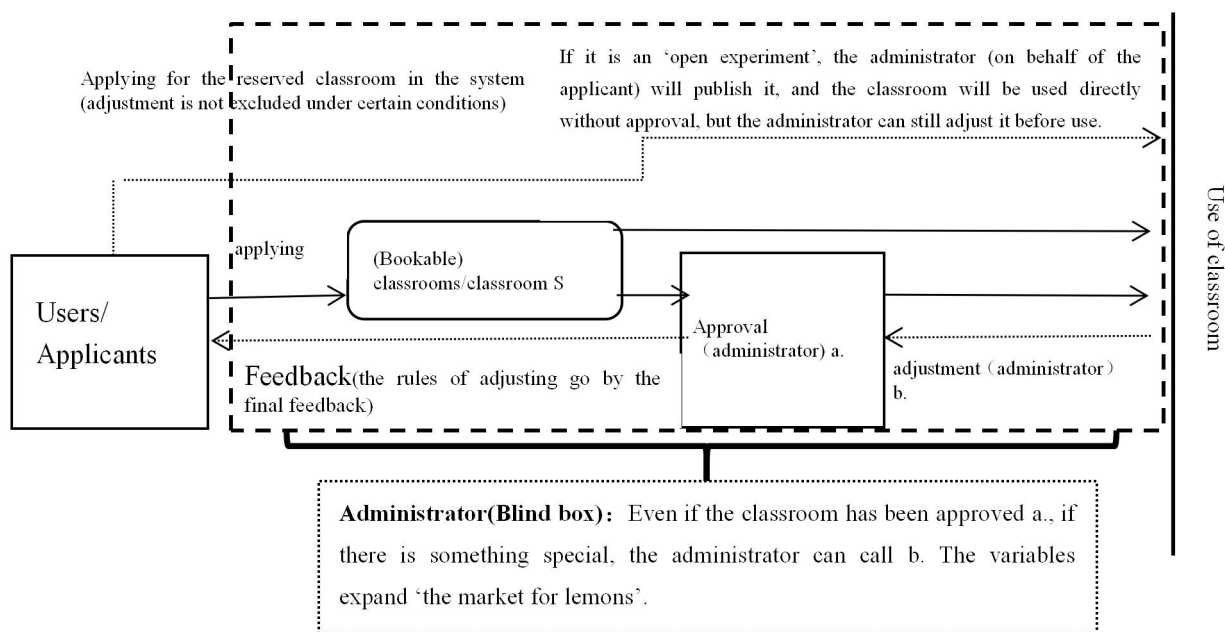


Figure 3. The range of adjustment of appointment in the booking system of the training center

is less than the demand, resulting in failed appointments. The applicants do not know about it and make appointments over and over time again, thus causing the decline in SR^②.

2) The adjustments before use expand the time range of approvals. Then SR goes down and users' experience is impaired.

3) Short approval time limit can lead to the missing of urgent and important appointments or situations in 2); Long approval time limit can cause difficulties for adjustments when there are a large number of appointments, and the appointment failure rate is high, like 'deep wells without water'^③, and users' experience is impaired; Flexible approval depending on actual conditions leads to an information processing not regular enough.

4) 'Blind box' makes appointments easy to be superimposed in time and space dimensions, with a wide range of approvals and reduced SR. The 'snowball' effect increases at this time and adjustments slow down, forming a vicious circle.

This paper believes that the above problems are due to the destruction of the 'Unification' mechanism, resulting in a decline in efficiency. How to ensure that the system returns to 'Unification' under the premise of completing more tasks, so that the training center can operate efficiently with the help of the booking system?

② SR: Success rate

③ Deep wells without water: a metaphor for waiting for a long time but making no appointment

2.2 The Mathematical Analysis of 'Three Born Out of Two'^[3]

The following is a 'modeling' for the management and interaction in the training center's booking system, FAHSYSU Simulation T, to find the answer of 'unification'.

Modeling: 'The Akerlof Mode 1' of booking management of the training center

Event A in this model is 'successfully applying for a classroom' (Because different classrooms in the training center have different functions, there may be inherent differences in users' daily application rates. At the same time, in the process of application, the administrators will make coordinated arrangements of the classrooms, which leads to the mutual dependency of the classrooms. Therefore, this study analyzes all the classrooms as a whole to investigate the features of overall application SR). Appointment SR: $p(A)=p$.

2.2.1 'Idealized' Process - Original Systematic Judgment ('One')

Information symmetry: The both sides have, i. the same information, and ii. synchronous behaviors (appointment is equal to approval) (the both sides are exactly the same).

The appointment SR is 100% (p is identically 1). The distribution of 'idealized' appointment SR is shown in Figure 4.

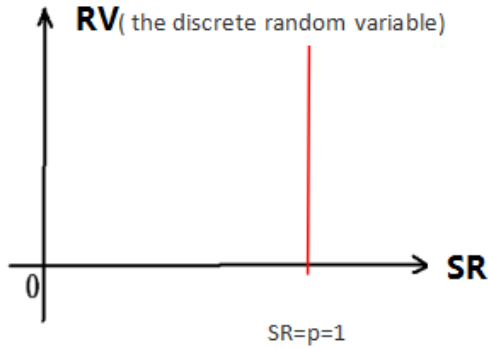


Figure 4. The distribution of ‘idealized’ appointment quality (‘One’)

2.2.2 ‘The Market for Lemons’ Effect Caused by ‘Blind Box’

(1) Prerequisite

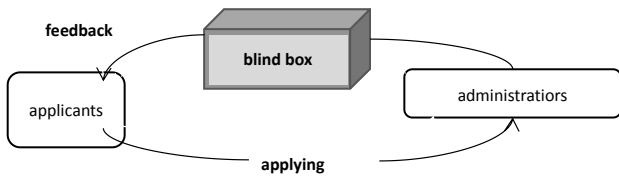


Figure 5. The current information system: information asymmetry (blind box)

(2) The Distribution of Appointment Quality under The Prerequisite

‘Two is born out of one’: the booking system needs approvals (blind box), and the both sides do not have, i. the same information, and ii. synchronous behaviors (the unity of knowledge and practice).

Information asymmetry results in a $SR < 100\%$ (there are appointment failures, and $SR \neq 100\%$), $0 < p < 1$ (there are also appointment successes, and $p \neq 0$).

According to the law of large numbers, in a great quantity of repeated random events, there are laws almost inevitable.

The user makes an appointment at FAHSYSU Simulation T, which conforms to the characteristics of the n-fold Bernoulli experiment (independent). The random variable obeys the binomial distribution of $B(n, p)$ ($0 < p < 1$).

‘The distribution of appointment quality’ of FAHSYSU Simulation T:

refers to the number of event A, or ‘successful appointments’ in the n-fold Bernoulli experiment, which is the quality level of the appointment, or m. refers to the probability distribution of different m (high or low success times)

The progress of ‘Three Born Out of Two’

The first stage, the beginning stage: Initial status:

$t=0$, the system is started for appointments, $OT^{\text{④}}$, $p=1$, $n=1$, $SR=100\%$. As shown by the yellow column in Figure 6, there are many free classrooms in the training center (information symmetry) - the SR is 100%, and it is still in the state of ‘unification’. But the ‘unification’ does not last long.

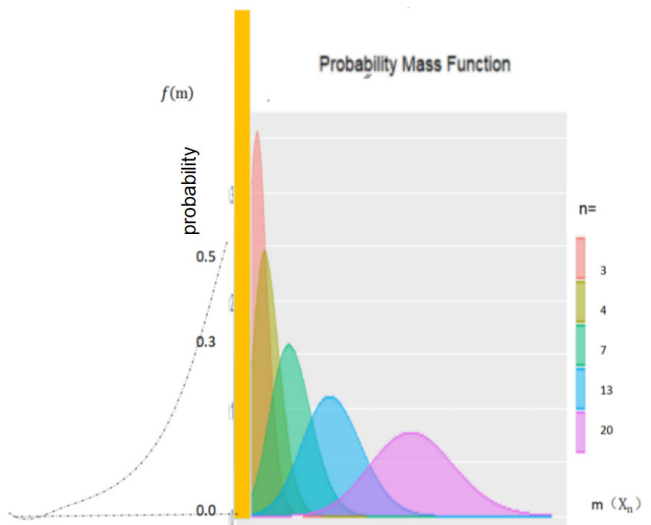


Figure 6. ‘The distribution of quality’ of appointments in the information system of the training center(at the beginning stage)

Dynamic process of reverse selection (Figure 6): On time, affected by the ‘blind box’, the supply and demand do not match and adjustments become increasingly difficult. The blind growth of n expands the information gap between administrators and applicants.

It can be seen that, over time, regardless of the average speed of information processing (approval), the ‘blind box’ between administrators and applicants becomes larger and the information asymmetry is exacerbated. SR starts to decline $100\% \downarrow$, $p \downarrow$. The distribution of appointment quality gradually becomes worse (negative skewness $n=3 \rightarrow$ positive skewness $n=13$). Adverse selection occurs and ‘the market for lemons’ effect is revealed.

The second stage, the mid-term stage: On time, the value of n is stable. Compared with beginning stage, at which n rose sharply, the appointments in the system entered a normal state. $\sim N(np, np(1-p))$, as shown in Figure 6. ($n=20$)

Dynamic process of reverse selection (Figure 7):

Initial status: $p=0.5$,

In some peak seasons of assessment, appointments are overlapped in time and space with many complicated conflicts, and the impact of approvals on appointments is enhanced. $SR \downarrow$.

④ OT: on time, t: time, n: number of appointments

It can be seen from dynamic Figure 7 that $t \rightarrow +\infty$. Observing from any different dimension of n , $m \downarrow$, $m \uparrow$. ($m \uparrow + m \downarrow$)/2 = \downarrow , and when n changes little, $p=0.5 \downarrow \rightarrow 0.1$

The opacity of the time-space structure of the appointments brings about the ‘blackening’ of the blind box. At this time, n does not reduce, and the supply and demand do not match, accelerating the decline of p . There is a serious positive skewness ($bs^{\textcircled{4}} > 0 \uparrow$), and the ‘differentiation’ is aggravated.

The third stage, the long-term stage: The number of long-term appointments will increase, and when n is high but p is low, Poisson distribution ($\lambda = Np$) is approximate.

Initial status: $p=0.05$,

The gap between demand and supply are very large, and the blind box is overloaded.

$\lambda \uparrow$, $bk^{\textcircled{5}} \downarrow$, $f(np) = \frac{1}{\sqrt{2\pi np(1-p)}} = \frac{1}{\sqrt{2\pi \lambda(1-p)}}$, when λ is high and p is low, the kurtosis approaches 0. $SR \rightarrow 0$, and the

system goes failure.

2.3 ‘Out of Three, The Created Universe Is Born’ and ‘The Butterfly Effect’

‘The distribution quality of appointments’ of the FAHSYSU Simulation T system appears, that is, there are applicants and administrators in the system. The blind box set a blocking both between applicants and administrators, and between one applicant from another. So it is can be assumed as an independent Bernoulli experiment. But is that really the case?

The well-known ‘butterfly effect’ explains that at all times and in all countries, many big events or a big era often originate from some small inconspicuous factors at the beginning, which can be seen as the ‘One’. This ‘One’ is very critical, because the trigger of its fission will cause the incredible results.

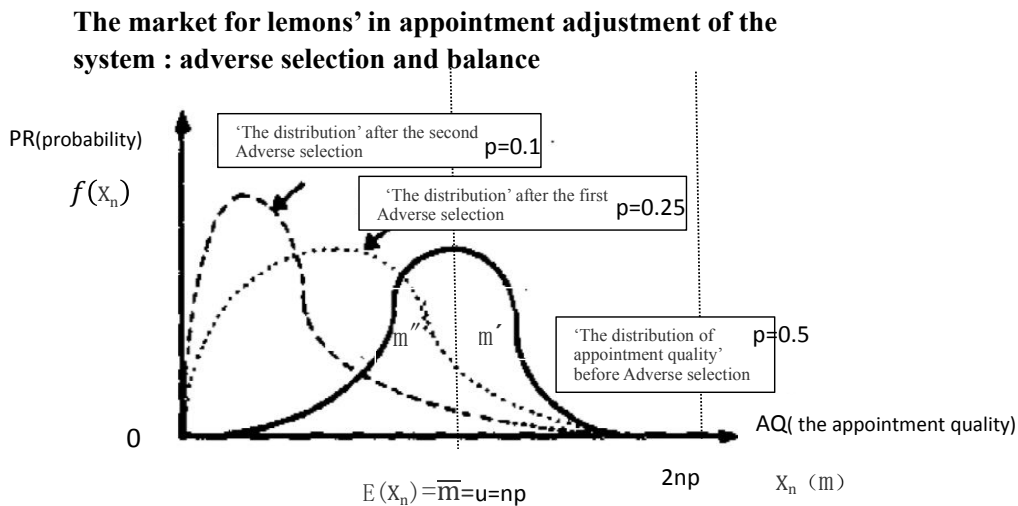


Figure 7. ‘The distribution of quality’ of appointments in the information system of the training center(at the mid-term stage)

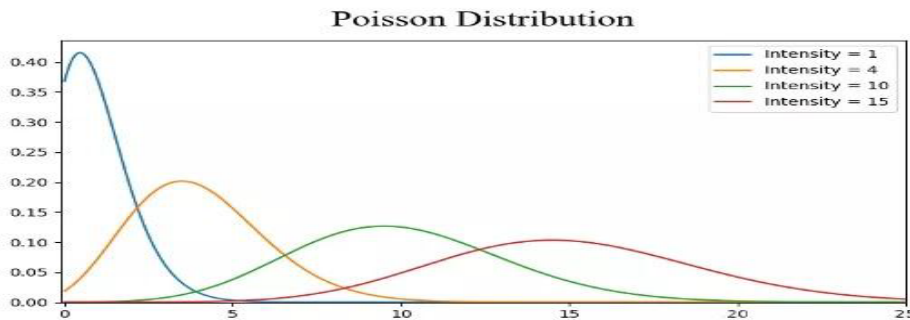


Figure 8. ‘The distribution of quality’ of appointments in the information system of the training center(at the long-term stage)

④ $bs > 0$: positive skewness, the peak moves left. $bs < 0$: negative skewness: the peak moves right
 ⑤ Bk : kurtosis

All this is hidden in the ‘blind box’. Everything is interrelated. Nothing can be completely separated from another. Not independent of each other, the system of things can be regarded as an approximate assumption:

As mentioned above, the influence of the users’ booking amount on the adjustment difficulty of the administrators leads to a worse distribution, which also indirectly affects the appointment success rate of other users. When the blind box is closed, the temporary adjustment difficulty remains unchanged, and the appointments are independent of each other, which is similar to the distribution analysis. However, over time, the mutual influence becomes greater, and the distribution changes constantly.

It can be seen from the above gradual process that the dispersion of the distribution is getting larger and larger. When the number and structure of the above blind box are seriously affected, the distribution goes almost a complete failure. (low success rate of matching and low efficiency).

Nevertheless, the ‘butterfly effect’ is like a larger blind box. As an individual ‘user’, it is difficult to understand the box from a micro perspective. How do you know what is going on inside? Can you tell how dark can the ‘blind box’ be?

So, is it urgent to find a way of ‘unification’? Do you have a heart to go home?

2.4 ‘The Akerlof Mode 2’ of the Booking Management of the Training Center

The above analysis considers neither the loss of efficiency nor alternative places. What if these factors are considered?

Due to the low SR, poor user experience, selection mechanism and other factors, the training center tries to look for some alternative classrooms to achieve high-quality appointments.

Model 2: Assumption: quantity distribution of appointment quality^⑦ of different classrooms (Figure 9).

Expectation (maximum efficiency): The selection is distributed to the right of the red vertical line 1.

The selection mechanism of FAHSYSU Simulation T: to display manual filtering according to the conflicts: suppose the red and green are chosen.

Reverse selection: 1) The yellow is lost and the blue is flowing in. 2) The green squeezes out, with a lack of item supply.

The distribution of appointment quality goes worse: 1→2→3.

Classroom 2: The appointment quality increases.

From the above analysis, it can be seen that ‘the market for lemons’ still exists even if the best is not achieved. Is there a lot of pressure on readers at this moment?

So what is inside the blind box?

3. The Unification Analysis of ‘The Market for Lemons’

3.1 Strategy Research 1: The Greatest Truths is Concise, and Man is an Integral Part of Nature

To achieve a balanced unification in the interaction of

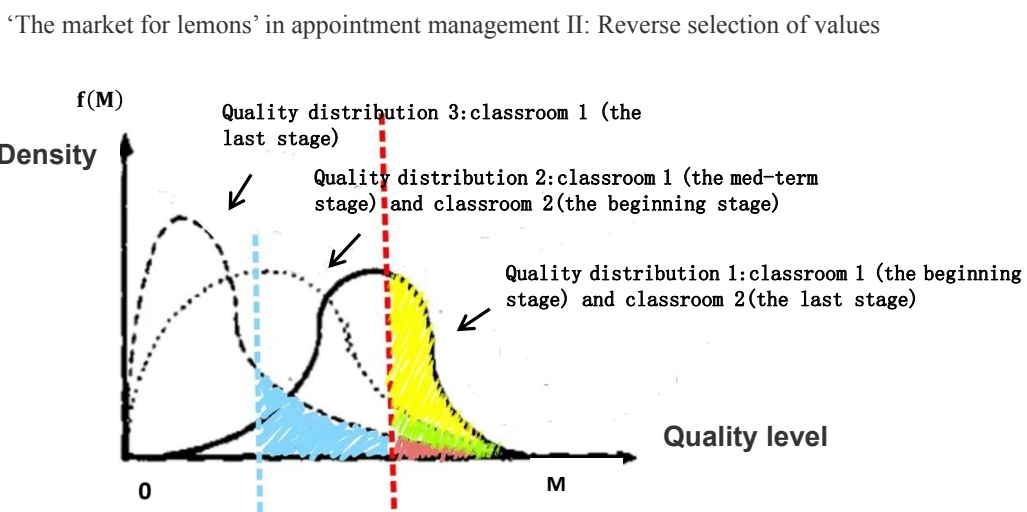


Figure 9. The adverse selection in the distribution of appointment quality

⑦ appointment quality: Model 1, the number of successful appointments. Model 2, the quality level of appointments

FAHSYSU Simulation T.

Open the ‘blind box’: to effectively transform unknown information of users.

3.1.1 Publicity of Sorting Optimization

Users and users, as well as users and administrators, are connected by sorting (the following Figure 10), to realize the unity of knowledge and practice, and to achieve ‘unification’.

As shown in the figure below, when quantity, conflict, time and space, and dynamic adjustment are presented, they are free to advance or retreat.

3.1.2 To Find out the Law and Achieve Unification

The design of sorting rules is very important, and it is difficult to reach a high degree of consistency between the information transmitted and the decisions. Therefore, the initial model will not be particularly accurate. Later, according to the calculation results, the final value will be manually adjusted and reversely fit, the model coefficient will be adjusted, and new features will be added.

UI of the FAHSYSU Simulation T  system:

No.	Real-time sorting of appointments	
	Timeline switching	classroom
	7:00 17:30 . . 8:00 .	MOOC OSCE1-15 Multi-media
1	Appointment a	
2	Appointment b	
3	Appointment c	
4	Appointment d	
5	Appointment E	
6	Appointment e	
7	Appointment f	
8	Appointment g	
...

Figure 10. UI of the FAHSYSU Simulation T  system

Appointments in the previous system were almost independent and random. Through the above measures, both sides can be connected. ‘Real-time sorting of appointments’ is like the ‘One’, indicating the matching direction. When the success rate reaches 100%, the unification is achieved. However, the decision-making direction in real-

ity is constantly fine-tuning and the influencing factors are numerous. Therefore, ‘sorting rules’ do not seem to be so easy to design. So the ‘One’ can only be approached, and $p \neq 1$. Isn’t it another kind of ‘unification’, a ‘unification’ towards the ‘ultimate truth’?

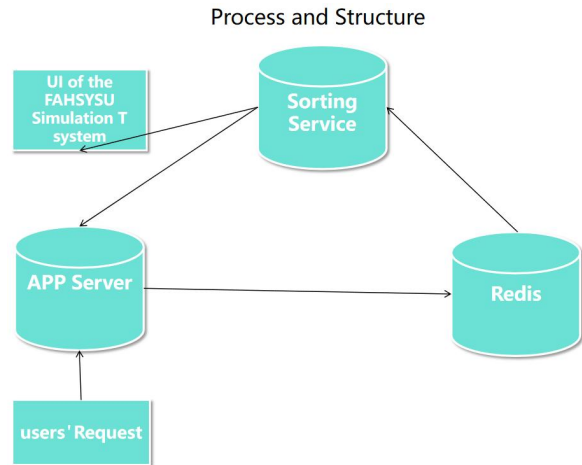


Figure 11. Upgraded system

‘The market for lemons’ disappears when the blind box has a high resolution ratio, easy to understand.

There is a state in life that is to be simple towards childishness, and to be complicated towards simpleness. Many philosophers have been looking for this state all their lives.

3.2 Strategy Research 2: To Overcome Firmness by Gentleness

‘The Akerlof Mode 2’ of the booking management of the training center: the adverse selection of value shows a pressure of ‘natural selection and survival of the fittest’. However, although the author still often ‘regrets’, it seems that the secret of nature are showing itself gradually.

The ancient Chinese sages are free like immortals. Perhaps the ‘Tao’ here is not ‘natural selection and survival of the fittest’ (as the dinosaur era has passed). The ‘sorting rules’ do include other elements:

It is also a natural principle that to overcome firmness by gentleness in *Tao and Teh*. As for natural selection and survival of the fittest, everything needs to compete on its own, and face the world fairly and justly.

The change of strength lies in the trend. If we can understand the law of the trend, we can overcome firmness by gentleness! Therefore, after saying that the best of men is like water, Laotse said that ‘In his dwelling, the Sage loves the lowly earth; In his heart, he loves what is profound; In his relations with other, he loves kindness; In his words, he love sincerity; In government, he loves

peace; In business affairs, he loves ability; In his actions, he loves choosing the right time.’

There is only the right, not the best.

‘Unification’: a natural law. Ancient sages said that the key to the success of the giver is ‘to do without competition’. The most intelligent and successful people are not ‘competing’ for success. Their success is the result of cooperating with others to generate new values and make the cake bigger together. The premise of not harming others is also an attitude of giving, altruism and cooperation. It is still of profound significance to us now.

3.3 Strategy Research 3: A Community with a Shared Future for Humanity

As mentioned above, we need to make the cake bigger together. How?

According to the above analysis, the ‘good’ sorting rules are designed for high efficiency. What will happen when classroom 1 runs with a high efficiency?

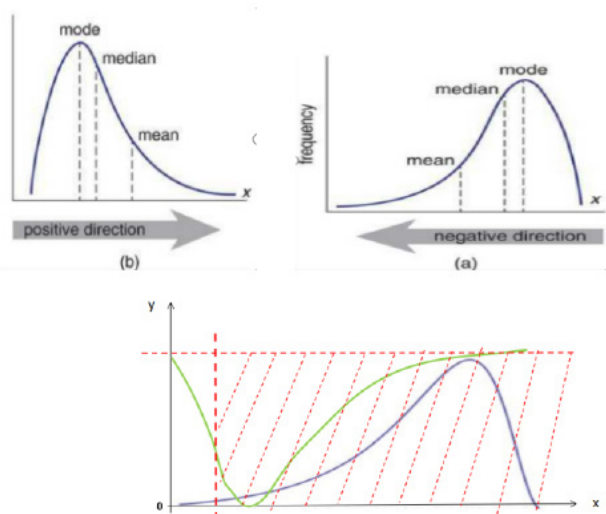


Figure 12. The combination of classroom 1 and 2(Inside the area of red lines)

The distribution of appointment quality of classroom 1 will become better. Because of the increase of efficiency and the full use of resources, the distribution of appointment quality ($n\uparrow$) will be improved and also expanded

horizontally (b→a:The Akerlof Mode 1 & 2). Cooperation, openness and mutual benefit, as the teachings of ancient sages, will be an inevitable development trend.

‘There is only the right, not the best.’ (*Tao and Teh*)

Since the 18th CPC National Congress, President Xi has expounded and advocated the concept of building ‘a community with a shared future for humanity’ on numerous international and domestic occasions, which shows a in-depth insight into ‘Tao’. The idea of building ‘a community with a shared future for humanity’ is genetically homologous with the ‘Tao’ in Confucianism, Buddhism and Taoism of traditional Chinese culture. It reveals the natural way of ‘returning to nature and integrating nature and man’.

The whole nature is under the management of ‘Tao’ and runs according to certain laws. The unification of man and nature means that people should respect the laws of nature.

According to the concept of returning to nature, health refers to the mutual matching and adaptation between man and nature.

The scene of ‘streets full of envoys and businessmen’ of the ancient Silk Road has created the exchanges of different civilizations. In the ‘The Belt and Road Initiative’ today, no matter how far apart and different we are, complementary advantages, joint cooperation, common development and mutual benefit can be achieved with ‘a community with a shared future for humanity’. This is an experience of great value for human civilization, and also an inevitable choice for human society to move towards a future of happiness, peace, harmony and beauty.

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