SHARING TRANSPORTATION SYSTEM IN CHINESE RURAL COMMUNITIES

SHARING TRANSPORTATION SYSTEM

Social innovative transporation system based on rural communities in south west of China.

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FIGURE

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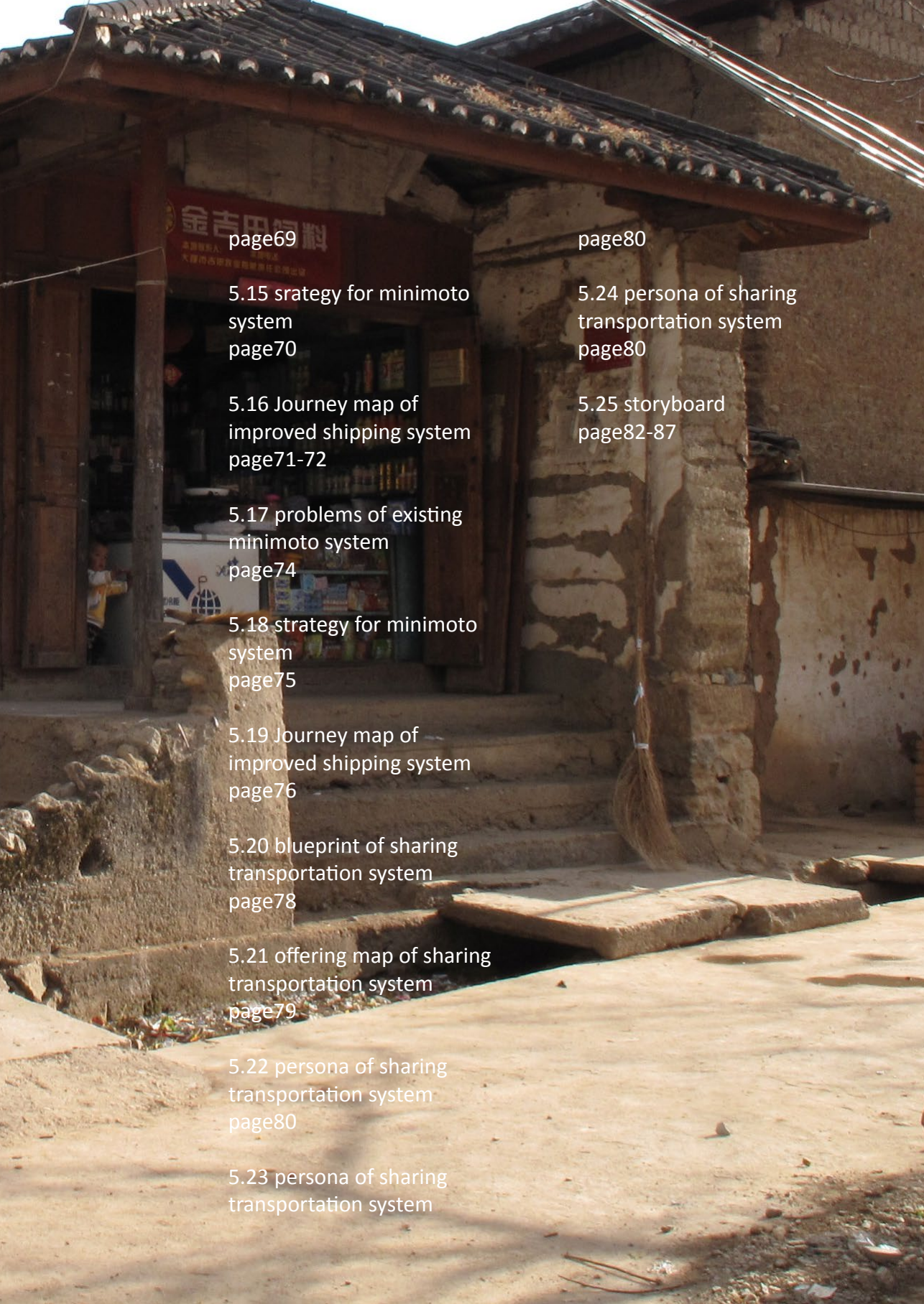

ABSTRACT

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Rural area is one of the national development priorities under the“new socialist countryside construction” strategy. Transportation is an important standard of living condition and main component of carbon emission.

The current research and practice focus on south east rural area which is mainly plain terrain and developed. Common approaches are urban-scale planning, mass construction of infrastructure and county-county public transportation network.

On the opposite, rural area in south west of China requires develop as well. Due to the different economic condition and particular basin topographic, strategies in high-development area inevitable acclimatized in rural area. This thesis attempts to establish a sharing transportation system in town-scale operated by local people.

Author participated “Heihui river corridor development strategy”, “Study of low-carbon infrastructure in ShaXi” since 2011. In 2014, Author made an on-site research for one month and collected some first-hand information and data. The thesis explores a sustainable sharing transportation system based on supply and demand of current system, the common transportation features about social activities. With PSSD methodologies and tools, from system locating to system setting, from front stage system to back stage system, this thesis presents different fields of sharing transportation system step by step in 5th chapter. In the last part of the paper, the author summarizes the paper with achievements, weakness, experience and future prospective.

Keywords: ShaXi, Yunan province, basin topographic, service system design, sharing transportation in rural area.

01 INTRODUCTION

This chapter describes the geographic features of south west China and explains the research value of Shaxi. Additionally, a brief situation of sharing transportation system is discuessed.

1.1 Research context

This section gives the background of the thesis and defines the features of rural community in south west of China. Shaxi localed in Jianchuan county, Yunnan province, south west of China. (See Figure 1.1)

1.1 Location of Shaxi.

1.1.1. Characteristic of rural community

In 1930s, Xiaotong Fei, one of the greatest socialist, introduced the idea of "community" to China and defined it as"A place where groups of people live and work."[1]

Compare with urban district, the main industry in rural area is the 1st industry. Although the development mode is transform into the 2nd and the 3rd industry[2], agricultural activities still have a strong impact in rural area.

Due to the poor transportation condition, the range of villagers' daily life are small, people share only facilities in rural area. Common language, tradition and custom enhance the clan consciousness and sense of belonging among the local people.

1.1.2. features of south west village, Shaxi as an example

Geographical environment has a major influence on society, economy and livelihood. Basin topographic is a salient feature in south west of China. Shaxi, the background of the thesis, belongs to basin topography as well. (See Figure 1.2)

1 Ferdinand Tönnies. Community and society[M].Xiaotong Fei translate.1887
2 The 1st industry including agriculture, livestock, fishing and etc. The 2nd industry including manufacturing, construction and etc. The 3rd industry including Medical treatment, education, commerce and other sercvice industries.

1.2 overlooking of Shaxi.

Basin topography takes about 6.52% area in Yunnan province. The remaining area is mainly mountain district and plateau. As a result, these basins make up the shortage of plains and some of them have become centres of politics, economy, culture and agriculture in each county. In fact, this particular topography is the fundamental element of rural district in south west of China.

Shaxi is a typcial basin. The population, transportation condition, economic development, industrial mode and other criterias are representative among south west villages.

Total population of Shaxi is 23172 people, which consist of four minorities. The basin area where 90% population inhabited is about 27 square kilometers and takes only one-tenth of the total area. The distance from Jianchuan county to

1.3 Shaxi as a typical basin topographic valley.

Shaxi is approximately 32km and the main road towards outside is Pingdian road.In 2010, total revenue of Shaxi was 6.17 million rmb, the annual income is 2372 rmb per capita. According to therecent statistics, although the annual income per capita reached 3903 rmb, it isn't ideal either.The industrial structure will be adjusted from 6:2:2 to 5:2:3[3] in 2015. In terms of tourist rescources, the core area in SiDeng village was included in "the world's 101 endangered architectural heritage list" by WMF in 2001.[4]

As a conclusion, the survey and research in Shaxi is valuable and replicable.

3 1st industry: 2 ndindustry : 3rd industry.
4 The 12th five-year-plan by Shaxi government 2011.3

1.2 Research object

Following the research content, this section describes the features, definitions and different types of sharing transportation system.

1.2.1. Transportation features in south west village

The transportation system is affected by issues like geographic environment, incomplete infrastructure and etc.

First of all, transportation tools has a direct relationship with distance. According to the on-site survey, except walking, local people use bicycles, motobikes, minimotos to travel inside valley. Minivan and rural bus is mainly used for travelling outside of Shaxi. Secondly, the government made great efforts on the planning and construction of road network, but the transportaion system has been neglected, overloading, illegal driving is quite common. At last, transportation activities is mainly related with agriculture and weekly market is the most important approach to purchase daily use.

This section is brief introduction about transportation features in Shaxi. More information will be presented in the following chapter.

1.2.2. Definition of sharing transportation system

Sharing transportation system is a low-carbon resolution based on the sustainable context. "Sharing" is interpreted as "using information or objects with others."

1.2.3. Case study of sharing transportation system

Sharing transportation including car-sharing, car-pooling and public transportation. The following figure compares different characteristics between these three types of system.

1.4 research of different cases.

Type	case	operation	advange	weakness
car-sharing	Zipcar	B2C	guaranteed service	high-tech, high cost
	Lyft,GetAround	P2P	low cost, fast promotion	user base, uncertain service
car-pooling	eRideShare.com, Carpooling.com	P2P	low cost, fast promotion, sharing resource	user base, accuracy and effectiveness of information
public transportation	BRT,Bike rent	G2C	guarateed service, Top-town	high cost, mass construction

Car-sharing system divided into two types due to different ownership of the vehicles. B2C company always collaborate with enterprise like BMW, they have

the ownership of the vehicles and operate the whole system with electronic information system. As Zipcar says"You don't have to own a car, but you can use it anywhere, anytime." On the other hand, P2P company regards themselves as a platform where people could exchange information to rent a car.

Car-sharing shares the car while car-pooling shares the route. The definition of car-pooling is "the sharing of car journeys so that more than one person travels in a car." compare with car-sharing, car-pooling makes a better use of the rescourse. Additionally, the key of car-pooling is the accuracy and effectiveness of the information.

Public transportation is common in our daily life. Bus system, railway system and bike system has already become part of our life. Public transportation is suitable for urban area with more population, density and space. The top-down operation mode has some benefits on policy, law, planning and construction.

After all, different sharing transportation system has different feature, we couldn't copy one of them to rural contents easily. Generating ideas with on-site survey and research is the basic concept of this paper.

1.3 Research value

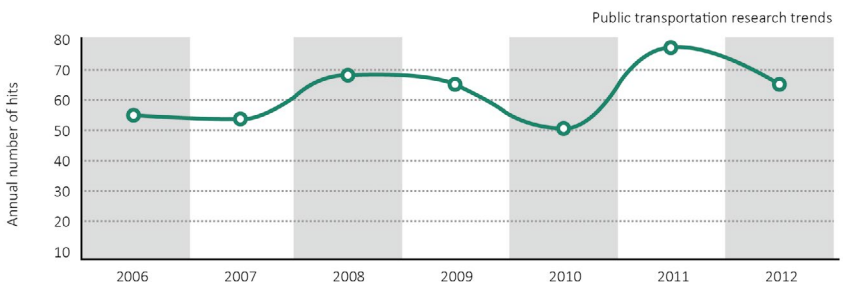
Combined with domestic researh, development trends and policies, this section discusses the theoretical significance and practical value of the paper.

1.3.1. Theoretical significance

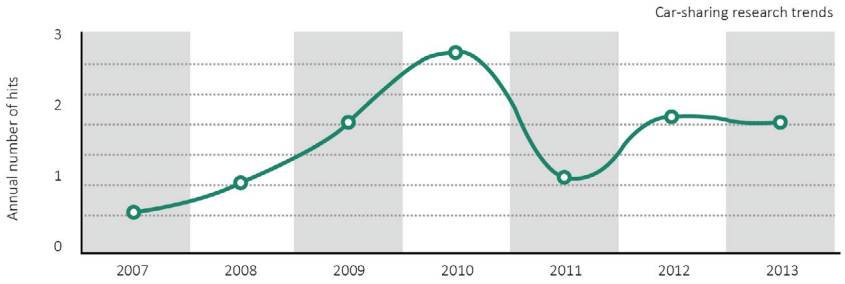
Research about transportation feature in rural area is a blind spot between domestic investigators. Most of the studies focus on urban area or developed towns around major cities.

Among the existing research about sharing transportation system, the study on public transportation already has an initial size while the study for car-sharing and car-pooling is still insufficient. Moreover, the topic is mainly about car-pooling in city, system algorithm and legal insurance.

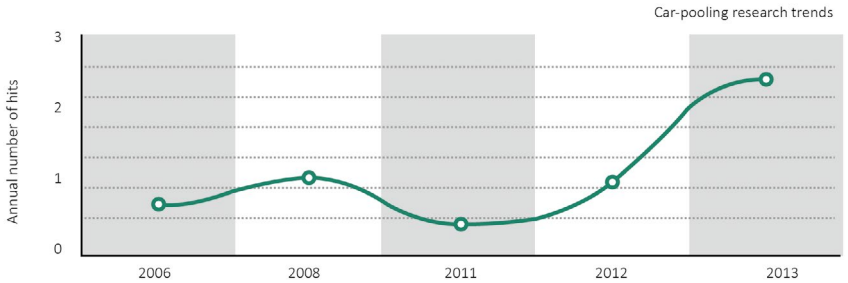
Therefore, this paper has some basic data and initial analysis about the sharing transportation system about Shaxi in order to provide other investigators with some references and information.



1.5 Statistics of public tranport research trends.



1.6 Statistics of car-sharing research trends



1.7 Statistics of car-pooling research trends

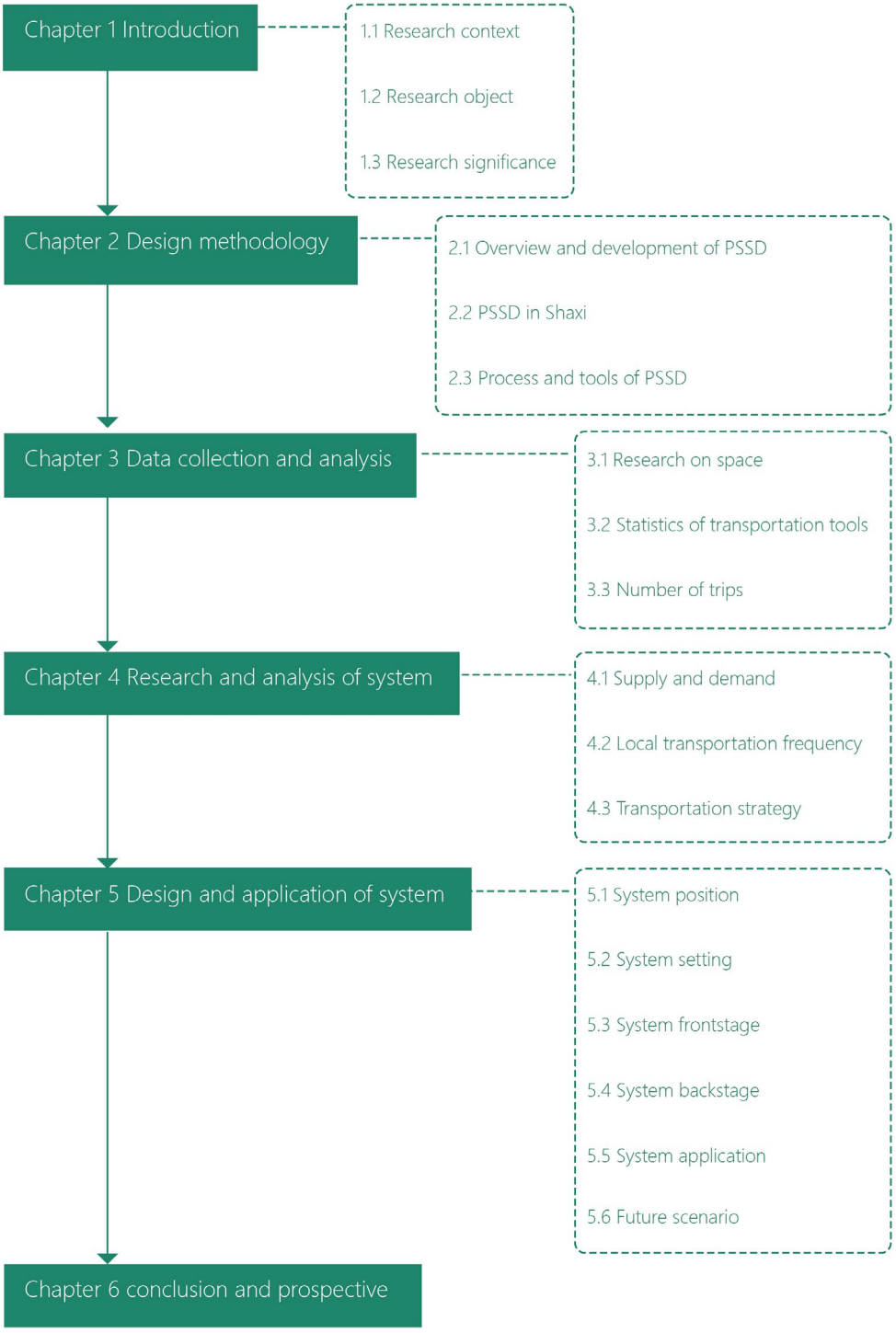
1.3.2. Practical value

The proportion of urban population to total population has over 50% for the first time in 2012. The large rural population still have problems with different issues like medicial treatment, transportation, education, envirnment and etc. The national government promulgated series of policies to guide the "new rural construction". With the increase in per capita income, economic and social activities have become more active, problems of transportation is revealing gradually.

The measures to deal with such problems are the urban-scale planning, the construction of road network in county-level and the rural bus system which connected different towns. It's hardly to find a successful and duplicated practice focus on the inner transportation in one town. Shaxi as a typical case could be a good starting point.

This paper collected some information based on servcie system design philosophy in order to understand tranportation features in rural area. What's more, the sharing transportation system proposed in this paper implement the idea "Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime." Based on local rescources, the system would establish and operate by the local people. At last, the experience of this practise could be duplicated in other rural area in south west of China.

1.4 Thesis structure




Canon

02 APPROACHES

In order to deal with more complicated problem in modern society, we design “system” rather than “object” in a collaborative way. This chapter will introduce some basic ideas of service design and the implementation in Shaxi.

2.1. Description and development

The research of PSSD begins abroad and it's widely accepted that Pro. Michael Erlhoff proposed the idea of service design in Cologne International design academy for the first time. Britain enacted the first course of service design in 1994, then the major european institutions including Politecnico di Milano setted up service design programs.

In 2010, Pro.Ezio Manzini described PSSD with four characteristics: small, local, open and connected. [1] Marc Stickdorn proposed five principles of service design: user-centered, collaboration, sequence, evidence and comprehensiveness.[2] In 2013, pro. Anna Meroni predicted that one of the features in the next economy is the social economy, a variety of individuals, public institutions and civil organizations with different motivations constitue a complex economies. She also outlined four directions for service design with a large number of examples.[3]

Domestically. in Tsinghua University, the service design studio led by Pro. Guosheng Wang began their research of social innovation in 2007. In 2009, the establishment of the DESIS-China consisted of Politecnico di Milano, Tongji University, Jiangnan University and other alliances promoted the level of sustainable social innovation.

2.2. PSSD in Shaxi

The philosophy and approaches of PSSD are quite suitable to establish a sharing transportation system in rural community. The following three points are the main value and significance of PSSD in Shaxi:

Collaborative desgin

The transportation system should based on-site research and collaboration as much as possible. In either case, the locals have better understanding about Shaxi and stronger sense of belonging on their hometown. In this case, their voices are much more valuable than the "airborne" experts. One of the principals of PSSD is in-depth communication with the locals. Moreover, the responsibility of service designer is guiding the users to tell the problems and looking for solutions in collaboration.

People as asset

1 Ezio Manzini. Small, local, open and connected Design research topics in the age of networks and sustainability.DESIS Network.2010.7

2 Marc Stickdorn. This is Service Design Thinking.2011

3 Anna Meroni,Daniela Sangiorgi. Design for Service

In fact, the traditional development mode depends on top-down policy, which should consider whether the policy could conveyed and implemented effectively. The outsourcing or hiring system might be immediate, however it could hardly stimulate the local economy and the operators from outside barely have the sense of belonging and responsibiltiy to the local. Why not make a good use of existing local rescources and guide the local people to set up and operate the system on their own. "Compendium civic economy" has a lot of self-management practises such as community energy service in Bishop's castle, Joint venture center in Hudswell and etc.[4] The common features of these successful cases are integrating existing resources, inspiring people's initiatives and ultimately reaching a win-win situation.

Dematerialization

2.1 photos during the on-site survey.

Service design focus on "system" rather than "object".in this case, when the existing test in Shaxi successed, the prototype and experience in Shaxi could be replicated with lower cost. Dematerialization solves the problms that most rural sustainable projects have such as lack of generating funds or the difficulty to maintain.

In a word, this paper breaks the boundaries of the urban area and puts emphasis on the rural district. Based on the idea and approaches of service design, the sharing transportation system in Shaxi could provide other researcher some valuable experiences.

2.3. General approaches and PSSD tools

The previous research is based on literature review and case study. The system

4 00:/.Compendium for the civic economy.2011.5

design is mainly based on on-stie survey and service design tools.

General approaches

• Literature review: Accessing the school library and books online. Searching database of relevant literature and translating English ones. (See chapter 1,2)

• Field research: investigating on Shaxi locals and tourists with questionnaires and interviews in order to get information such as transportation demands, habits, routes and etc. Collecting datas such as drivers of minivan association, existing quantity of private vehicles. (See chapter 3,4)

• Visualization: expressing information, ideas, concepts with inforgraphic, diagram and illustrator. (See chapter 3,4,5)

• Empathetic research: imagining to be the system user and experience the service process in first person in order to improve design. (See chapter 5)

Service design tools

• Positioning map: Studing characteristics of similar products and design by two pairs of antonyms on positioning axes. (See section 5.1)

• System map: Researching the relationship between different stakeholders on material flows, information flows and funds flows. (See section 5.2)

• Journey map: Visualizing the main process of service system. (See section 5.3)

• Blueprint: Studing on the establishment and operation of service system. (See section 5.4)

• Offering map: Visualizing the direct and added values of service system. (See section 5.5)

• Persona: Setting up groups of typical users by analysing different users and verifing different parts of service system. (See section 5.5)

• Storyboard: Expressing different stages of service system processes in film breakdown. (See section 5.5)

03

SURVEY

In order to deal with more complicated problem in modern society, we design “system” rather than “object” in a collaborative way. This chapter will introduce some basic ideas of service design and the implementation in Shaxi.

3.1 Space research

This section attempts to collect information about facilities as “points”, roads as “lines” and transportation zone as “areas” in Shaxi as “canvas” in order to support further design. Generally, the more people go for a same “point”, the more possible people could share the vehicle, the more people use a same “line”, the more possible people could share the route.

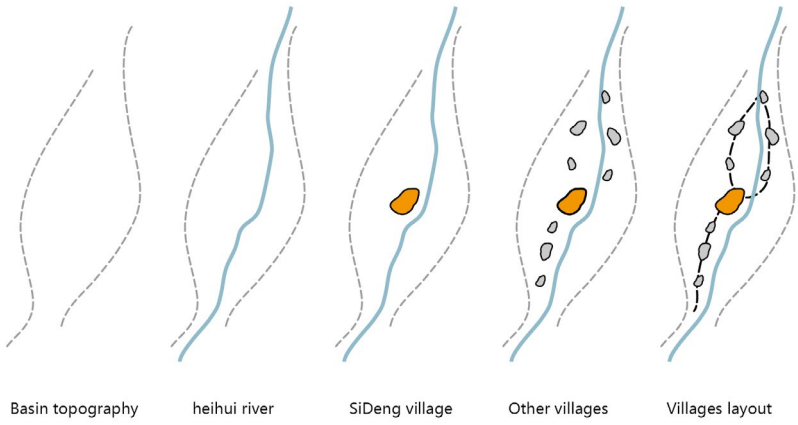
3.1.1. Shaxi as “canvas”

Shaxi is surrounded by mountains, the middle of the basin is about 5 kilometers wide and it shrinks gradually to the southern end and northern end. The Heihui river flows through the entire basin. The total area of Shaxi is 287 square kilometers and the basin area is about 27 square kilometers.

Shaxi is mainly inhabited by Bai minority and the other three ethnic groups are Han, Yi and Lisu. Shaxi has jurisdiction over 14 administrative villages, 49 villages (See Appendix A).

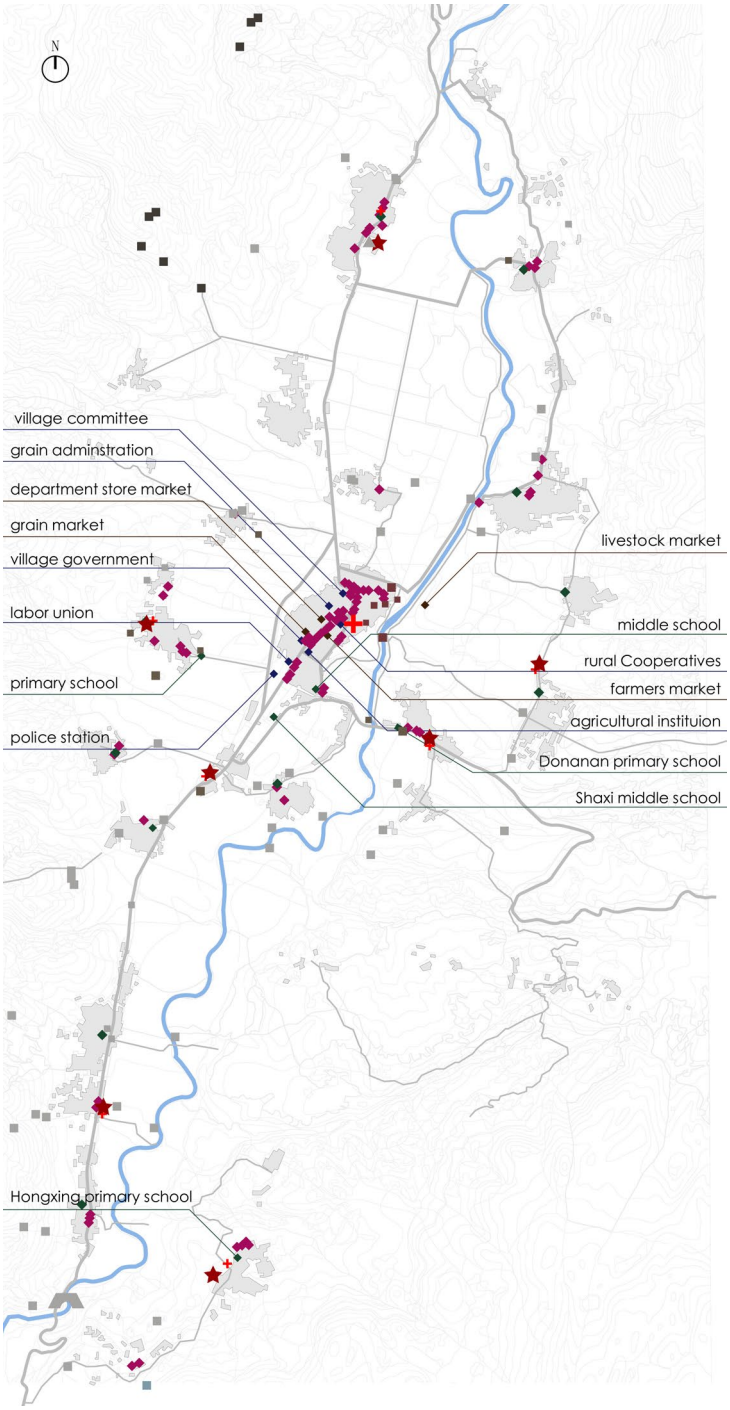
The investigation focused on the basin area where most of transportation activities happens. Among the 12 administrative villages inside the basin, Sideng where Shaxi renovation project implemented is the most thriving village with the most complete infrastructure, the largest population and the highest per capita income. Further more, Sideng is the geographical center of Shaxi, Silian, Shaping and other villages form a ring in the north while Dengta, Xinan and other villages scattered along the Heihui river in the south.

3.1 Abstract elements of Shaxi valley



3.1.2. Local facilities as "points"

“points” including existing facilities such as rural cooperatives, post office, schools, clinics, markets, tourist spots and so on. According to the materials that Shaxi government provided and on-site satistics. Most of the local facilities are pointed on Figure 3.2.

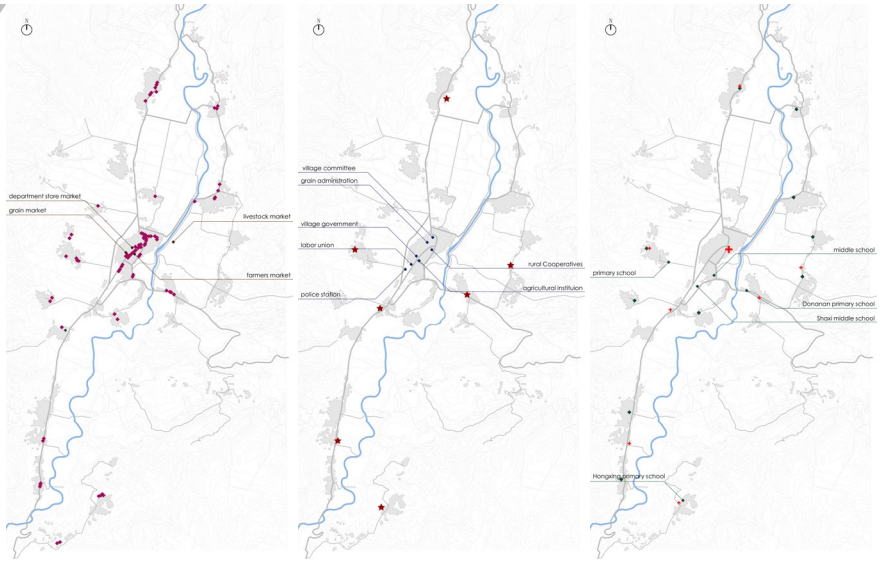


3.2 points map of Shaxi valley

- town clinics
- village clinics
- institution
- primary/ middle school
- kindergarten
- market
- stores
- government
- Sideng
- Other village
- Bailong lake
- Shibao mountain
- Mapingguan/Huacongshan
- Others

3.3 points map of Shaxi valley

- town clinics
- village clinics
- institution
- primary/ middle school
- kindergarten
- market
- stores
- government



Purchasing living materials

The main purpose of daily transportation is purchasing food and living necessities. When the villagers want some grains they don't plant or some livestock they don't feed, Sideng where grain market and livestock market located is where they could go to.

Besides, most villages have their own shops along the main streets, but the type and quantity of the products are scant. Most of the time, the commercial street in SiDeng would be the first choice for local people.

Handling daily affairs

Each adminstrative village has their own office where local people could handle some basic affairs. If someone need to re-submit ID cards, apply for licences and deal with other advanced affairs, they must go to Jianchuan county and find

3.4 photos of stores

the advanced dapartments. Additionally, Post office, police office, bank, grain burean and other service facilities are located in Sideng.

Medical and educational facilities

Kindergartens are common in Shaxi. Before 2010, each administrative village has a primary school. After that, the government integrated all the educational resources into Sideng and built a new primany campus besides existing middle school. As a result, all the students from 7-16 have to go to Sideng to take

lessons. Moreover, there is no high school in Shaxi, the closest high school is localed in Jianchuan county.

On the other hand, each villlage has a corresponding clinics. Unfortunately, the medical equipment and environment is poor. According to the interview. the local people attempt to go to Jianchuan hospital in Jianchuan county if they have seriouse illness.

3.5 photos of clinics

Cultural architectures and scenic spots.

After Shaxi renovation project, the influence of Shaxi is increasing year by year. The Sifang street in Sideng is the soul of Shaxi, it used to be a commerial plaza consisted of ancient stage, temple, trees, alleys and inns. The plaza is where caravans exchange the commodities especially teas and salts. Furthermore, there are some ancient architectures located in other villages in Shaxi such as the great screen wall in Aofeng and the Wenchang temple in Changle.

In long distance, Shibao mountain and Bailong lake are quite popular among the tourists. Shibao mountain is famous for its buddhist temple and grotto in 9th century and Bailong lake is known as the most beautiful natural space in Shaxi.

The general location of each spots has pointed out on the FigureXXX, the majority of the tourists prefer Sideng village. Some of them visit Shibao mountain and Bailong lake and few of them take a walk to other villages.

The following image is the icon for most important destination in Shaxi. The diagrams and figures in the thesis will take this image as a standard.

3.6 photos of toursit spot, Sifang Street

Village

Stores along the street

Ancient theater represent the core village-SiDeng

The screen wall represent the scenic spots in the valley

JianChuan county

Mountain area

Field

3.7 Legend of different places

3.1.3. Roads as "lines"

"lines" refers to existing road network in Shaxi. As mentioned in the previous section, the core of Shaxi is a basin area surrounded by mountains and it's relatively isolated from the outside world.

Taking Sideng as middle point, the Pingdian road throughout the entire basin. This main road north to Jianchuan and south to QIaohou is the most important road in Shaxi. With Shaniu road east to Niujie, these two roads are the only three exits for local people.

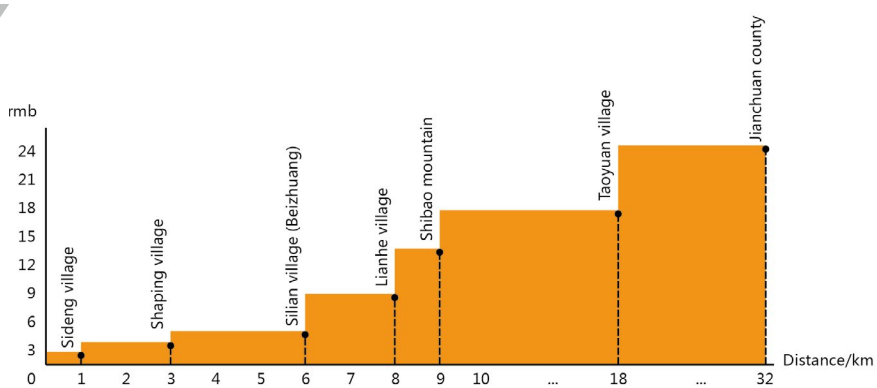
In side of the valley, Beilong road formed a circle with Pingdian road.

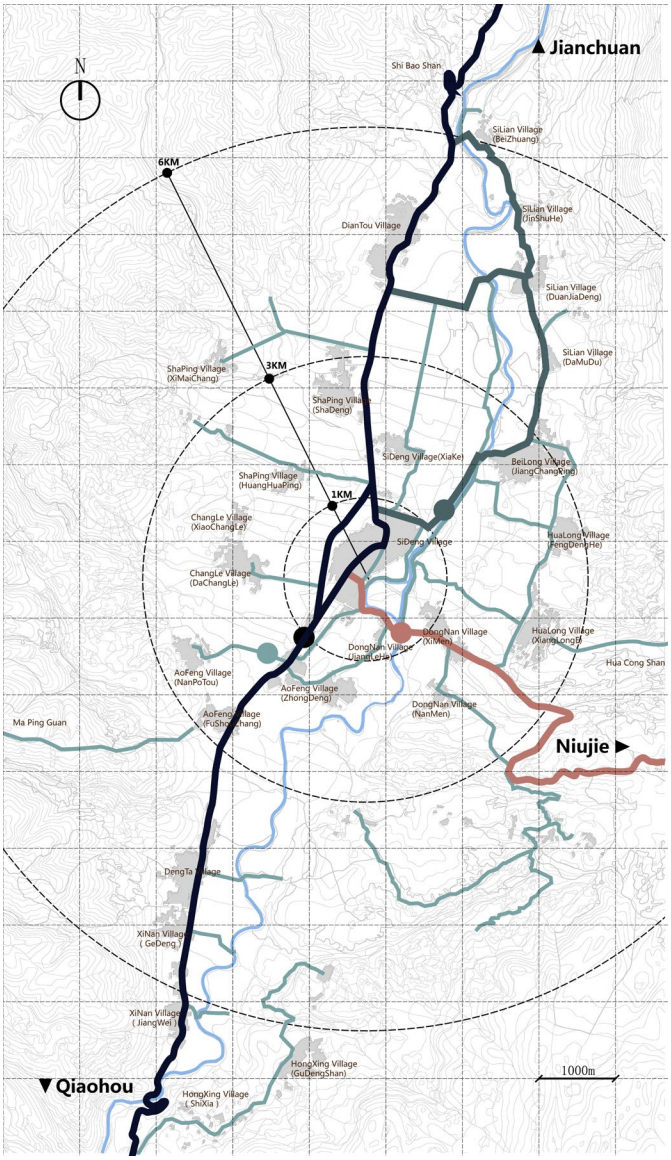
During the development, some branch roads connected different villages and Pingdian road make the road network in Shaxi more complete.

3.1.4. Transportation zones as " areas"

A specific transportation system requires a transparent and reasonable price range and pricing, otherwise, this problem will cause the unfair competition and decrease the trust from local people.

3.8 pricing range in Shaxi





Pingdian road

Shaniu road

Beilong road

village road

3.9 road system and transport range in Shaxi

According to the on-site survey, because of the management of minivan association, the route from Sideng terminal station to Jianchuan terminal station is the only route has a standard price which is 10 rmb each passenger. This association is permitted by Jianchuan government to operate the route from Jianchuan to Shaxi.

The other inofficial operators such as minimoto drivers and private car drivers have a fuzzy range of pricing. Take minimoto as an example, 5 rmb for 1 kilometer, 10 rmb for 1-3 kilometers, 15 rmb for 3-6 kilometers. Based on these fuzzy range, the basin area is divided into different transpotation zone consisted of 1km*1Km squares. In this way, the pricing system would be more reasonable and transparent with a suitable price per kilometers. Further more, the grey area in FigureXXX is the core area of Shaxi, the rest area will has a extra fee because of less business.

3.10 photo along Pingdian road

3.1.5. Summary and Analysis

In conclusion, most of the "points" located in Sideng and majority of the transportation route will gather to the main "lines" . These two features are strong support to establish a sharing transportation system in Shaxi. Meanwhile, the study on "areas" could provide a fundamental reference to create a backstage of the system.

3.2 Statistics of transportation tools

Last section discusses some static factors, the "points","lines","areas" on the "canvas". The research and analysis in this section focuses on the dynamic factors, the transportation tools.

3.2.1. General situation

Unusual transportation tool plays an important role in rural community. The usage of truck, minimoto and minivan is much more frequent than urban area. Photo XXX is a common scene in Shaxi: due to the small transportation radius, people could walk along the main road between two villages, the minimoto on the right side is used for picking up people in side of the valley, the minivan in the remote side is used for taking people from Shaxi to Jianchuan.

Photo XXXX is another common scene in Shaxi: when local people decide to see a doctor, attend school or buy something in Jianchuan county, they have to take the minivan from minivan association. In 2012, in order to unify the image, the Jianchuan government paints all association owned minivans into green and yellow. Compare with the minivan in Photo, the green and yellow is the legal one.

Of course, there are trucks, buses, lorries and other tools in Shaxi as well. Figure XXX is the collection and icons of different transportation means in Shaxi.

3.11 photo in Shaxi terminal station


Bicycle


Motobike


Car


Minivan


Minimoto


Truck


Bus

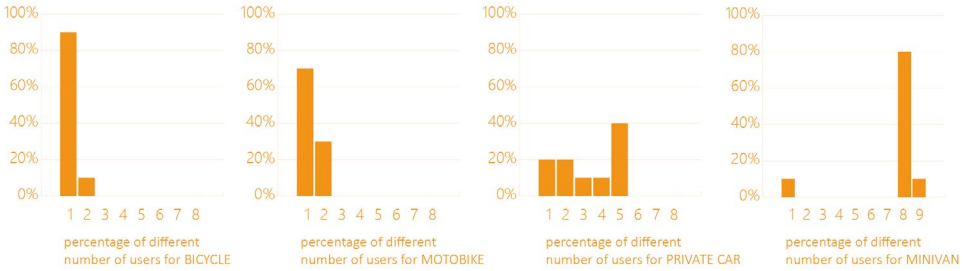

Lorry

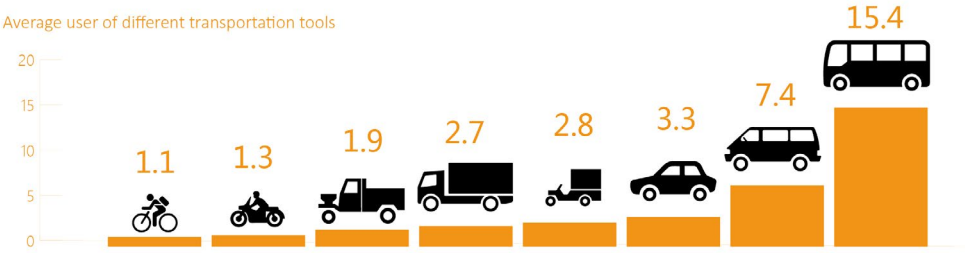
3.12 legend of different vehicles

3.2.2. Average user

The calculation about average user of different transportation tools is based on interview and on-site observation. It's efficient by counting the quantity of vehicle first and calculate the number of trips with the average user. Moreover, the number of trips are more valuable and obvious to describe the trips than the quantity of vehicle. For instance, motobike is quite common in Shaxi and the average user of a motobike is 1 or 2. On the other hand, there are less private cars in Shaxi and the average user is about 2-4. In this case, private cars could provide more trips than motobikes even if the quantitiy of motobike is higher.

This paragraph is about to explain how to calculate the average user. For example, the capacity of a minivan is 8 people including the driver. According to the interview and observation, in the case of 80%, the minivan departure from Shaxi terminal station in full case so as to guarantee the income. Meanwhile. in the case of 10%, overload occurs because of local people's weak safety awarenes, the last 10% of the cases, the driver have to drive back to the





3.13 avergae users of different vehicles

terminal station alone. In fact, other cases like 2 or 5 passengers happen as well, but the common situation is in that three cases and the author can hardly have time to calculate in detail. For this reason, the average users is calculated in weighted average and the formular is:

The average user=[(number of users*percentage in case A)+(number of users*percentage in case B)+...+(number of users*percentage in case Z)]/10

Take minivan as an example: [(8*80%)+(9*10%)+(1*10%)]/10=7.4. According to the calculation, the average users of minivan is 7.4 passengers. FigureXXX is the results of different vehicle.

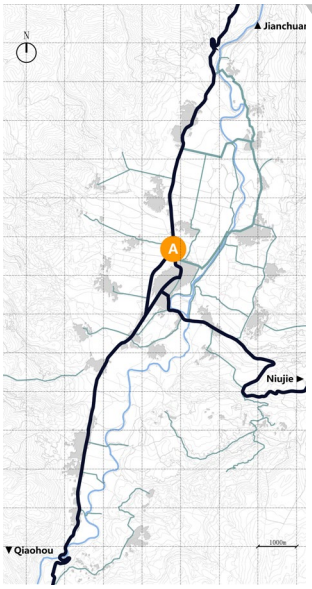
3.2.3. Summary and Analysis

Generally, this secion describes the transportation situation in Shaxi and the transportation suppliers such as minivan association, minimoto and private cars. Based on the interview and on-site observation, they are the most popular means to travel in Shaxi. At the same time, the calculation of the average user is introduced in this setion. We could make the further analysis with this data.

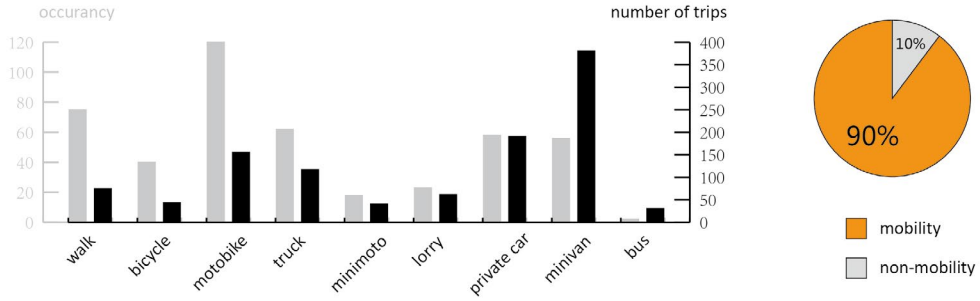
3.14 photos in observation spot

3.3 The frequency of transportation tools

This section presents the research about transportation features in different periods with on-spot observation. Spot A, the entrance of Sideng and crossing spot of Pingdian road and Shaniu road is marked on Figure 3.15. For the reason that most of the trips concentrated here, the author take this spot as sample.



3.15 location of observation spot

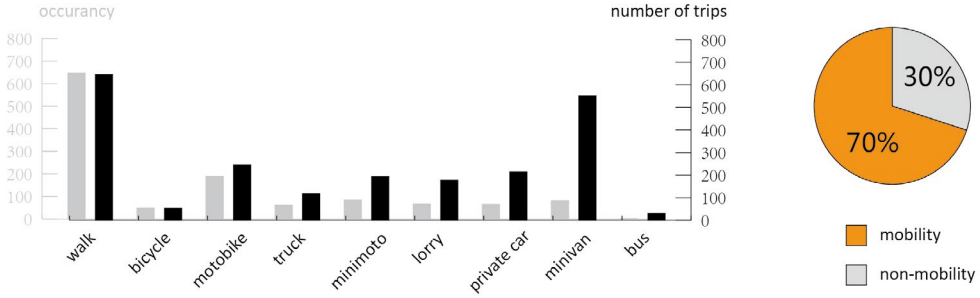


3.16 transport statistics in regular day

On the other hand, Jan 10th and Jan 13th was taken to be the cases of market day and ordinary day in order to compare the difference between different time. The following section is the conclusion after the collation of information, more original data is provided in Appendix C.

3.3.1. Daily transportation

The period when people transport is concentrated in 8:00-12:00 and 15:00-18:00 according to the villagers. The statistics is bases on 9:00-10:00 and 16:00-17:00 on Jan 13th in spot A. The grey column presents the quantitiy of different



3.17 transport statistics in market day

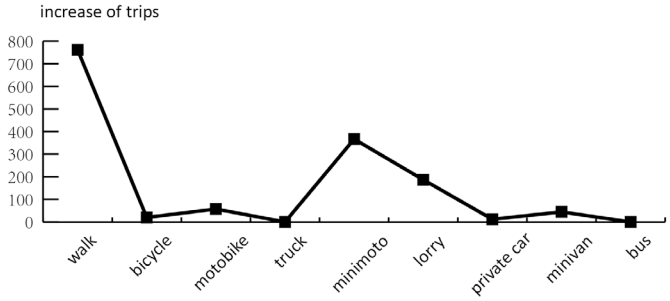
vehicle and the black one presents the number of trips. Majority of people use minivan and private cars. The transport efficiency of motobike is lower than the other. In ordinary day the percentage of non-mobility and mobility is almost the same.

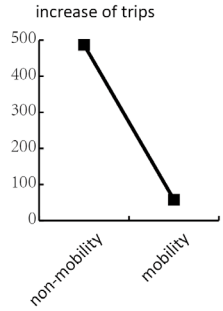
3.3.2. Markey day transportation

Marketing fair is particular in rural area. People from other villages come to Sideng and exchange their grains, livestocks and everything they need on Friday. This fair has last for hundreds of years in Shaxi and Shaxi is known as its "the last ancient market on Tea horse road". The transportation features are different on markey day. Most of people walk to the market.

3.3.3. Summary and Analysis

On market day, the total trips are twice of ordinary days. The number of trips





that people travel on foot rise a lot on the market day and the increase is about 761.33%. Most of people prefer to carry a basket with food inside and walk to Sideng. The increase of minimoto and truck is about 366.67% and 186.96%, local people use these two vehicles not only for commodities, but also for people. The minivan provide in-valley service on market day as well and the increase is about 44.64%.

3.19 comparison between regular and market day

In conclusion, the trips during market day are enormous, people, animals and vehicles sharing the main street which is only 7 meters wide at the same time. the main street becomes quite crowed and full of potential dangerous.

3.18 photo of main street

3.20 photo on market day

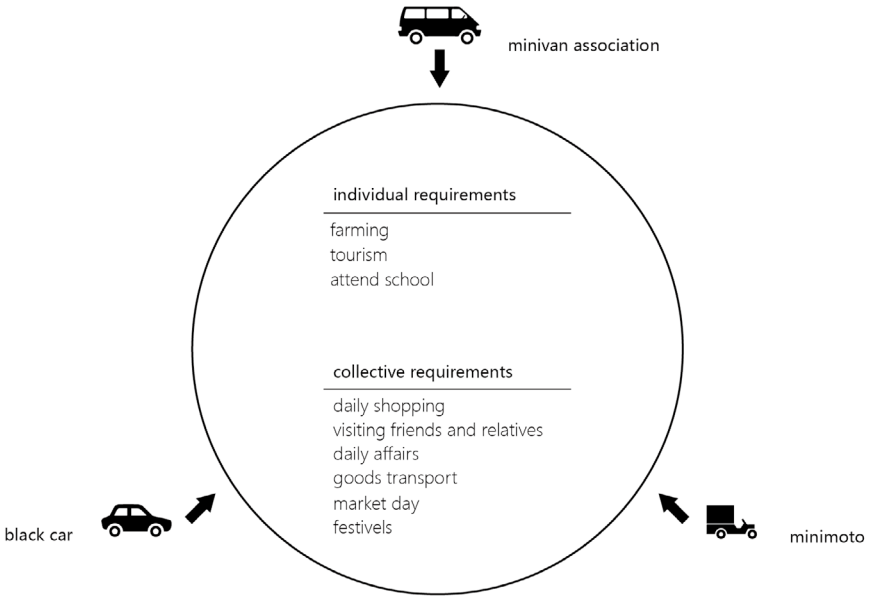
04
ANALYSIS

The system is based on the relationship between supply and demand. The core problem and strategy came from the common feature of transportation.

4.1 Supply and demand

As the rules of market economy, the transportation system work effectively only if the supply and demand is balanced. This secion explores the transport market with information from the stepped interviews. (See Appendix D)

Local people and tourists constitute the demand while the minivan association, black car and minimoto are the suppliers.



4.1.1. Research on supplier

Minivan association is a legal organization and their offical business is the route from Shaxi terminal station to Jianchuan terminal station. The black car and minimoto are self-operated and their business are fuzzy, flexible and wide. According to the experience abroad, local private vehicle could be an important part for a sharing transportation system. In fact, the vehicle ownership is't high enough to support the system and most of private vehicle is motobike, agricultural truck and other vehicle which is not suitable for sharing. In this case, the research focus on three existing suppiler, the minivan association, black car and minimoto.

Minivan association



4.2 photos during the interview

The minivan association is the official organization permitted by the Jianchuan government to operate the route from Shaxi terminal station to Jianchuan terminal station.

•Organizational Structure:
There are 48 minivans in the association. All of the minivan drivers have an offical business license and all of the minivans require regular maintenance and inspection. The structure is relatively simple: except the drivers, the association only set president, vice-president, cashier and secretary. The membership fee of the minivan association is 50 rmb a month. The expense of the fee is the monthly salary fee, reserve funds for the car accidents or festive gifts.

•Staff composition and income:
The drivers aged from 20-30 accounted for 60%, the drivers aged from 30-40 accounted for 20% and the drivers aged over 40 accounted for 20%. Actually, the minivan driver is popular among the young people in Shaxi. Part of the reason is that they are unwilling to take the burden from the elders and to be a farmer. Another reaon could be the high income to be a minivan driver. As we mentioned before, in order to cover the cost, most of the minivan departure in full capacity. Based on the survey, single way from Shaxi to Jianchuan is 10 rmb each. Except the fuel and extra cost ,the daily income for a minivan driver coulde be 50 rmb. Compare with the average annual income for local people, 1000 rmb per month is ideal.

•Business scope:
Almost 70% customers are local people. The starting point of minivans is Shaxi terminal station. The main destination for the natives is Jianchuan terminal station. Another 30% customers are tourists. jianchuan terminal station takes a large proportion in their destination. In the rest of the destinations, Shibao mountain is the most popular one.

Black car

The relationship between minivan association and black car are antithetical. From the black car drivers' point of view, the number of government-permitted operating licenses is fewer and the application is more complex in recent years, thus the minivan association formed a monopoly in local transportation market and the service is dissatisfied. On the other hand, the minivan association think they have the right to operate Shaxi-Jianchuan route and from their point of view, the black car seize their market.

•Organizational Structure:

All of the black car drivers don't have an offical operating permit and there is no formed organization among black car drivers. They know each other ,but their businesses are individual because their prefer a flexible schedule.

•Staff composition and income:
Most of the black car drivers have their main work such as farmer, store owner, etc. They don't have an organization, so there is no staff compostion at all. The price for taking a black car is cheaper than taking a minivan. Part of the reason is that they don't require regular inspection and they don't buy the transport insurance. Except that, they just want to make a little extra money during the slack season. So their psychological expectation is lower. Generally, the price from Shaxi to Jianchuan is about 60 or 50 rmb.

•Business scope:
Unlike the minivan association, the black car could only wait outside of the terminal station. Meanwhile, some of the black car departure from different village or wait along the main road. As for the destination, Shaxi-Jianchuan route is popular because of better road condition and higher price.

Minimoto

Last part of the existing transportation system we will analyse is the minimoto, the ownership of minivan is increasing rapidly in Shaxi. One of the reason is the complete of the road network, farmers use minimoto which is flexible and relatively cheap instead of horses in agricultural activities. Another reason is the economic development. The construction in Shaxi is raising and the minimoto plays different roles such as shipping grains, construction materials and so on.

•Organizational Structure:
As like black car, all of the minimoto drivers don't have offical operating permit from the government. There is no organization, no schedule, no leader for the minimoto drivers. Their attitude for their work is making extra money.

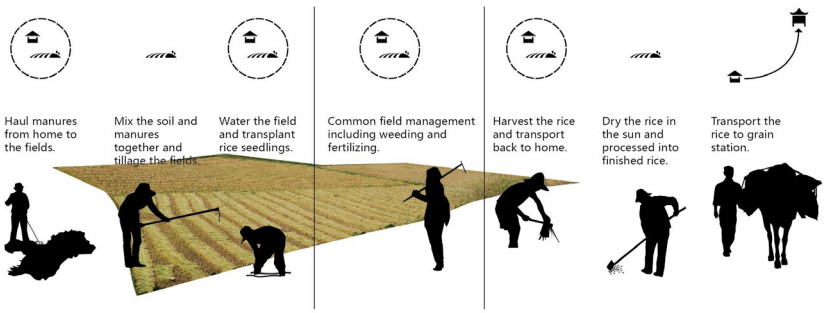
•Staff composition and income:
Without the organization, the pricing system is floating. According to our research, the price is related to the distance and weight. In fact, the drivers and customers makes a deal first and the local people have a fuzzy pricing system themselves.

•Business scope:
Most of the minimoto drivers wait in their village when they during the vacation . Some of them drivers along the Pingdian road and some of them wait in Sideng. The main business for the minimoto is shipping commodities. In particular time such as market day, the minimoto carrys people as well in Shaxi because the weak safety awareness.

4.1.2. Research on demander

The transport requirement for the local people could separated into individual needs and collective needs. The individual needs have a strong connection with the occupation and identity. For example, farmers travel between fields and home, tourists travel between scenic spots and inns. Meanwhile, the collective needs are common requirements such purchasing food and water, visiting friends and relatives.

Individual need: agriculture-related



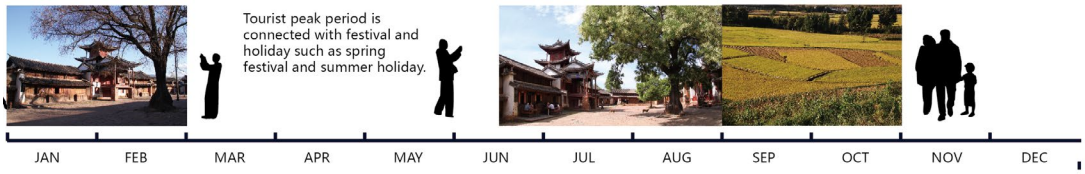
4.3 photo of local farmer, season, transport feature

Local agricultural production is alternately farming, take rice for example, the general steps are selection, breeding, arable land, planting, field management, harvesting, threshing, drying and processing. The whole process could be divided into three periods seasonally. During June to July, the farmers carry manure to the fields and combine it into the earth, after that they plant the

seedling after irrigation. During August to October is the slack season, except the regular field management, they don't have particularly heavy work. From Novermber to December is the harvest season, the farmers harvest the rice, and ship it to the grain adminstration after processing.

Generally, the basic field is close to farmers' home. For this reason, most of the agriculture- related transportation concentrated around each villages. In addition, after processing the rice, some of the family will buy a minimoto, a truck or a private car to ship the products to grain adminstration. According to the survey, a minimoto costs 5000 rmb, a truck costs 20000 rmb and a private car is much more expensive. The fuel fee in Shaxi is about 8 rmb a liter. Vehicle is not a small investment comare with the per capita income of local people. unfortunately, most of vehcile are idle during the slack season.

Individual need: tourist related

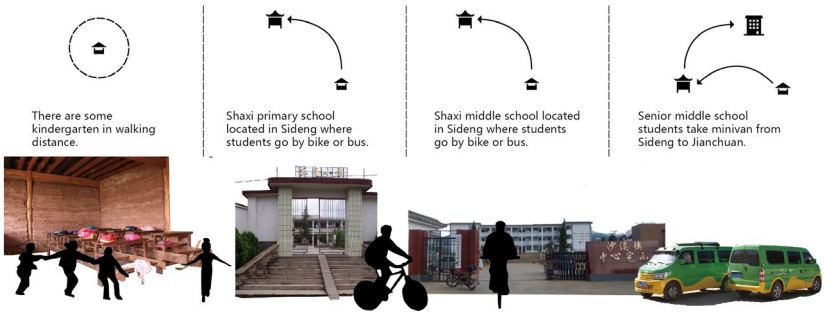


4.4 photo of tourists, season and transport feature

Due to the unique tourist resources, tourism is a significant part in future development of Shaxi, the transprotation activities of the tourists have a inevitale impct on the system.On the basis of interview, tourist season is influenced by the festival and national vacation. There are more tourists in Shaxi during the holidays.

The main feature based on twe activities, entering and visiting Shaxi. Based on the investigation, 48.7% tourists use minivan from Jianchuan terminal station to enter Shaxi, 23.1% tourists prefer private car. In addition, the majority of the tourists choose black car to visit Shibao mountain, Bailong lake. Other scenic spots are mainly concentrated around the core area, so tourist could walk or bike there.

Individual need: attending school



4.5 photo of students and transport feature

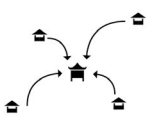
The trips of attending school is not large while the peak period is regular and concentrated. There educational function in Shaxi covers kindergarten to middle school. Jianchuan school is the only high school close to Shaxi. Most of rural school is boarding, so the student back home every Saturday, stay for one night

and go back to school again on Sunday. The peak time on Saturday is from 10:00 to 12:00 and the peak time on Sunday is about 15:00 to 16:00.

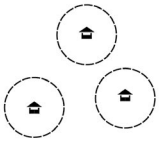
In summary, the transportation feature is relevant to the grade of student. Kindergarten and primary school located in the village, so the students could attend on foot. Middle school located in Sideng and the students prefer to use the bicycle. At last, the high school located in Jianchuan and the students take minivan and get off on the halfway to Jianchuan terminal station.

Collective need: purchasing living material

4.6 photo on market day and transport feature



Local people from different village gather to Sideng during the market days.



Simple daily consumption happens in the corner shop in each villages.

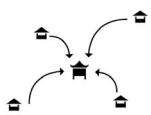
Food, water are common requirement for living, just like in the city, consumption related activities take a large proportion in transportation system in rural area. The characteristic is different during marketing and daily shopping.

•Market day:
Shaxi retains marketing every Friday, local people from different villages come to Sideng with basket full of products. People from close village prefer walking and biking while the people from remote village take minivan, minimoto and black car. The grain market and commodity market are occupied by the crowd. People build up a simple roof and sell vegetables, fruits, grains and other products like clothing, shoes and farm tools. The transportation pattern on market day is assembling route towards Sideng.

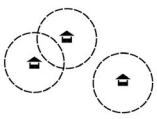
•ordinary day:
During the development in recent years, the local people open commissaries in

each village,which sells snacks or drinks. Books, school bags, pencils and other stationeries are available in the commerical street in Sideng. In the city, the supermarkets always located besides residents area, the transport range of the commissaries are walking up and the tranportation pattern in ordinary day is a small radius around each villages.

Collective need: social activites



Local people come to Sideng or other particular village to celebrate differet festival.



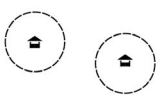
People share the same sername always live close, so the range of visiting relatives is small.

4.7 photo on prince festival and transport feature

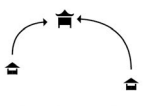
Because of the clan relations, most of the family in rural area has 4-5 generations. The relationships between villagers are closers and the contacts are more frequent. As a result, visiting friends and relatives is an important part of transportation system in Shaxi. The transportation feature is small radius around each villages.

On the other hand, Shaxi retains many traditional festivals such as Prince's day in Lunar February 8th, The town god fair in Lunar March 5th, Torch festival in June and Shibao mountain fair in July. A hugh amount of trips occurs during different festival and the transportation pattern is an assembling route from different village to one destination.

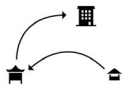
Collective need: daily affairs



Most affairs could deal with in the village government adminstration.



Local people go to Sideng to deal with town-level matters.



Local people make their own to Sideng and take minivan to Jianchuan to deal with county-level affairs.

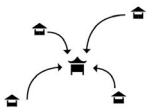
4.8 transport feature of daily affair

As we mentioned in Chapter 3, the majority of facilities such as rural credit, grain adminstration, post office located in Shaxi. Meanwhile, all of the facilities are town-level. When local people need to deal with county-level affair, they have to take the minivan to Jianchuan.

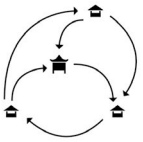
In conclusion, the transportation feature of daily affairs have a strong connection with the level of the affairs. Village-level affair belongs to village range. Town-level affair is based on Sideng and county-level facilities is located in Jianchuan.

Collective need: commodity transport

4.9 photo about shipping and transport feature



Express stop at Sideng local people go to agency located in Sideng to pick up their express.



The transportation of commodities forms a flexible and random network around Sideng.

Commodity transportation system divided into express and shipment in Shaxi. Due to the rapid economic development, the living condition is better and the flows of commodities is more active.

•express system:
Before 2013, because of the inaccessibility of Shaxi, all of the express are delivered in Jianchuan, people have to take minivan for 45 mins in order to get their express. This inconvenience spawnes the business of courier collection in minivan association. After 2013, the express company setted up agents in Sideng. It's much more convenient than before, but some people live in the remote village still have to spend sometime to get their express in Sideng.

•local shipment:

During the development of economy and tourism, the construction in Shaxi is increased. According to the interview, local people lived in core area are willing to rent their house to outside investor and build a new one out of the core area in Sideng. On the other hand, family with 4-5 generation is replaced by small family with 1-2 generation. This two phenomenon cause the frequency of local shipment and the transportation patters is more flexible and irregular.

4.1.3. Summary and analysis

In fact, 48 minivans in minivan association can't meet the diverse needs of local transportation, while the system inside of the valley can't cover each villages. For these reasons, the invisible hand induces black car and minimoto to play the complementary roles between them and the minivan association. Although the operation is illegal and the safty and insurance ism't complete, it's undeniable that their presence are important.

And now, the government start to manage the transport system and squeeze the market of black car and minimoto. In my opinion, support minivan association blindly and eliminate the black car and minivan extremely isn't appropriate. This industry is born spontaneously and various forces generate the transportation system in Shaxi. If the government put black car and minimoto on the opposite side of minivan. The local living will be affected and the black car and minimoto will strike back. Therefore, exacerbating conflicts isn't an appropriate solution.

Since the presence of the black car and minivan are significent, by analyzing the needs, the transportation market in Shaxi can be broken down, the efficiency of the transport service can be improved. In the further desin, the sharing transportation system attempts to balance the relationship between the black car, minimoto and minivan association and improve the quality and efficiency of the transport services.

4.2 Features of transportation activities and related strategies

Based on the research about supply and demand in the previous section, this section focuses on different characteristics of transportation activiites such as purposes, range and time in order to find the core problems and propose the related strategies.

4.2.1. Transportation range

With the statistics of distance between villages to main facilities and the information from interview and observation. The transportation range of different activities can divided into village-village, village-Sideng, SIdeng-Jianchuan.

Village-village

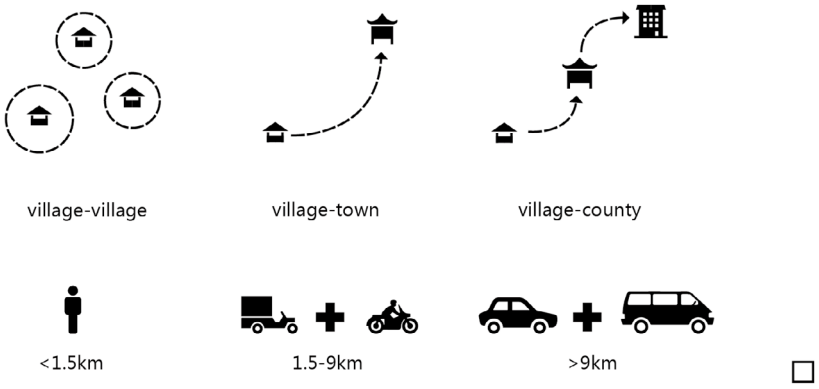
Field management, daily shopping in the Commissaries, dealing with village-level affairs belong to this range because all of the destination located inside or near each village. Visiting friends and reltives belong to this range as well due to people share the same surname always live together. The transporation range of these activities is a circle with 1-2km radius.

Village-Sideng

For the reason that most of the facilities located in Sideng, shipping grains, purchasing particular daily necessities, vegetables, food and other activities assembling into the range of village-Sideng. The route that students attend school based on this range as well. The transportation range of these activities is a circle with 2-6km radius.

Village-Jianchuan

The last range is extended to the outside part of Shaxi. The local people have to make their own way to Sideng first and then they can take minivan to Jianchuan for Shaxi terminal station. Furthermore, the journey to Shibao mountain, Bailong lack and other remote scenic spots departrue from Sideng as well because most of tourists live in the core area in Sideng.



4.10 transport route analysis

basic strategy

As we discussed before, the local people prefer to walk in the range of village-village, such as buying a bottle of Cola or celebrating torch festival in the village center plaza. Although, there is a huge number of trips, walking doesn't generate transport pressure. On the other hand, the activities people travel from village to Sideng make local people take bikes, private cars, motobikes and other tools which generate transport pressure and the main feature is that no matter where do they departure, the destination is always Sideng. When people go to Jianchaun, they all have to make their own way to Sideng first.As a summary, one of the basic strategy of the sharing transportation system is connecting different villages to Sideng.

4.2.2. Transportation purpose

The service of local transportation system including manned and shipping. Because of the weak safety consciousness and traffic regulation, the boundary of manned and shipping is very vague. In fact, it's quite danger when shipping vehicles are used to carry people. One of the important reason for this phenomenon is inefficient operation, manned vehicles cann't meet the needs for villagers while shipping vehicles cann't find enough business.

Manned transportation

Minivan association and black car are the main approaches to travel. The inefficiency of the minivan association provide the market for the black car while the information asymmetry makes black car can hardly find passenger inside of the valley on time and force their to break the law and seize the market of Shaxi-Jianchuan route.

Shipping transportation

The local people prefer minimot to ship commodities because of the flexibility. The wheeled width of minimoto is 1.3 meters and the width of village path is about 1.5 meters which makes the minimoto the only vehicle can travel inside village.

4.11 transport purpose analysis

basic strategy

In the city, people ask express to deliver commodities. In the rural area, a great amount of grain shipping requires the system could provide local people an option to ship or deliver their goods as well.

4.2.3. Transportation time

Transportation time is diverse in different activities. For example, market day occurs only on Friday and daily shopping happens every day. Agricultural and tourist related activities are seasonal while contaces between local people coulde be year-round. With the interview and collation, the transportation time is divided into Single day, seasonally and yearly.

Single day event

Regular activities can be regarded as single day event because the date the

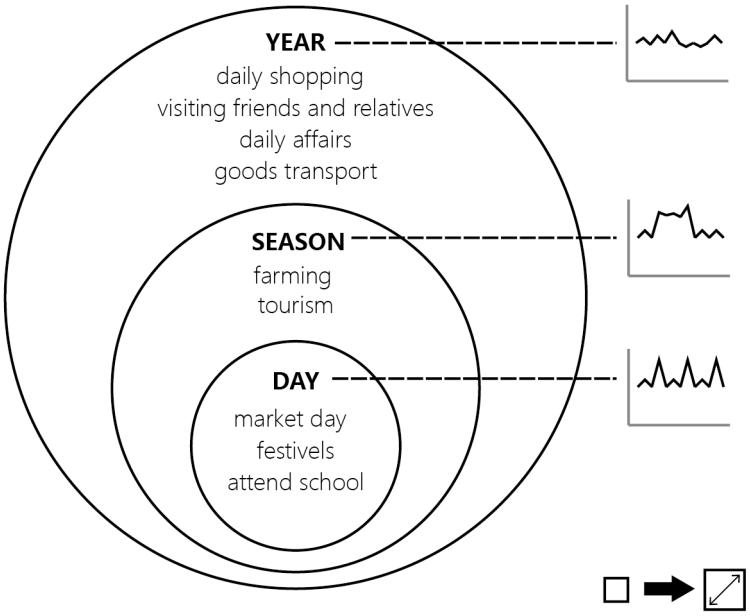
activity happens could be predicted. For example, the date of different festivals changes by lunar calendar, market day on each friday happens 52 times per year.

Seasonally event

Agricultural and tourist related event are seasonal. Since ancient times, production has distinct relationship with season. Shaxi is no exception and there are two quarters of grain season each year. In the 1st quarter, sowing begins at November to December and harvest is during June to July, the main grains in the 1st season is wheat, oilseed and beans. In the 2nd seaon, people start to sow in June to July and harvest in November to December, the main products are rice. This alternative agriculture maximize the usage of the fields. Moreover, as we know, the tourism has strong impact by the holidays and vacations.

Yearly event

The yearly event is unpredictable and irregular. Activities like daily shopping, dealing with different affairs in village, town or county, attending hospital and visiting friends and relatives are random.



4.12 transport time analysis

basic strategy

The single day event and seasonally event coud be combined, because the main feature of these two kinds of activities all happen in a few days which requires the system to meet the peak time transportation.

4.2.4. Summary and analysis

In this section, the feaures of different transportation activities are illustrated by purpose, range and time. More information could be found in Appendix C. Meanwhile, some basic strategies are proposed in each aspect.

extended service: in order to meet peak period

orginal system: basic service meet the daily requirement

orginal system: basic service meet the daily requirement

4.13 basic strategy

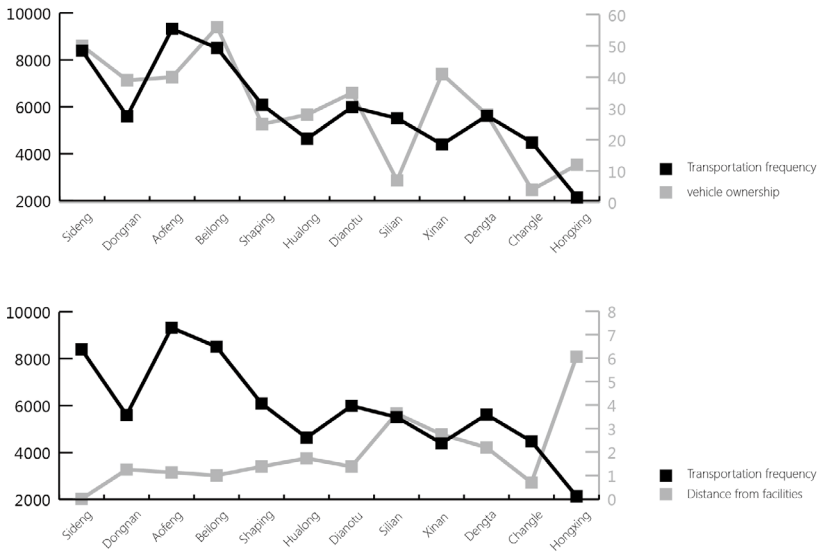
4.3 Opportunities and challenges

Based on previous proposals, this section evaluate the existing resources and discuss the potential opportunities and challenges.

4.3.1. opportunities

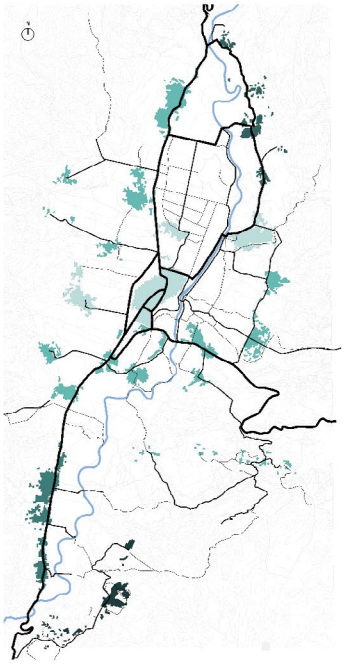
In this setion, the comparison between travel frequency with other information like population, vehicle ownership, average incomes can offers some possible opportunities. More original data could be found in Appendix C.

Improving transportation condition



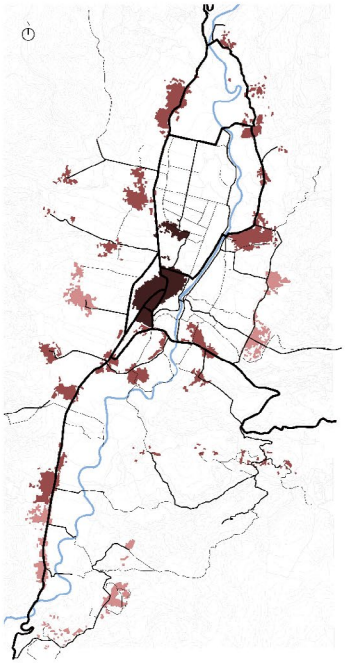
4.14 data analysis about number of trips

Travel frequency has a strong connection between the distance from villages to main facility, the core village-Sideng has better transportation condition than other villages. Hongxing which is the most remote village in Shaxi has the lowest travel frequencey. (See Figure)



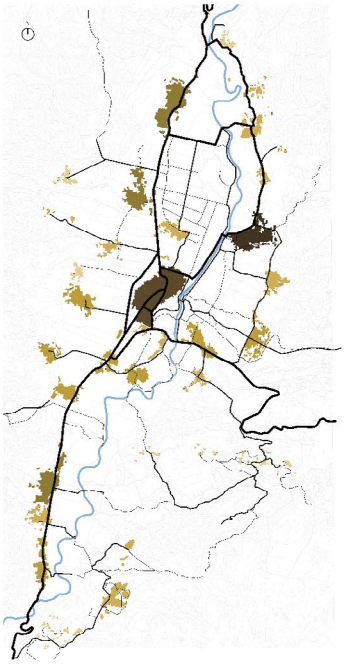
average distance from basic facilities

- >4 km
- 3-4 km
- 2-3 km
- 1-2 km
- 0-1 km



population density

- >7000 rmb/year
- 3000-7000 rmb/year
- 0-3000 rmb/year



Transportation frequency

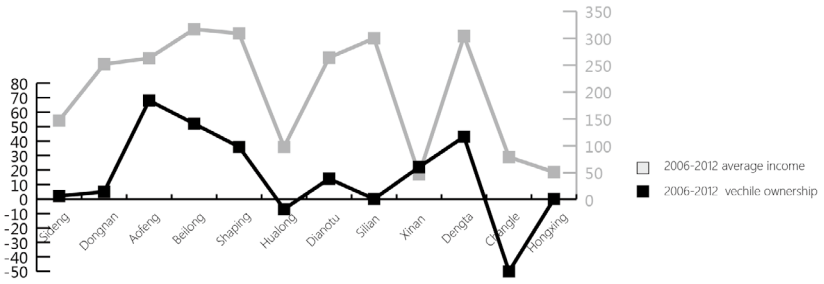
- >8000
- 6000-8000
- 4000-6000
- 2000-4000
- 1000-2000
- <1000

4.15 data analysis about basic information

The travel frequency and average income are direct ratio. Generally, higher average income means larger trips. The total income of the northern part of the valley is higher than the south. Except the industrial features, economic propotions, the transportion circle formed by Pingdian road and Beilong road play an important role as well. On the other hand, the transportation of northern and southern end of the valley isn't conventient while the villages close to Sideng has better transport condition and the feature is similar to the map of average income.

The gap of average income in different villages is obvious. Sideng is the champion with over 7500 rmb annual income. In the second group, the average income of Dongnan, Aofeng, Beilong, Shaping, Diantou, Silian and Dengta is about 5000 rmb per year. Among the rest villages, the average income is about 1800-2000 rmb. According to the official data, the annual per capita income of Shaxi is 3903.75 rmb, but if we don't count Sideng which is far more developed that the other villages in, the number decresed to 3567.9 rmb, so the economic condition in Shaxi isn't optimistic.

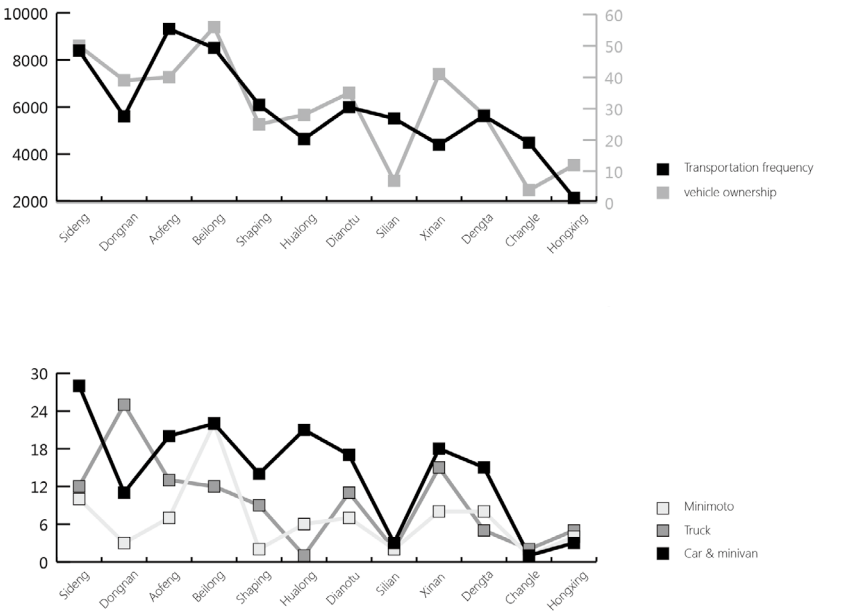
Negtive impact of economic development

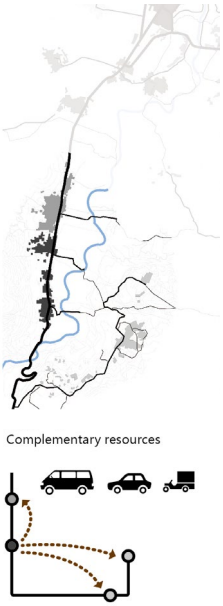


4.16 data analysis about increase number

The increase of economy and vehicle owernship is related. The vehicle owership of 10 villages among the 12 increases while the average income increases. Moreover, the economic growth curve is similar to the vehicle ownership growth curve in 7 villages. Therefore, if there is no reasonable planning, guidance, the travel conditions will be worse and the increasing vehicle ownership will have further impact on the environment undoubtly. The sharing transportation system offers another sustainable option.

Complementary of transport resources

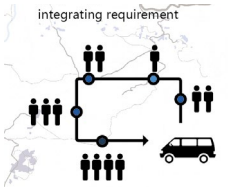


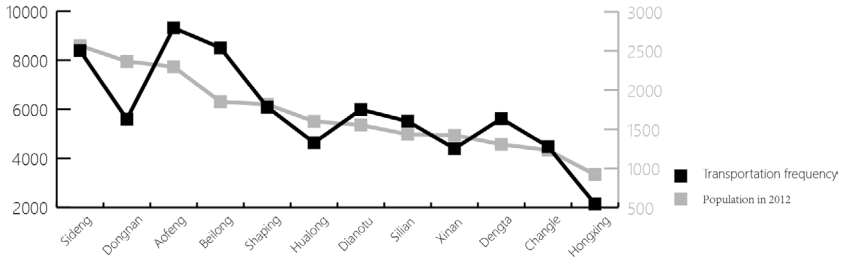


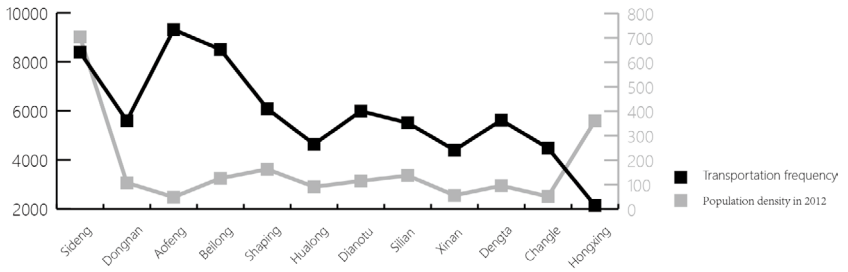
4.17 sharing transportation resource

The vehicle ownership affect travel frequency directly, according to the vehicle ownership map, villages along the Pingdian road always have more vehicles. Some villages have more private cars while the other villages have more minimotos. The resources could be shared between different villages.

Integration of common requirements







4.18 integrating transportation demand

Generally, higher population intensity generate larger trips. The population in northern part of Shaxi is higher than the Southern part and the numbers of trips is in the same feature. The circle Sideng, Shaping, Diantou, Silian and Beilong generate a large number of trips during markter day and festivals. Public transportation could be a suitable option to service the local people and the local drivers could make the part-time job in the peak time.

4.3.2. Challenges

Service design emphasizes the implementation in local. Considering objective factors, economic development in Shaxi is relatively backward, the government and natives cann't afford the expensive transportation system. Subjectively speaking, the attitude and adaptation for new things needs evaluation. In addition, the principle of service design, people as asset, depends on the initiative of local people, therefore the human uncertainty should be considered as well.

Low-cost system

The gap between Shaxi and eastern coastal towns are essentially different, therefore the system can't rely on the funds from government or the investments from society. On the other hand, the current average income make the cost of the system to stay affordable, so Shaxi people could use the system.

Low-tech system

According to the on-site observation, the penetration rate of mobile phone is not low in Shaxi, Huawei, HTC and other brands of smart phones are common there. But people use it only for calling, listening music and playing games. Thus, the APP like taxi calling or website like carpooling are hard to promote in Shaxi.

Inclusive system

Shaxi, as other rural are in China, is facing the problem of aging population, empty nest phenomennon is very common. Actually, most of the users of sharing transportation system are old people who are resistant to change and hardly able to master a new skill like young people. As a result, the frontstage of the system must be simple enough. The system should based on existing travel habits, so the elder can easily accept and use it.

Human uncertainties

Service design put a great emphasis on using people as resources, which make the foundation of the system is people's initiative. Inevitablely, how to control the human uncertainties become the key factor if the system are successful. For example, passengers and drivers make deal with mobile or online, the cost of default is very low, breaking a contract happens all the time. Fortunately, based on the enormous users in the city, a few dissension won't affect the system a lot. In Shaxi, a place with only 20000 people, several entanglements can be a great creisis to develop and promote the system.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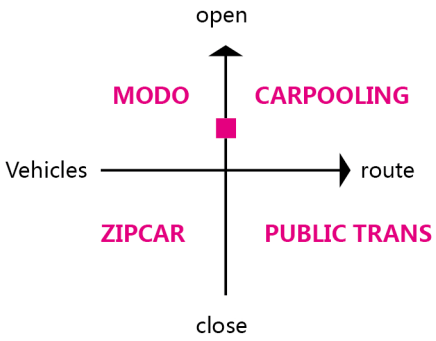
05
DESIGN

The traditional model could establish transportation system efficiently, but requires high cost during the construction and operation.

5.1 System positioning

In this secion, the analysis is based on previous case studies. The sharing transportation system is put into different quadrants to study potential position.



5.1 positioning map of sharing transportation system

5.1.1. Position map

THis axis is consist of two groups of words, the horizontal axis is sharing car and sharing route and the vertical one is open and close.

Take ZIPCAR as an example, all the vehicles belong to company. The management and repair is unified and the user can't add their vehicles into the system. On the other hand, MODO is more open, it allows all the qualified vehicles to enter the system, the owenership of these vehicles are the entire providers. Website and software like Carpooling.com or WEIPIN are more like a platform where users can exchange information. They share routes rather than cars. Last but not least, public transportation is a typical close system. All the vehicles belong to the company and each route is fixed.

5.1.2. Comparison in different quadrants

On the basis of existing situation, let's discuss the potential in each quadrants.

Close-Sharing car

This type of system requires a high cost to purchase vehicles to create the foundation to support the system. The economic situation can't afford such an expensive system without the investment from the government or other enterprises. Unfortunately, the amount of trips in rural, the exisiting market can' t attract enough attention.

Close-Sharing route

Rural bus system was mentioned during the meeting with Shaxi government. According to the research, transportation activities is regular on the range, route and time. The public transportation system could be implemented based on enough research and test in order to make a suitable schedule and route.

Open-Sharing car

In this system, local people could integrated their own vehicles into the system. In the foreign case, users don't have to own a car but they can use a car anywhere, anytime. Such an advancing concept requires a big foundation of the users and vehciles. In rural area, only a few groups of people have a lience to driver, as a result, the vehicles can't be divdied from drivers. The key fact in Shaxi is the Information asymmetry. In current situation, drivers of minivan, black car and minimoto look for passengers only by experience. The efficiency is hardly guaranteed.

Open-Sharing route

On the basis of the internet, this system connect different people in the form of a website or an app which requires enough penetratoin of smart phone. According to our research, smart phone isn't popular in Shaxi and most of people use mobile phone only for calling others. Of course, the mobile ternimal system is the future trend, but the P2P mode is hard to operate and be accepted in Shaxi in this phase.

5.1.3. Conclusion and design vision

Due to the reaseach in previous chapter and positioning. The Sharing transportation system in Shaxi should be open and make good use of any suitable existing resources. Moreover, the user could share both the car and route in order to meet particular situation in rural area.

"Tt's a platfrom where people could share the information where the users and drivers chould find each other easily, On the resources is gathering together to enhance the connection between different villages. Age, geography, economy will never be excuses that the entire transporation system in Shaxi is improved."

5.2 System setting

As we mentioned in the vision, better using of exiting resources makes system more feasible, local and effectiveness. This section study the possibility to transfrom the exisiting resources into the entire transporation network.

sharing vehicle to value more people making more income

Add transportation service to the stores along the street

5.3 setting service stops

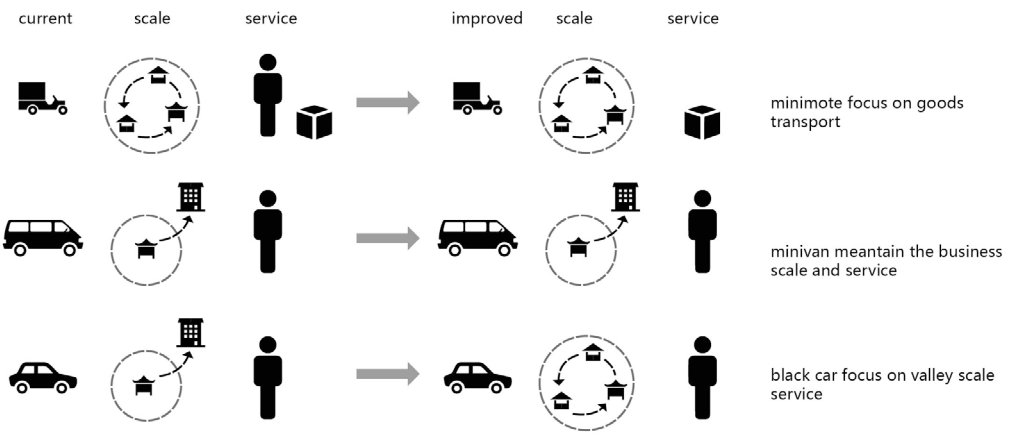
5.2.1. From conflict to win-win situation

The minivan assocation and black car are contradictive mutually because both supplier focus on Shaxi-Jianchuan route. If the business can be adjusted and extended, the divided market could make a balance between minivan association and black car. In fact the best market for the black car is the inside valley transportation, but as we discussed in chapter 4, only a few black car drivers know each other, the way they receive and share passenger information is weak. The efficiency of the operation and the uncertainty of the income force the black car driver to take risk. If the transport market inside valley can be excavated deeply, the strained relationship might be released.

On the other hand, the minimoto in Shaxi is facing a great quandary as well. According to relevant regulations, minimoto cann't carry passenger. The reason why minimoto drivers take risks to carry local people is also the inefficient operation. According to the survey, local peopel purchase minimoto to transport grains, construction materials and etc, the price of a minimoto is not cheap compare with the average income of Shaxi. In one family, the minimoto is always idle. What if several families could share one minimoto, in this way, the usage of the minimot could be enhanced. Further more, other business like express delivery can be extended business for minimoto drivers.

5.4 business range adjustment

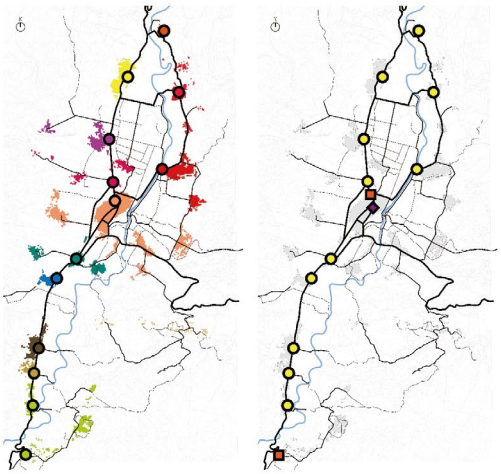
With the effective information exchange, the minivan, black car and minimoto driver could reconsider their business range and operation mode. The sharing transportation system provide a solution to share the market in a win-win situation instead of conflicts.



5.2.2. From separated facilities to systematic collaborators.

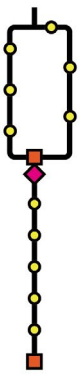
In most of time, drivers meet passengers by coincidence or experience. It's hard to generate a system if all the drivers and passengers are dispersed every place in Shaxi, even they could contact with each other, it's hard to find the location immediately. Thus, set up several service point in Shaxi is necessary.

Considering the current economic situation in Shaxi, building up an entire new stop system is improper. Fortunately, local stores along the main road could be a perfect collaborator to generate transport network. The owner could make part-time job to get extra income and offer transport information to both the drivers and passengers.



service spots and service range

spots property



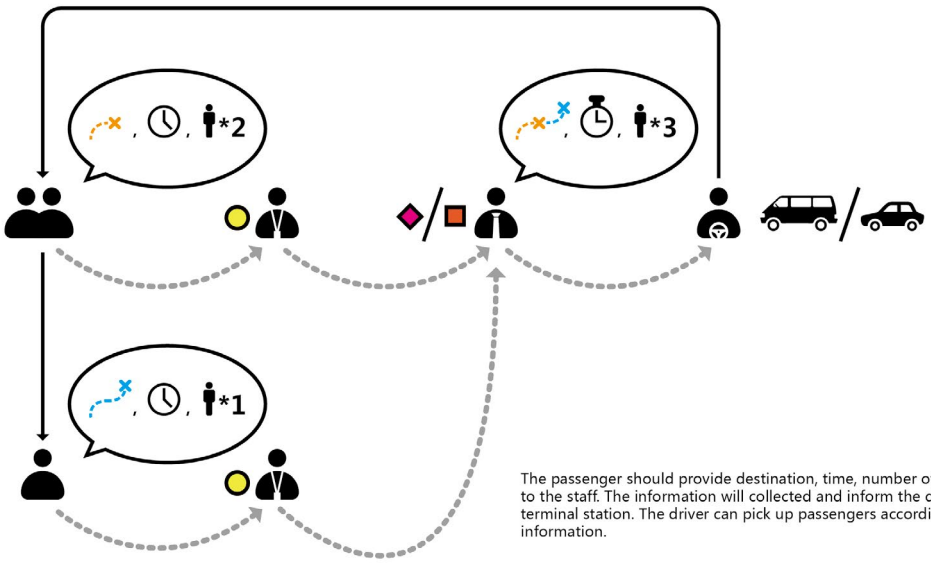
This is the abstract map of sharing transportation network.

stops only for passenger to get on and get off.

terminal station vehicle travel in the valley.

terminal station vehicle from ShaXi to JianChuan

According to the population density, vechicle ownership and average distance from basic facilities. Author locate several spots along the main road to create a sharing transportatoin system. The spots have different function serve the villagers in different range.



The passenger should provide destination, time, number of passenger to the staff. The information will collected and inform the driver at the terminal station. The driver can pick up passengers according to the information.

After several testing, the service stops can divided into three functions.

Passenger stop

There are 11 stops inside Shaxi valley. Local people could use any stops close to their village. The staffs in each stop could be the store owners who can make extra money by collecting information about passengers, destinations and delivering the information to the ternimal stations.

Inside-valley ternimal station

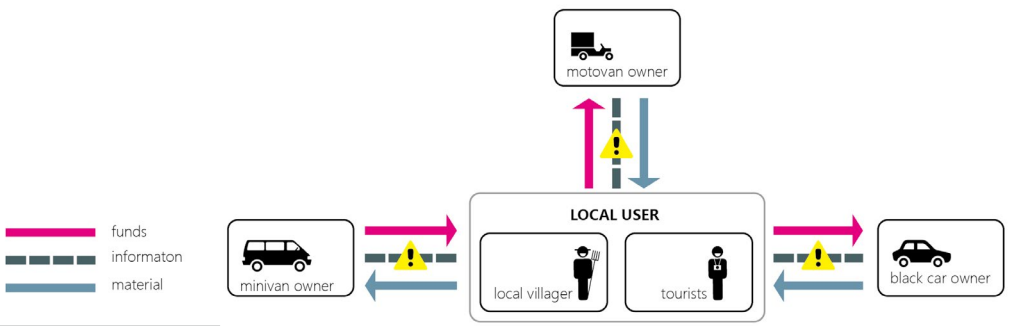
There are 2 ternimal stations, each station has a full-time staff whose duty is collecting information from different passenger stops and formulating suitable route for the driver. The black car driver could wait here and departure in queue.

Shaxi-Jianchuan ternimal station

The Shaxi-Jianchuan ternimal station is located in the existing place. Minivan association work on this route with a full-time staff to collect and deliver transportation information.

5.2.3. System map of stakeholder

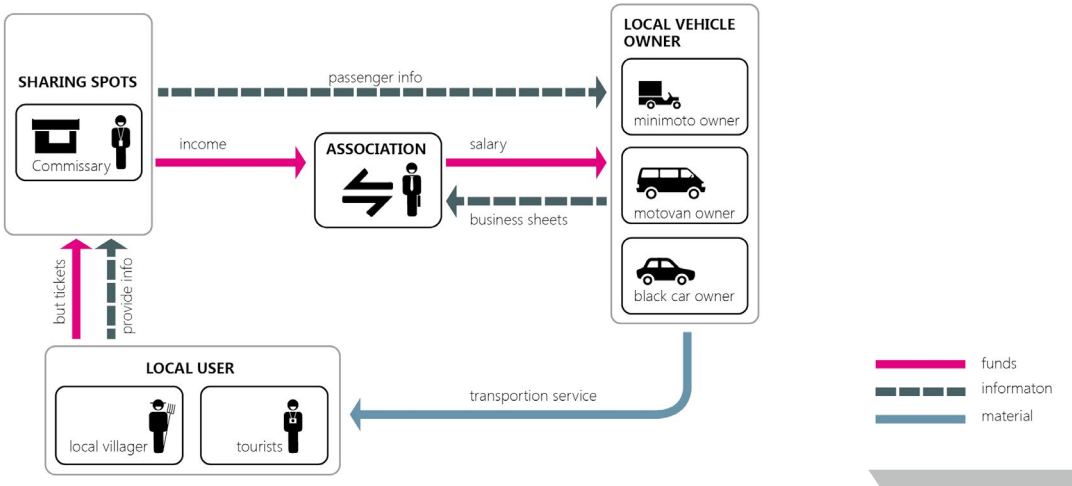
The existing service system is independent. According to the survey, only minivan association operate as an organization, other drivers prefer to wait passengers in specific place where frequent guests could find them. It's proper under the existing condition, but this solution limit the business range which cause the unstable income and inefficient operation. (See figure) There is no conncetion between passengers and there is no collaboration between suppliers. (See figure)



5.6 existing system map

If we integrate passengers' demand by collecting transport requirements from different passenger stop, the system can save more time and provide better experience for both local people and drivers. Part-time staff in each stop can get 200 rmb per month and the full-time staff can make 2000 rmb for

monthly salary. This part of cost is covered by the numbership fee from each drivers. Each driver interested in sharing transportation should provide related documents and sign the contract before they become the members, in addition, annual checking and insurance is necessary to guarantee the quality and safety of the service. (See figure) There is more specification during the operation in section 5.4.



5.7 improved system map

5.3 Frontstage system

In the previous section, the sharing transportation system integrates the local resources into small, open and connected components. This section will study differet concepts with prototyping and journeymap.
The frontstage system is the surface of the whole service, which has a direct interaction with the users. According to the contents, this secion discuss the basic strategy in original system and peak-time strategy in extended system.

5.3.1. Prototyping

The system is stimulated with a simple prototype consist of an abstract road network and severl pieces of paper which represent vehicles and users. Differet options and strategies is compared based on this method. In the following section, some main problem and solution is discussed.

What if each stops are able to send vehicles?

It's a chaos if each stop become ternimal station. Because none of the drivers have a priority to departure and the association can't share passengers from one stop to another. In this case, most of the stops can hardly have enough passengers and the information exchange stops. As a conclusion, On route two ternimal station is the principal of sharing transportation system. Based on that, the system will be more efficient if all the transport demand on one route could

gather to the only related ternimal station.

Why don't we set a ternimal station in the south of Shaxi?

First of all, the number of trips can't quarantee with the passengers from south part of Shaxi alone. In this case, both of the local peole have to wait more time. As a result, if this route itself is inevitable either, why don't we divided this system into two parts. Local people live in the north part of Shaxi could use the Shaxi-Jianchuan system directly and the local people live in the south part of Shaxi could use inside-valley system first.

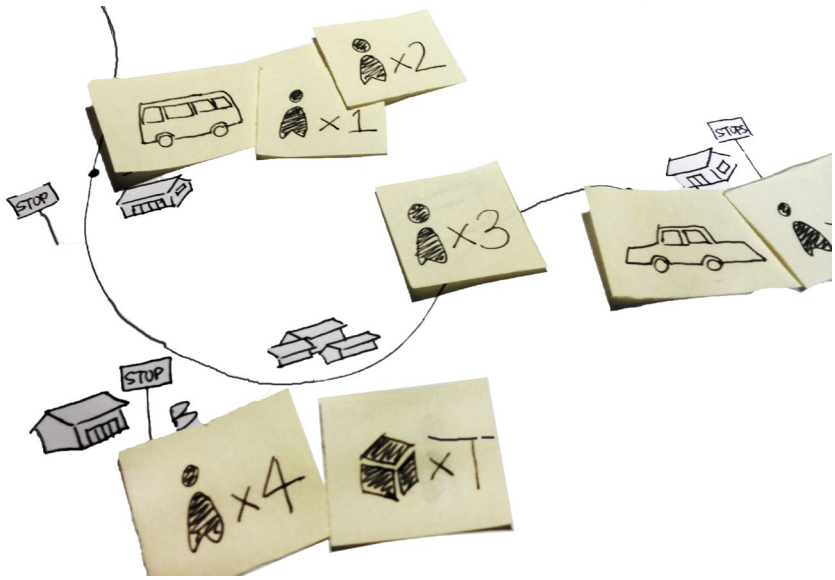
The ideal conditon of the system is that drivers in ternimal station could gather enough passengers in a short time. What's gonna happen if there is no passengers for a quite long time?

The shortage of passengers is because of the lack of trips while the purpose of sharing transportation system is increasing the efficiency and offering a convenient, sustainable transport solution. Number of trips is related with population, economy and industry. It's a great issue that sharing transportation can't solve.

What if passenger get off in the half-way, is there a possiblity to take another passenger?

First, if we take urban life as an example, if the community we live have enough facility to meet our requirements, we won't go to another community. So as Shaxi, since most of the villages have their own village adminstrations, stores and clinics, it's exceptional phenomenon that people live in southern village and travel to northern village. Second.According to our survey, the transport destination has an inseverable relationship with basic infrastructure.

Above all, Figure is the general process how the ternimal station staff work.

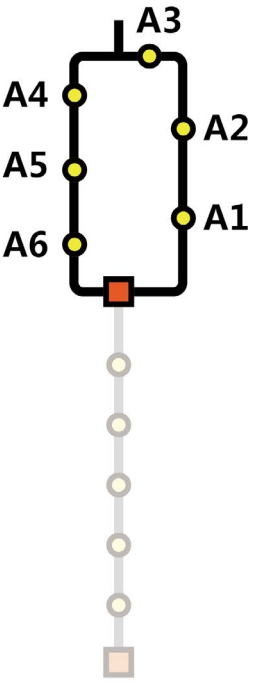


5.8 photo of prototyping

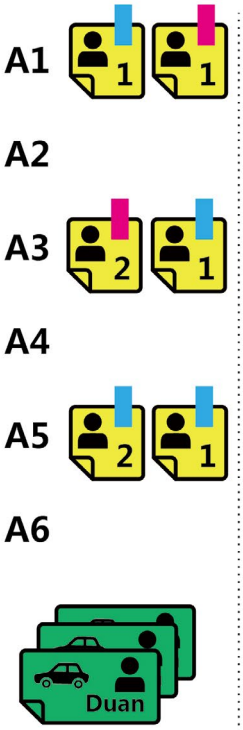
Recording number of passengers with yellow posit-it. Each terminal station have several post-its.

Colorful paper present the direction, ⬆ mains north and ⬇ mains south.

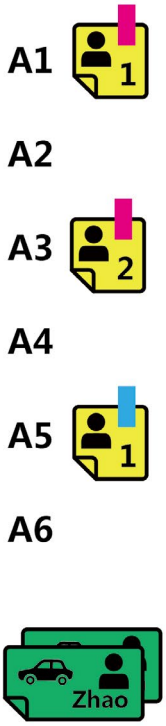
green post-it is the infomation for drivers.



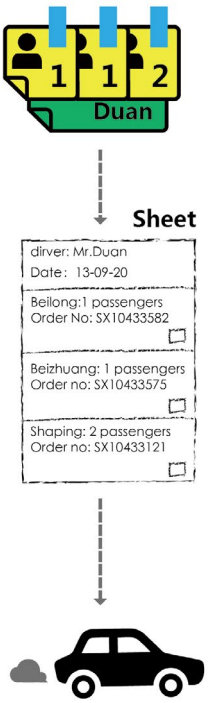
Take south part system as example. Each passenger stop has a code.



Record the information from each passenger stops.



Counting number of passengers with same color.



Filling the information on the sheet and provide it to next driver.

5.9 prototyping about system

5.3.2. System concept

This section discusses the main business of minivan, black car and minimoto. The concept of each system is generated from main problem.

MINIVAN, Shaxi-Jianchuan route

•note: There is a enormous number of trips to Jianchuan county, almost all of the local people depend on minivan association which is the only official organization operate Shaxi-Jianchuan route in Shaxi.

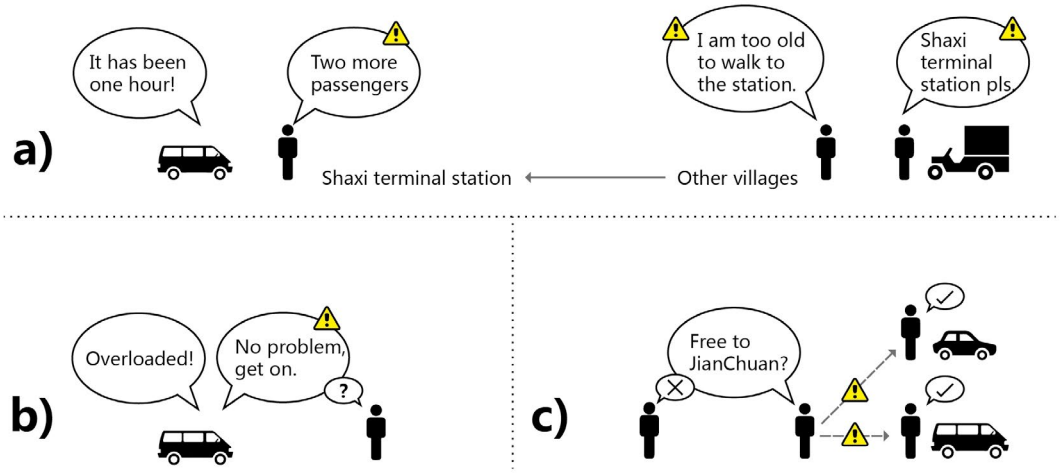
•business: Based on the main principal of using existing resource. Minivan association take the business of Shaxi-Jianchuan route.

•basic problem:

a) The minivan departure only if the minivan is full in order to guarantee the transport cost. Due to our interview,the average waiting time is about 2-3 hours. Meanwhile, local people live in surrounding village have to walk or take minimoto to Sideng in order to take minivan to Jianchuan.

b) Some of the passengers prefer to wait minivan along the Pingdian road and most of the drivers would like to take one or two more passengers because the weak consciousness. It's quite danger in mountain road.

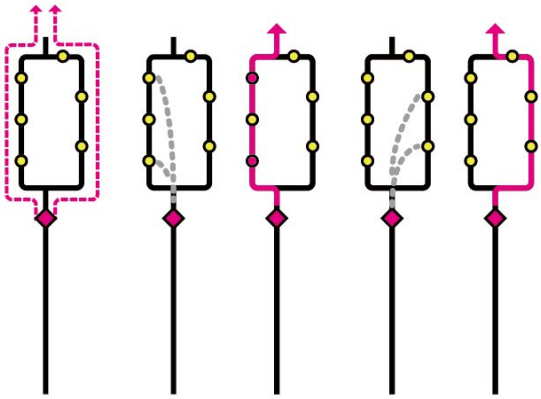
c) Local people always contact minivan drivers they know. If the driver isn't avaible that day, it's hard to find another one.

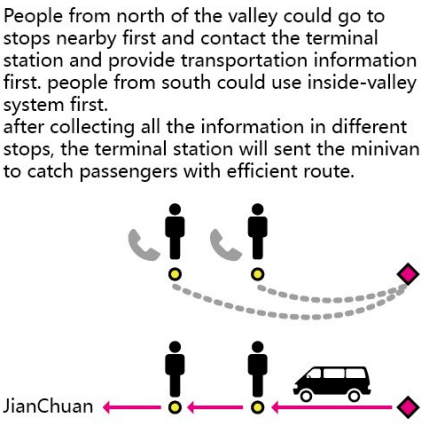


5.10 problems of existing minivan system

•core problem: Because of the information asymmetry, passengers always wait along the road while drivers wait somewhere else, the connection between the demand and supply is weak.

•basic concept: Local people live in the northern village could go to close passenger stops and the staff can deliver the information to the ternimal station . In addition, local people live in the southern part of Shaxi could use inside-valley system first. The return route will belong to Jianchuan county, but the system can form a systematic network with the Shaxi system because of the replicability.





5.11 strategy for minivan system

•improvement:

a) Shift information instead of people. Local people don't have to go to Sideng to take minivan, but they can go to the nearest stops and deliver information. This change improve the experience of elders' transportation.

b) More convenient for the passengers and more efficient for the drivers.

c) Ease the problem of overloading. Because the system provide the transport information so the half-way overload situation is forbidden.

BLACK CAR, inside-valley system

•note: according to the research, majority of the facilities including rural credit, grain market and etc located in Sideng village. In this case, the main feature of the inside-valley transportation is from different villages to Sideng. As we discussed in the previous section, it's barely a situation that local people need to travel from a northern village to a southern one.

•business: The existing black car system could be the foundation of the inside-valley system. Most of the local people have their own job, driving black car is just a way to make extra money. Sharing transportation system remain the flexibility for their business. Particularly, the black car have to provide driving recoard, car-condition check and insurance to participate the system.

•basic problem:

a) Black car drivers face the same embarrass as minivan drivers, which is the

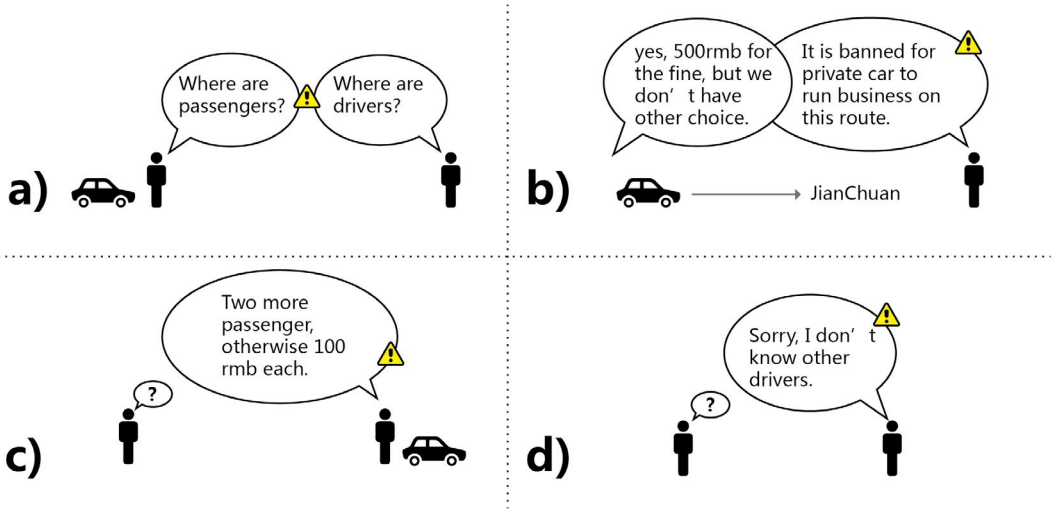
weak contact between the passengers and drivers.

b) The inefficy iency make the black car driver have to seize the market from minivan which generate the conflict between them.

5.13 problems of existing black car system

c) Local people have to gather enough passengers on their own when they make reservation.

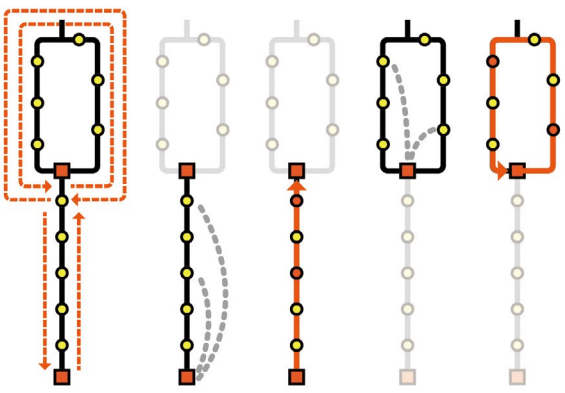
d) The servie range is even smaller than the minivan association because there is no organization or contact between most of black car drivers.



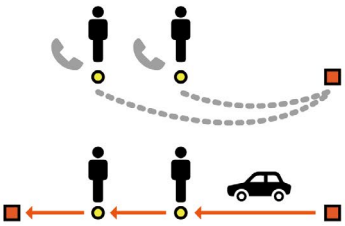
•core problem: Dividing market could help to reduce the conflict between black car and minivan association. But the initial condition is enough inside-valley business for black car.

5.12 strategy for black car system

•basic concept: Each route have two ternimal station to send vehicles and make a round trip. According to the geographic feature. We could set one ternimal station in the northern circle and another ternimal station to support the southern system.



The inside valley system seperate into north circle and south route. Terminal stations in north circle is the same one, the route seperated into clockwise and counterclockwise. South route have two terminal stations, the route seperated into south-north and north-south.
Service process is similar with SiDeng-JianChuan system



•improvement:

a) Ease the conflicts between the minivan association and black car.

b) Maintain the flexible business mode for the black car drivers, transform efficiency into more extra income.

c) Better experience and more guarantee on safety.

MINIMOTO, inside-valley system

•note: except the transportation for people, the commodity shipping is important as well in Shaxi. The characteristics mainly present the gathering from different villages to Sideng.

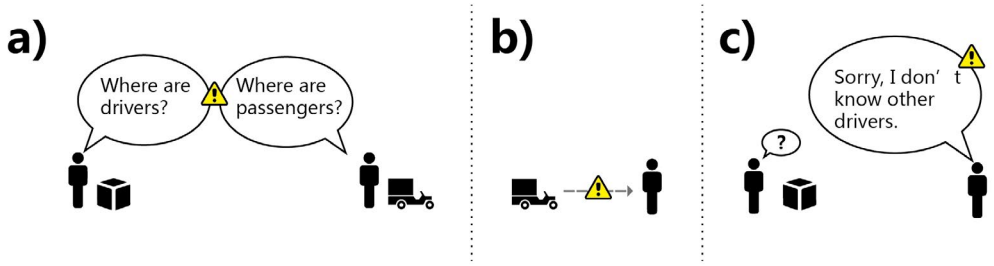
•business: Minimotos are sutiable for the shipping system in Shaxi because the flexibility. Like the black car, minimoto drivers should deliver related documents and materials to join the system.

•basic problem:

a) The operation efficiency is more weak than the black car. The commodity shipping demand is even random than the passengers.

b) According to the traffic regulation, the minimoto can't carry people while the minimoto plays a manned role in Shaxi.

c) The contact between minimoto drivers is weak as black car drivers.

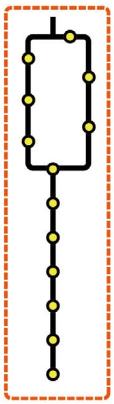


5.14 problems of existing minimoto system

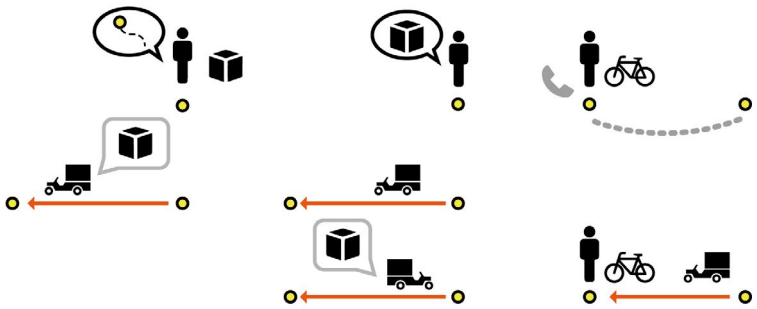
•core problem: How to collect information to improve the efficiency of minimoto service and how to extend more business for minimoto driver.

•basic concept: Local people need minimoto because they have too many things to carry, otherwise they will use their basket. On the other hand, the transport route is even random because village-village range also takes some proportion. According to our observation, minimoto transportation barely has possibility to share the route, each journey has an individual user and a particular route. Above all, each passenger stops could be a ternimal station for minivan in order to expend service range. Minimoto drivers can leave messages to the staffs or wait beside the stops.

In terms of business development, biking system in Shaxi could be a good example. According to our research in 2011, tourists have a strong willing to visit Shaxi by bike and the geographic of core area in Shaxi is quite suitable for biking. The problem is that most of the bike rent station is located in Sideng, all the tourists have to rent and return the bicycles in Sideng, which limit the transport range and the tourist pressure in Sideng becomes too heavy. If the minimoto system could collaborate with bike rent system. The passenger stops could be bike return points as well, the minimoto drivers can help tourist to return the bike and make some extra money.



For minimotos, the network is the same, the service is mainly for goods. People could ask to deliver or recive goods with the sharing transportation system.
You could go to stops nearby and ask the driver to provide service directly. Meanwhile you could ask the staff to record your requirements, the staff will inform the driver to deal with it by the way.



5.15 srategy for minimoto system

•improvement:

a) Ease the phenomenon of manned transportation. Similar to black car, minimoto drivers should sign the contract to obey the regulation.

b) Save more time and provide a convenient approach to improve the efficiency of the shipping system in Shaxi.

c) Some overlapping can bring some unexpected benefits.

5.3.3. System journeymap

Figure XX present the problem in the existing system: local people with same destination can't share the route because of the information asymmetry, native live in remote villags have to make their own way to Sideng in order to take minivan to Jianchan, the experience of passengers can't guarantee if the drivers departure with full capability, half-way overloading is unsafe, etc.

Figure XX is the improved system, the core strategy is sharing information of different stops, collecting demands and arranging vehicles in each ternimal station.

9:45 a.m.

Aunt Zhao has a package in Sideng, he need someone to take it for him.

Master Zhao is about to the market to sell his apples, he buy a ticket from the cloest stop.

10:00 a.m.

Master Yang is told by the terminal station staff to pick up Master Zhao and take a package for Aunt Zhao from Sideng.

10:15 a.m.

According to the information on the sheet, Master Yang meet Master Zhao, they drive to Sideng after confirming the information.

10:30 a.m.

Master Zhao go to Sideng by Master Yang's minimoto.

10:45 a.m.

According to athe information on the sheet, Master Yang find Aunt Zhao's package as well.

11:00 a.m.

Master Yang drive back to his village with his commodity and Aunt Zhao's package.

11:15 a.m.

Aunt Zhao pick up her package ontime.

Master Yang makes some extra money as well.

5.16 Journey map of improved shipping system

9:45 a.m.

Master Yang would like to take some passengers with the same route.

The duan brother provide in formation to the staff..

Master Li gets the work sheet from the terminal station staff.

10:00 a.m.

With the help from the staff, they meet in one stops.

10:15 a.m.

The duan brother takes much less time from their village to Sideng.

Master Li receives information from the staff that there are two passengers.

10:30 a.m.

Master Yang makes extra money during regular routine.

The minivan coulde departure right now.

10:45 a.m.

11:00 a.m.

11:15 a.m.

11:30 a.m.

materila flows

information flows

funds flows

surrounding villages in north side.

remote villages in north side.

JianChuan county

JianChuan terminal station

People live close to Sideng could walk to Sideng as well.

Master Zhang and his wife live far away from Sideng, we don't have to walk to Sideng but provide information to the stop staff.

Mr Huang purchases the ticket from the stop staff and he wait here for the minivan.

According to the information, Master Li picks up Master Zhang

Passengers have to provide tickets to the driver.

Master Li meets Mr Huang as well.

Mr Huang have to confirm the information in order to take the minivan.

5.3.4. Extended system concept

•note: based on the research, except the daily transportation, single day-transportation is obvious as well, such as market day, festival and attending school. The main feature is a group of routes from different villages to a common destination.

•business: Minivan association and black car are the main body of the extended system, they provide reservation and schedule in different situation for local people.

•basic problem:

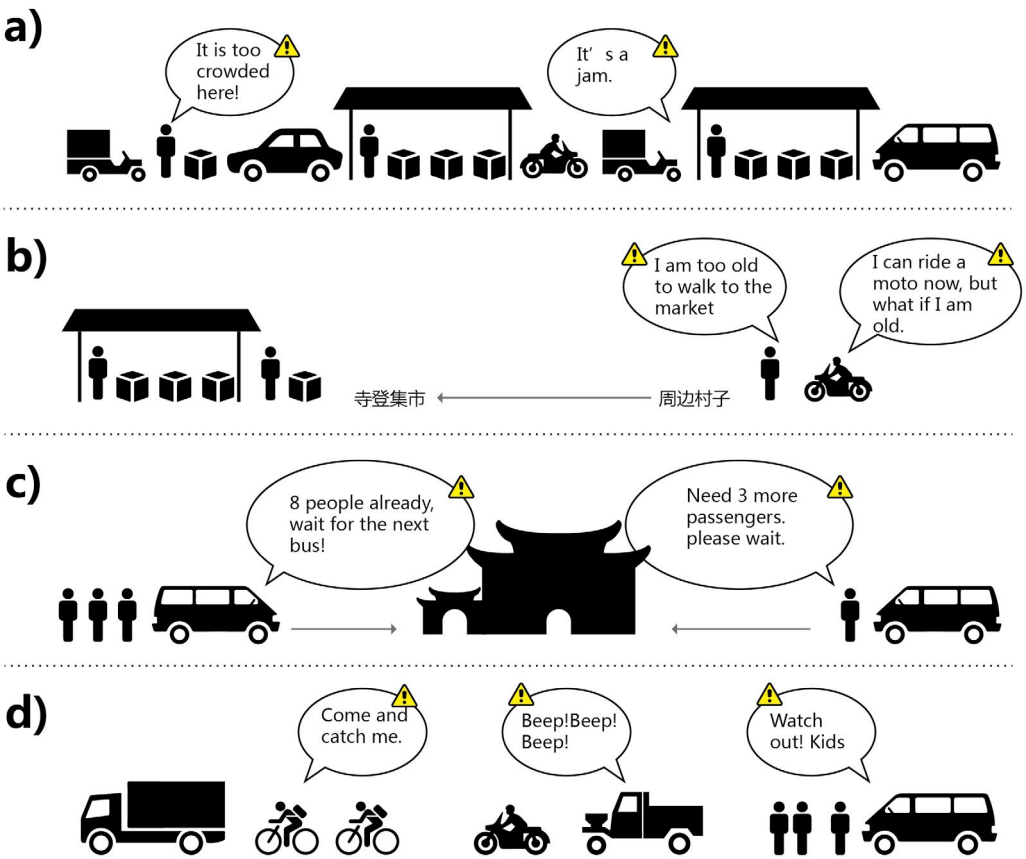
a) The main street in Sideng is quite crowded.

b) Local people go to the market with a basket to purchase grains, vegetables and other commodities. It's turns into a burden when they get old.

5.17 problems of existing minimoto system

c) The distribution of vehicles is unbalanced and the operation efficiency needs to improve.

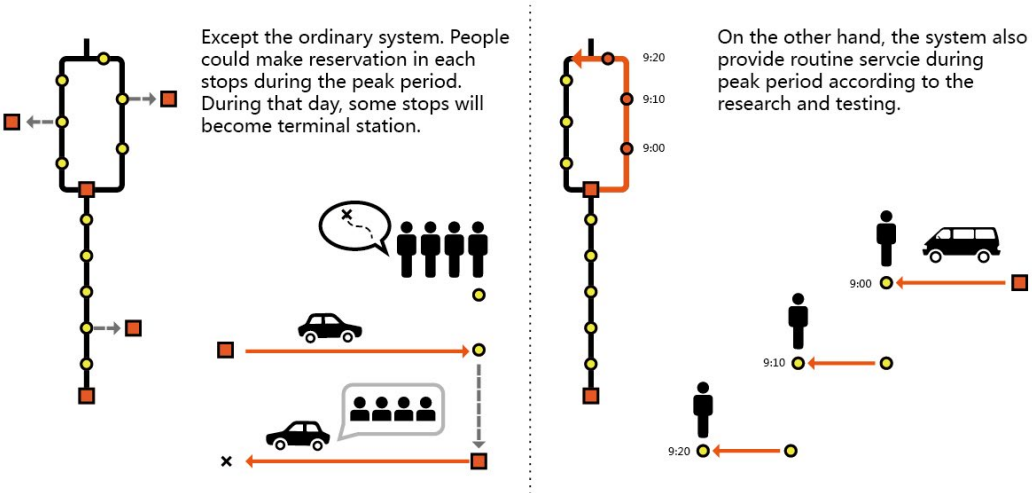
d) Students walk along the main road which is high-speed lane to school. The vehicles such as bus, trucks are great potential dangers for students.



•core problem: The inefficient operation and inconvenitent experience in peak period. In addition, the existing transport system pay few attention on the elders and students.

•basic concept:

The minivan association could send minivan by schedule on several specific routes which planned by both designer, local people, government and other related stakeholder. During the festival or or other moment with a great amount of transportation. The local people can make reservation in each passenger stops one day before and the sharing transportation can arrange resources in advance.



•improvement:

5.18 strategy for minimoto system

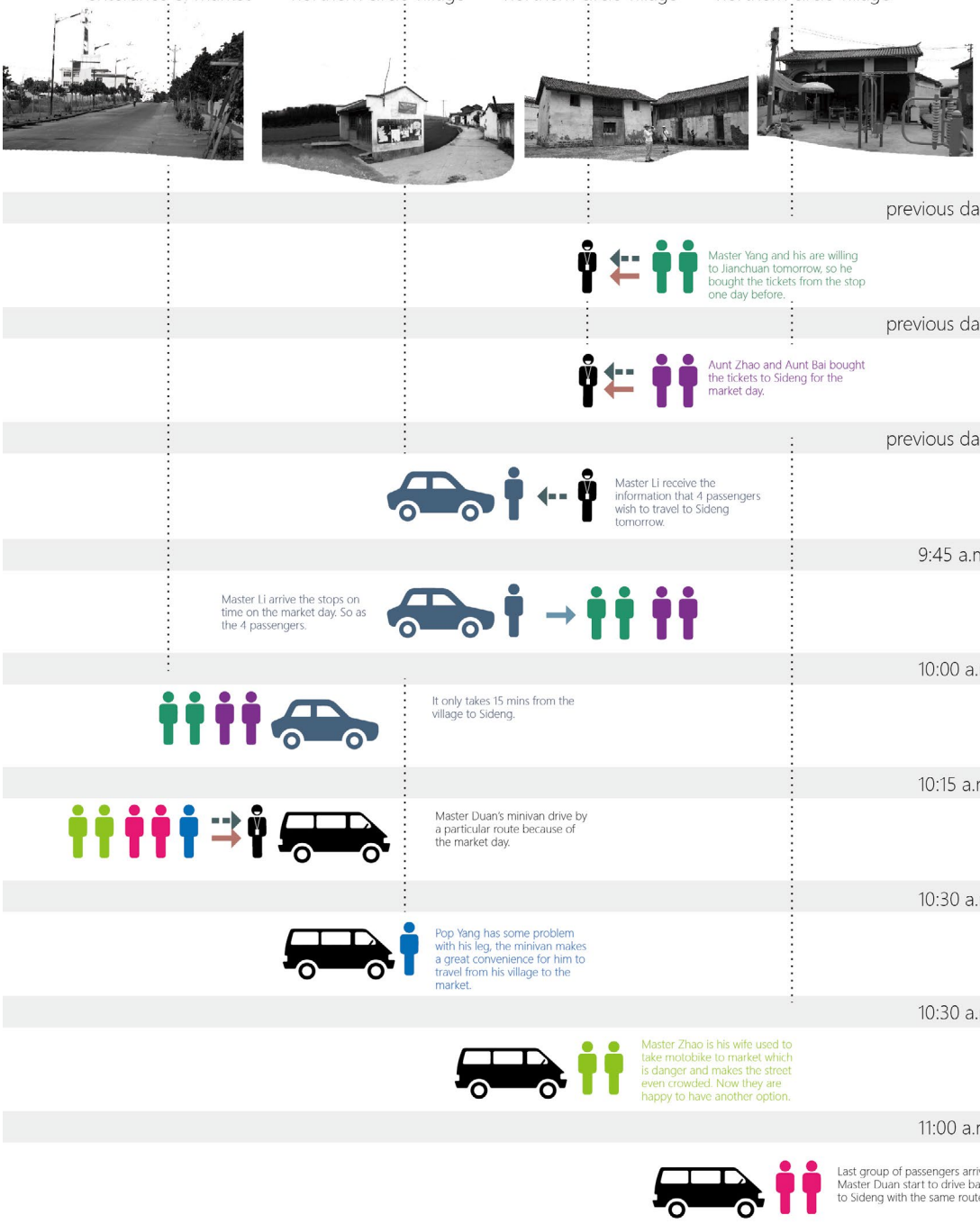
a) Better resources distribution and higher operation efficiency.

b) Improve the chaos during the peak period, reduce the usage of privage vehicles and encourage sharing transportation.

c) Pay more attention to the elders and students.

5.3.5. Extended system journeymap

The upper part of Figure XX present the reservation mode during peak period, local people could regist and buy the ticket first in advance. The association will arrange the route proporly to meet different requirement. In the under part, passengers take minivan by schedule on particular stops. Take market day as example, the peak period on market is 9:00-10:00 and 15:00-16:00, the minivan will departure by order and provide service along the north cirle and south line.



5.19 Journey map of improved shipping system

5.4 Backstage system

As we discussed in the previous chapter, the initiative is the foundation of service system design. But people aren't machine and even the machine can't remain in an ideal condtion. Therefore, the backstage system is the key fact to maintain the operation system. This section describes the pricing system, the credit system and blueprint of the sharing transportation system.

5.4.1. Pricing system

The existing pricing system is based on common rules which formed graduately by drivers, passengers and market envirnment. But this fuzzy can no longer fit the sharing transportation system because the princial is fair and information sharing.

The pricing system takes kilometer as basic unit to regular the price. The lowest departure number and maximum wait time is other two methods to balance the interests of passengers and drivers. If the vehicle can departure in time with full capability, every passenger pay the money by distance. The unit price can be adjusted due to different vechicle and transport range. If the vehicle isn't full, is the lowest departure number and maximum wait time is reached, in order to protect the right of passengers, the drivers must departure. The lowest passenger number for black car and minivan is 3 and 5, the maximum wait number is 1 hour. In some particular moment, passenger can negotiate with driver and decide the price by themselves, which improve the flexibility of the system.

5.4.2. Credit system

The uncertainty determines that "what if" and " how about" are inevitable. These expected situations will influence the credit of system and the initiative of users.

We discussed that there is a ticket for passenger and a sheet for driver in the front stage system. They are the key element for the credit system. The drivers take their sheet as the evidence record， the staff in terminal station will fill in the passenger information on the sheet after gathering information from other stops. On the other hand, the passengers have to buy the ticket and provide information first and the staff will fill in the driver information on the ticket. When they meet, passengers and drivers can comfirm identity for each other.

Some core problems about the credit system during protoyping are describes in the following paragraphs.

What happpens if there is another car also belongs to association pass by with availible seat?

In general situation, the system encourage passengers take the vehicle

contacted. No matter which vehicle the passenger take, there always be an empty seats.

What if the drivers break the regulation?

When the drivers departure from the ternimal station, the staff of stops will get contact. If the driver can't pick the passengers on time, passengers could refound or take next one with some discount. The evalutation will be affected and the driver will be expelled with too much negative credits.

5.4.3. Blueprint

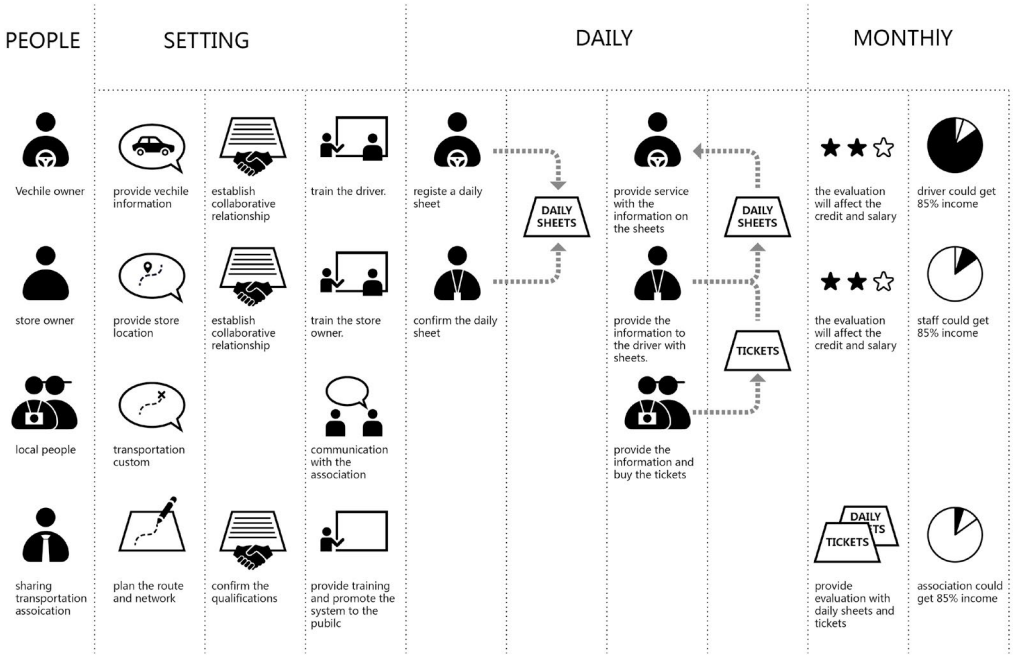
The blueprint describes how the system established and operated.

In the setting stage, different stakeholders like vehicle owner, store owner and passenger have to plan the route together and anyone who want to join the system should submit related documents. After that, the sharing transportation association start to train the drivers and staffs while promoting sharing transportation concept to the local people.

During the daily operation, as we mentioned, the key point is the information exchange and the crdit system based on ticket-sheet system.

5.20 blueprint of sharing transportation system

At the end of the month, drivers can get salaries by confirming tickets and sheets. The credit and service quality level is based on that as well.

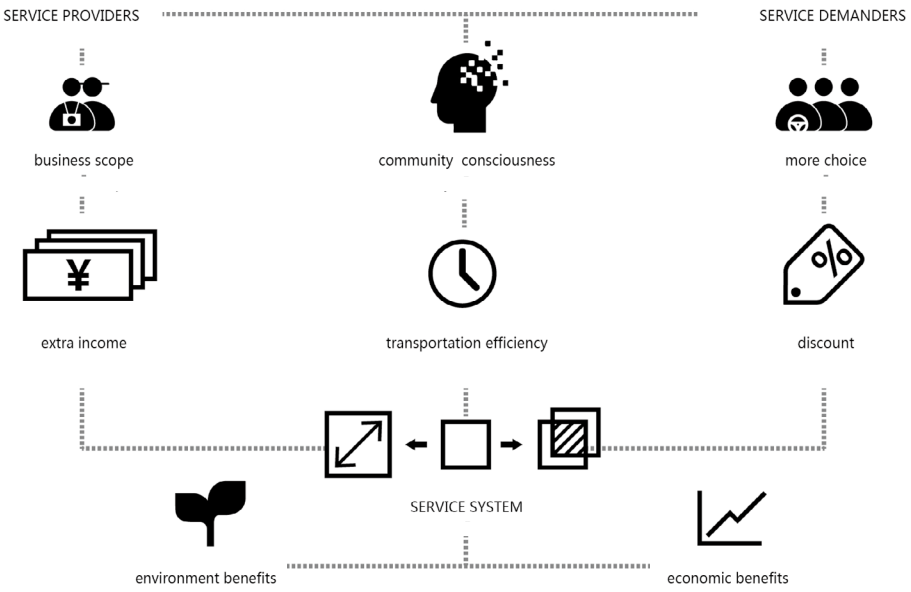


5.5 System simulation

The offering map describes the outcomes of the system, the persona and stroyboard is simulations with the experiences of six typical users.

5.5.1. Offering map

The left part of the offery dring map is the values for the passengers while the right part is for the drivers. The sharing transportation system provide values in different level. (See figure)



5.21 offering map of sharing transportation system

5.5.2. Persona

Persona is one of the service design tools which is common in the interaction design. This tool based on deep surveys, designer classify typical persona with similar characteristics and experience the whole journey in a empathic way and present in storyboards.

Based on the on-side survey, six persona are classified.

Duan
Male
45 years old
Minivan driver

Zhao
Male
34 years old
Private car driver

5.22 persona of sharing transportation system

MINIVAN DRIVER

Master Duan is about 45 years old, he has two sons, one of them work in the county, one of them is a student. He participated minivan association in 2003. About 7-8 years ago, the income is satisfied because there are not too many private vehicles in Shaxi. In recent year, more and more black cars occupy the market by pricing war, the cost of insurance and monthly check make official minivan drivers can hardly resist black cars. As a result, master duan wish the government take some action to strike the black cars.

BLACK CAR DRIVER

Master Zhao is 34 years old, he lives in Hongxing which is the farthest village in the mountain hill, the distance from Hongxing to Sideng is about 9 kilometers. In 2010, he bought a private car to improve the transport conditon for the family. In fact, he use it only a few times a week and he start to consider about some approach to make extra money. At first, he waited passenger along the Pingdian road, but it was hard to understand people's movements, then he found there are more people in Sideng and it was much more easy to find, so he started to wait outside of Shaxi terminal station and carry people from Shaxi to Jianchuan. When we ask why he didn't join the minivan association, he said that he was willing to, but the permission is hard to apply and the existing minivan drivers was monopolizing the market.

Yang
Male
50 years old
minimoto

Zhang
Female
35 years old
store owner

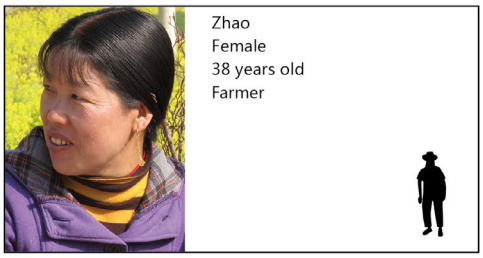
5.23 persona of sharing transportation system

MINIMOTO DRIVER

Master Yang is 50 years old, he is a farmer who has 6 arces. The initial purpose to buy the minimoto is shipping grains and vegetables. But he found that the minimoto are useless in the slack season so he began to ship some commodities for other people. One year age, he built a cover and added some seats on the minimoto and started carry people, he don't think it's danger.

STORE OWNER

Zhang is 35 years old, she is a free writer after she graduated from unviersity, she has been to a lot of place in China. In 2005, she fall in love with this peaceful place and rent a little store to sell beverages. During these years, Zhang learned to speak Bai langauge and got used to the local life style.



5.24 persona of sharing transportation system

LOCAL PEOPLE

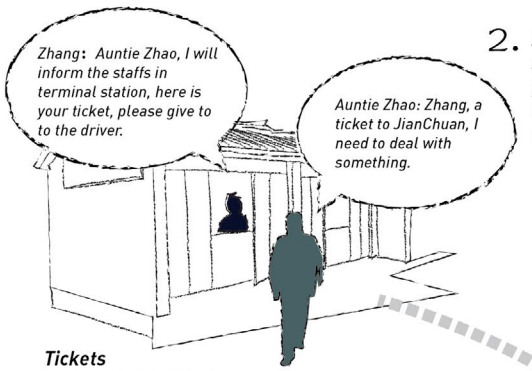
Aunt Zhao lives in Fushouchang and she is a typial farmer in Shaxi. Her husband work in the county. Every friday, she carries a basket and go to Sideng market to buy some food for the whole family. Her dauther works in Kunming, as a result, aunt Zhao have to take some money from her dauther monthly. Due to the short distance between her village to Sideng, she always walk to the market or the rural credit. Unfortunately, the trip become longer when she getting old.

TOURIST

Mr Huang is a manger in a foreign company, he likes to get close to the nature after work. He knows Shaxi by Longly Planet and he went to Shaxi last year during the national day.The memories was perfect except the transport experiece. He found that it's hard to find someone to share the route and the accessibility to surrounding villages and scenic spots are weak. The only apporach is renting a vehicle.

5.5.3. Storyboard

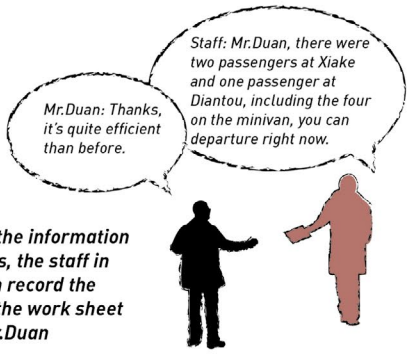
This section builds several storyboards based on previous personas in order to explains the whole system in a simple and vivid way.



Tickets

dirver: Mr.Duan Date: 13-09-20
Diantou:1 passengers Order number: SX10433582 Order time:9:40

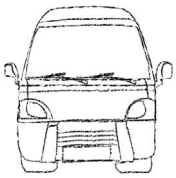
2. ***Zhang's living became rich Since Zhang participated sharing transportation association. she is pleased to get extra income while helping others. As usual, she offers sharing transportation service when she takes care of her store.***



3. ***After receiving the information from other stops, the staff in terminal station record the information on the work sheet and give it to Mr.Duan***

Sheets

dirver: Mr.Duan Date: 13-09-20
Diantou:1 passengers Order No: SX10433582 Order time:9:40 ☐
Xiake: 2 passengers Order no: SX10433575 Order time: 9:30 ☐
☐



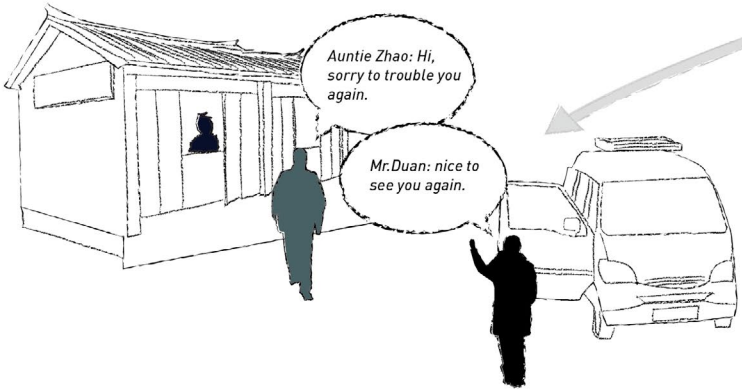
5. ***Then, Mr.Duan picks auntie Zhao at Diantou stops accoding to the information on the sheet.***

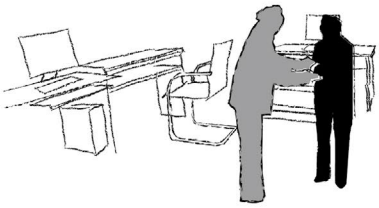
Tickets

dirver: Mr.Duan Date: 13-09-20
Xiake: 2 passengers Order no: SX10433575 Order time: 9:30

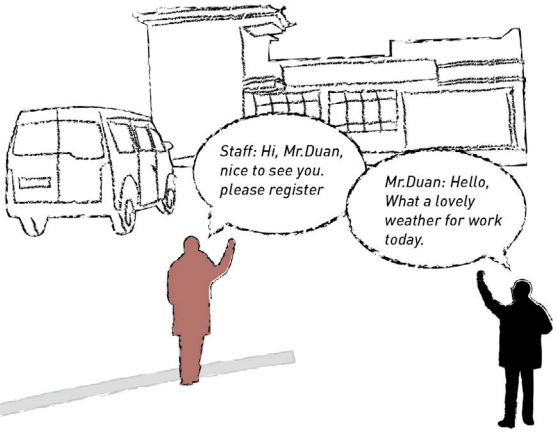
Sheets

dirver: Mr.Duan Date: 13-09-20
Diantou:1 passengers Order No: SX10433582 Order time:9:40 ☒
Xiake: 2 passengers Order no: SX10433575 Order time: 9:30 ☒
☐





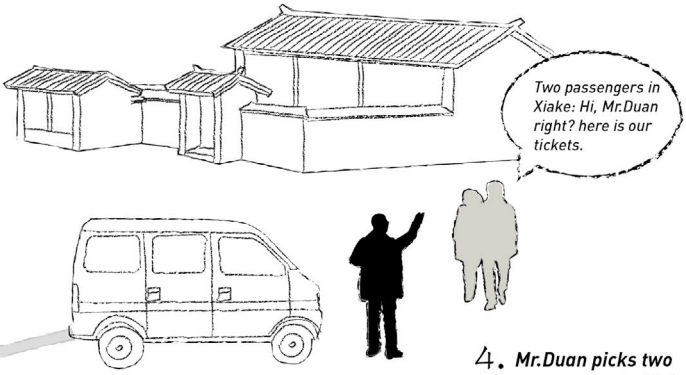
7. ***At the end of each month, Mr.Duan will get his evaluation and salary by confirming his work sheet and tickets at sharing transportation association.***



1. ***Mr.Duan is a minivan driver in sharing transportation association. He come to terminal station and start his work today.***

Sheets

dirver: Mr.Duan
Date: 13-09-20



Tickets

dirver: Mr.Duan
Date: 13-09-20
Xiake: 2 passengers
Order no: SX10433575
Order time: 9:30

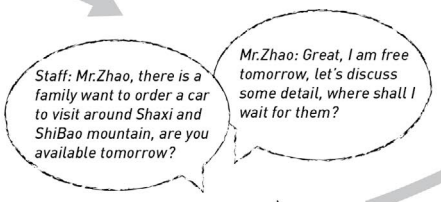
Sheets

dirver: Mr.Duan
Date: 13-09-20
Diantou:1 passengers
Order No: SX10433582
Order time:9:40
Xiake: 2 passengers
Order no: SX10433575
Order time: 9:30

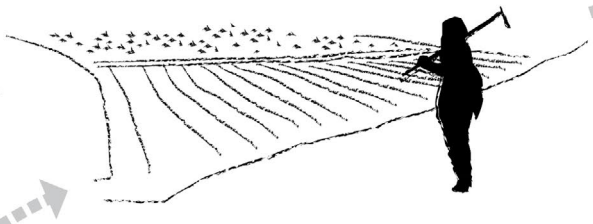
4. ***Mr.Duan picks two passengers in Xiake first, after comfirming the information on work sheet and their tickets, he invite them to get on the minivan.***

6. ***At last, Mr.Duan arrives JianChuan terminal station. It's faster than before and he has sometime to make extra drive.***

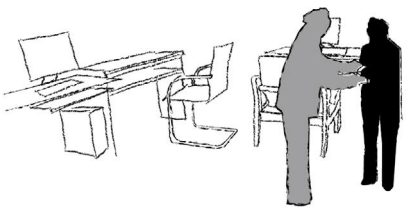
1. ***It says that people can make extra money with sharing transportation system. Mr.Zhao submit his driving lience and other material to join sharing transportation association.***



3. ***The same day, when Mr.Zhao is making regular field management, the staff of sharing transportation association ask he if he has some time to company a family to visit Shaxi and Shibao mountain tomorrow. Because of off-season, there are not too much work in the field, Mr.Zhao agreed.***



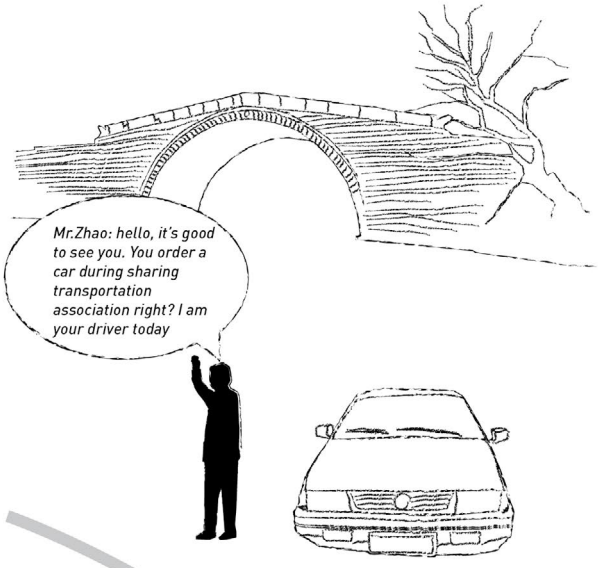
7. ***At the end of the day, Mr.Duan could get his evaluation and salary by confirming his work sheet and tickets at sharing transportation association.***



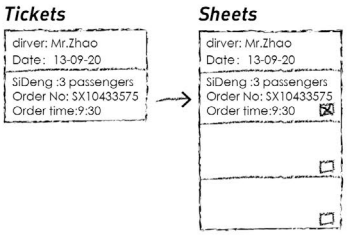
2. ***Mr.Huang takes his wife and child to Shaxi during his vacation. He plans to order a car to visit Shaxi and he wishs he could find a local driver who knows Shaxi's tradition, history and etc better. He comes to the sharing transportation service stops.***

dirver: Mr.Zhao
Date: 13-09-20

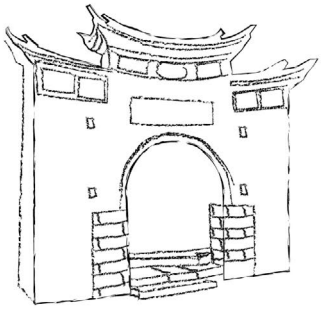
SiDeng :3 passengers
Order No: SX10433575
Order time:9:30



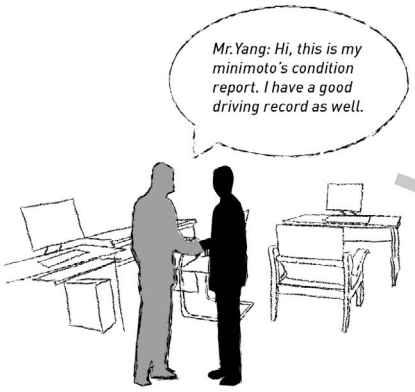
4. ***On the second day, Mr.Zhao picks his work sheet first at SiDeng station, then he find Mr.Huang's family in SiFang street. Today's plan is Shaxi in the morning and ShiBao mountain in the afternoon.***



5. ***In the afternoon, Mr.Zhao takes Mr.Huang's family to ShiBao mountain, they visit the grotto and temple. As a local people, Mr.Zhao tells a lot of local legend about Shaxi.***

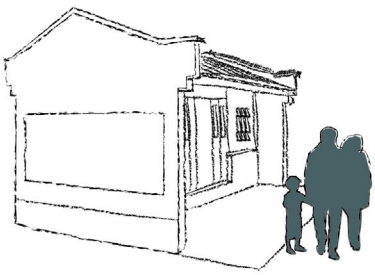


6. ***About sunset, Mr.Zhao drive Mr.Huang's family back to east gate. The journey is over.***

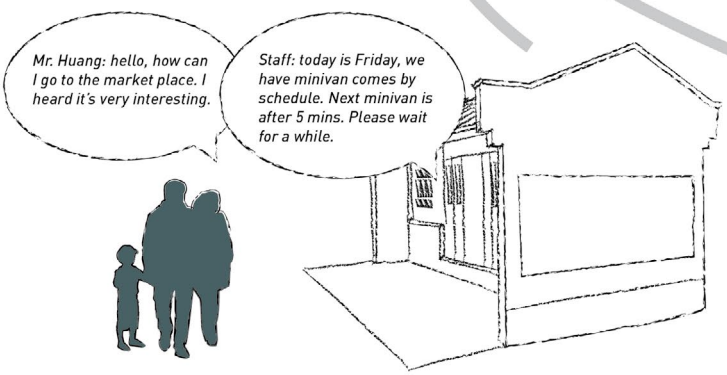


1. ***Mr.Yang bought a minimoto last year to transport grain. But he found his minimoto is idle most of time. He attempts to participate sharing transportation association to make extra money with his minimoto.***

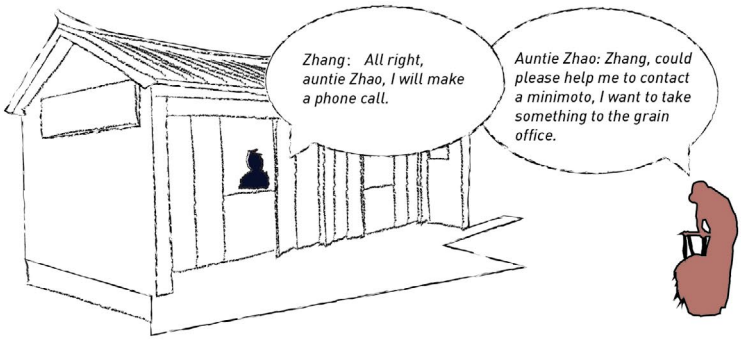
3. ***Mr.Yang is about to buy some food in the market. The staff of sharing transportation assocaition ask if he have time to pick up Auntie Zhao by the way.***



b. ***later, the minivan of sharing transportation association comes, Mr.Duan is on a shift today.***

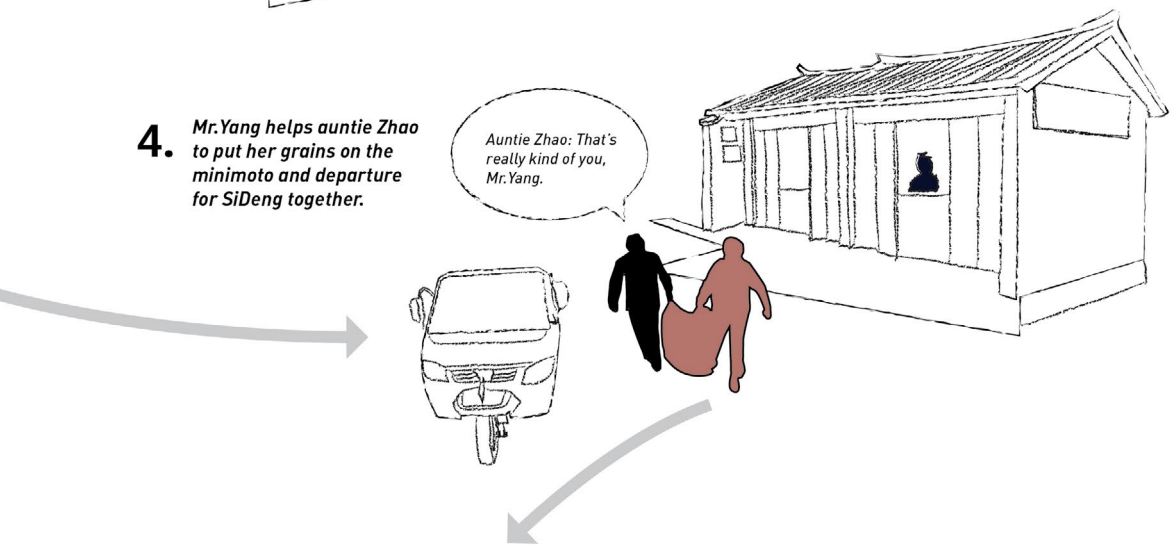


a. ***Mr.Huang's family plans to visit the market place, so they come to the nestest sharing transportation spots to get some information. They find that there is a schedule on market day, the minivan has a schedule and route.***

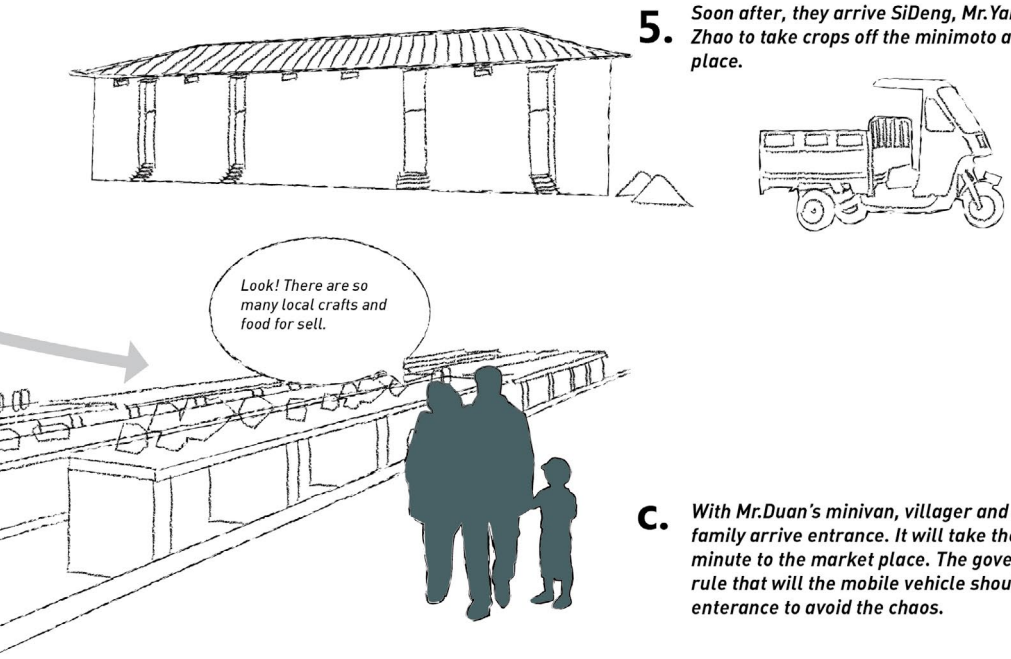


2. ***Today is market day, auntie Zhao want to take some crops she cultivated for sell to SiDeng's grains office. So she go to Diantou spot and ask Zhang to contact a minimoto for her.***

4. ***Mr.Yang helps auntie Zhao to put her grains on the minimoto and departure for SiDeng together.***



5. ***Soon after, they arrive SiDeng, Mr.Yang helps auntie Zhao to take crops off the minimoto and go to market place.***



C. ***With Mr.Duan's minivan, villager and Mr.Huang's family arrive entrance. It will take them about one minute to the market place. The goverment makes rule that will the mobile vehicle should stop at the enterance to avoid the chaos.***

5.6 Future scenarios

The sharing transportation system has create a complete network with passengers and terminal stations in Shaxi, this section discusses the possibility to overlop with other system such as express and emergency medical system. The proposals in the following paragrapch are conceptural idea.

5.6.1. express system

express system is the extended system of minimoto shipping system. According to our research, express company like Zhongtong and Yuantong set their service angency last year, so the local people can get their express in Shaxi directly instead of Jianchuan. But, the people live in the remote villages still have to make their own way to Sideng, maybe the "last kilo" problem can be solved by minimoto. People could ask the minimoto driver to pick up their express on purpose or by change with some extra money.

5.6.2. emergency medical system

Although the medical treatment improved a lot, but the emergency system is still a serious problem in rural. On one hand, it's hard to contact available driver in accdential moment, on the other hand, no matter the minivan or black car, noun of them has basic first aid apparantus.In most of time, the patient can get suitable treatment during 45 mins driving. Maybe the town clinic could collaborate with the sharing transportation association. Some minivans or black cars can be registed to be an ambulance with basic device. For that reason, the patients' family can contact with the driver on time and the patients can get some simple treatment on the way to Jianchuan.

5.6.3. tourist system

The rapid development of tourist industry in Shaxi is inevitable, the existing tourist mode is imbalance. If the main destination still focus on Sideng, too much pressure will destory the peacefull atmosphere in Shaxi. On the other hand, according to our research, most of the tourists are willing to visit surrounding village and scenic spots and the few transport option and poor experience limited their travel range. Sharing transporation association can provide specific route for tourists and train some drivers to be guider to provide futher service.

06 SUMMARY

The traditional model could establish transportation system efficiently, but requires high cost during the construction and operation.

6.1 Summary

When we face rural develoment, we are used to push to rebuild and ignore the memories and feelings worth to preserve, we are used to copy the existing urban mode and neglect the unaccustomed problems, we are used to seek for frequency and forget to understand the problem and explore suitable solution.

The most impressive expericen is the recoginze of design purpose. Not for surprised, not for odd, designer should stand on the site, think like the native, gather resources and make even little change with minimal inputs is encouraged.

Sharing transportation system is not only about better transportation experience, but also the awareness of sharing resources. Maybe, a huge amount of investiment make Shaxi change totaly, but it doesn't mean such a sustainable, low-carbon life style should be abandoned.

Product service system design tools can transform abstract system into graphics, diagrams and other readable results and provide designers with a comprehensive theoretical background to make further research and design. Unfortunately, in this case, the interdisciplinary background and a huge amount of research makes individual design or team can hardly to work by themselves. The on-site survey is ended at data collection and field interview, the prototype haven't been tested in Shaxi. But I hope the information of transport custom, feature of south west of rural China could offer some support to other researcher while the sharing transportation system can provide other designer some inspirtion. As a conclusion, Product service system design offers another option except "designing objects", design democreatization and dematerialized will become the trends in future.

REFERENCE

[1] Ferdinand Tönnies. Community and society[M].Xiaotong Fei.1887

[2] ShaoyuTong, YongsengChen. research on basin topography [M].2007.9

[3] Shaxi government.12th five year projects [R].2011.3

[4] PingZhang, WeiqiYao.Study about transportation feature in outside circle of Shanghai [C].Chinese urban traffic 2011 forum 25th collection of thesis 2011.11

[5] LinYan, YibingLi. Strategy about developed villages in south east of China——take example of WanQuan village in ZheJiang province [J].Traffic and Shipping 2011.7

[6] Kum Kum Dewan,Israr Ahmad. Carpooling: A Step To Reduce Congestion[J]. Advance online publication. 2007.2

[7] João Ferreira, Paulo Trigo and Porfírio Filipe. Collaborative Car Pooling System[J]. World Academy of Science, Engineering and Technology. 2009

[8] LimingTang, QihuaLiu. Neighborhood Carpool Practice——A Case Study on Community Carpool[J].Urban Transport of China .2010.11

[9] YiHuang. Study on sustainable transport behavior——take ChangSha as an example[D].Thesis of ZhongNan unviersity.2011.6

[10] KaiZhang, JunLu. The design of an intelligent carpool-matching system based on LBS-Cloud service[J].Embedded

Technology.2013.(8)
[11] TianFeng. dynamic calculation of carpool system based on Sufferage[J].Computer technology.2011(28)
[12] ZhouLiu. Individual freedom and government intervention [J].Productivity research.2009(24)
[13] YongNie.Insurance issues about carpool [J].Chinese insurance.2013(1)
[14] Institute of Sociology, Chinese Academy of Social Sciences. 2012 Chinese Academy of Social Sciences's blue paper of society[R].2011.12
[15] Ezio Manzini. Small, local, open and connected Design research topics in the age of networks and sustainability[OL]. DESIS Network.2010.7
[16] Marc Stickdorn. This is Service Design Thinking[M].2011
[17] Anna Meroni,Daniela Sangiorgi. Design for Service[M]
[18] 00:/.Compendium for the civic economy[M].2011.5

APPENDIX On spot observation

number	2014/1/13 regular day								2014/1/10 market day							
	9:00-10:00				16:00-17:00				9:00-10:00				16:00-17:00			
	to Jianchuan		to Qiaohou		to Jianchuan		to Qiaohou		to Jianchuan		to Qiaohou		to Jianchuan		to Qiaohou	
1 walk	1	20	20	17	17	23	23	15	15	192	192	170	170	130	130	154	154
2 bike	1.1	3	3	2	2	33	36	2	2	7	8	8	9	19	21	14	15
3 motobike	1.3	35	46	30	39	27	35	28	36	44	57	51	66	54	70	40	52
4 trucker	1.9	9	17	20	38	11	21	22	42	17	32	22	42	10	19	13	25
5 minimoto	2.8	5	14	4	11	5	14	4	11	20	56	28	78	26	73	10	28
6 lorry	2.7	6	16	7	19	5	14	5	14	10	27	23	62	25	68	8	22
7 car	3.3	13	43	14	46	15	50	16	53	13	43	19	63	13	43	20	66
8 minivan	7.4	10	74	13	96	14	104	19	141	15	111	20	148	22	163	24	178
9 bus	15.4	0	0	1	15	0	0	1	15	0	0	1	15	0	0	1	15
total		101	233	108	284	133	296	112	329	318	526	342	654	299	586	284	555

	a.m.		p.m.		day		a.m.		p.m.		day		increase
1 walk	37	37	38	38	75	75	362	362	284	284	646	646	761.33%
2 bike	5	6	35	39	40	44	15	17	33	36	48	53	20.00%
3 motobike	65	85	55	72	120	156	95	124	94	122	189	246	57.50%
4 trucker	29	55	33	63	62	118	39	74	23	44	62	118	0.00%
5 minimoto	9	25	9	25	18	50	48	134	36	101	84	235	366.67%
6 lorry	13	35	10	27	23	62	33	89	33	89	66	178	186.96%
7 car	27	89	31	102	58	191	32	106	33	109	65	215	12.07%
8 minivan	23	170	33	244	56	414	35	259	46	340	81	599	44.64%
9 bus	1	15	1	15	2	31	1	15	1	15	2	31	0.00%

	119	1023					699	1622			increse of non m	487.23%	increase of mob

propotion	1	2	3	4	5	6	7	8	9	18	19	20	number
1 walk													
2 bike	90%	10%											1.1
3 motobike	70%	30%											1.3
4 trucker	70%	20%						10%					1.9
5 minimoto	40%	20%			40%								2.8
6 lorry	50%	30%						20%					2.7
7 car	20%	20%	10%	10%	40%								3.3
8 minivan	10%							80%	10%				7.4
9 bus	20%									10%	60%	10%	15.4

APPENDIX Basic information from Shaxi government

	2012	area (km²)	population	populatin density	average income in 2006	average income in 2012	number of farmer	number of agricultural related	primary school student	junior middle school student	senior middle school student	number of trips	increase of average income
1	Sideng	3.65	2567	703.29	3078	7598	574	500	249	111	111	8392.29	146.85%
2	Dongnan	21.93	2366	107.89	1306	4595	547	2040	198	110	110	5597.2	251.84%
3	Aofeng	46.76	2298	49.14	1061.5	3850	518	1222	182	171	171	9319.46	262.69%
4	Beilong	14.64	1851	126.43	1040	4340	419	390	178	81	81	8505.2	317.31%
5	Shaping	11.11	1819	163.73	1109.6	4536	415	897	158	81	81	6086.51	308.80%
6	Hualong	17.57	1601	91.12	911.25	1801	414	440	201	87	70	4636.43	97.64%
7	Diantou	13.47	1555	115.44	1250	4549	341	805	123	71	71	5987.71	263.92%
8	Silian	10.44	1437	137.64	1237	4947	317	574	162	65	65	5511.08	299.92%
9	Xinan	25.26	1425	56.41	1158	1813	310	411	115	54	54	4394.24	56.56%
10	Dengta	13.66	1308	95.75	1214	4906	286	560	255	85	85	5618.89	304.12%
11	Changle	23.75	1234	51.96	1065.33	1911	286	681	108	68	68	4475.98	79.38%
12	Hongxing	2.56	924	360.94	1323	1999	219	313	41	33	33	2136.1	51.10%
	Total	204.8	20385	2059.751128	15753.68	46845	4646	8833	1970	1017	1000		
	average	17.06666667	1698.75	171.6459273	1312.806667	3903.75	387.1666667	736.0833333	164.1666667	84.75	83.33333333		

		Distance between village center to different facilities								
	2012	terminal station	market	committee	government	primary school	junior middle school	senior middle school	clinics	distance(km)
1	Sideng	0	0	0	0	0	0.3	0	0	0.04
2	Dongnan	2	2	0	2	0	2	2	0	1.25
3	Aofeng	1.5	1.5	1	1.5	1	0.5	1.5	0.5	1.13
4	Beilong	2	2	0	2	0	0	2	0	1.00
5	Shaping	2	2	0	2	0.5	2.5	2	0	1.38
6	Hualong	2.5	2.5	0.3	2.5	0.2	3	2.5	0.3	1.73
7	Diantou	3	3	0	3	0.5	0.5	1	0	1.38
8	Silian	3.5	3.5	0.4	3.5	0.4	3.5	14	0.3	3.64
9	Xinan	4	4	0	4	1	4	4	1	2.75
10	Dengta	3.5	3.5	0	3.5	1	3	3	0	2.19
11	Changle	1	1	0	1	0.6	1	1	0	0.70
12	Hongxing	9	9	1.5	9	0.5	9	9	1.5	6.06
	Total	25	25	1.7	25	5.2	20.3	33	2.1	17.1625
	average	2.083333333	2.083333333	0.141666667	2.083333333	0.433333333	1.691666667	2.75	0.175	

		Car, minivan		minimoto		trucker		motobike		ownership		ownership without motobike		increase of ownership
		2006	2012	2006	2012	2006	2012	2006	2012	2006	2012	2006	2012	
1	Sideng	30	28	7	10	12	12	24	27	73	77	49	50	2.00%
2	Dongnan	11	11	1	3	25	25	13	18	50	57	37	39	5.13%
3	Aofeng	9	20	2	7	2	13	11	124	24	164	13	40	52.00%
4	Beilong	12	22	10	22	5	12	12	55	39	111	27	56	51.79%
5	Shaping	5	14	1	2	10	9	31	38	47	63	16	25	36.00%
6	Hualong	19	21	5	6	6	1	7	8	37	36	30	28	-7.14%
7	Diantou	17	17	7	7	6	11	9	29	39	64	30	35	14.29%
8	Silian	3	3	2	2	2	2	16	16	23	23	7	7	0.00%
9	Xinan	5	18	12	8	15	15	28	28	60	69	32	41	21.95%
10	Dengta	7	15	4	8	5	5	9	20	25	48	16	28	42.86%
11	Changle	1	1	1	1	4	2	3	56	9	60	6	4	-50.00%
12	Hongxing	3	3	4	4	5	5	7	7	19	19	12	12	0.00%
	Total	81	134	48	67	60	75	133	381	322	657	189	276	
	average	6.75	11.16666667	4	5.583333333	5	6.25	11.08333333	31.75	26.83333333	54.75	15.75	23	

APPENDIX List of transportation features

			features	number of user	weight	month	day	year	yearly number of trips	daily number of trips	starting point	destination	average distance
agricultural related	1	purchasing seeds	harvest season	10031	100.31	4	122	2	200.62	1.64442623	home	grain adminstration	2-3.5KM
purchasing	2	daily management	slack season	10031	100.31	8	210	150	15046.5	71.65	home	field	1-2KM
shipping	3	harvesting	harvest season	10031	100.31	4	122	10	1003.1	8.222131148	field	home	1-2KM
daily affairs	4	grain adminstration	harvest season	10031	100.31	4	122	10	1003.1	8.222131148	home	grain adminstration	2-3.5KM
social activities	5	shopping	yearly	14001	140.01	12	365	200	28002	76.71780822	home	village store	<1KM
student transportation	6	marketing	yearly	14001	140.01	12	52	50	7000.5	134.625	home	Sideng street	2-3.5KM
tourist transportation	7	Sideng	yearly	14001	140.01	12	365	35	4900.35	13.42561644	home	Sideng street	2-3.5KM
	8	Jianchuan	yearly	14001	140.01	12	365	60	8400.6	23.01534247	home	Shaxi terminal station	2-3.5KM
	12	express	slack season	2137	21.37	8	210	1	21.37	0.101761905	home	Sideng street	2-3.5KM
	13	shipping	yearly	20	0.2	12	365	30	6	0.016438356	home	construction site	2-3.5KM
	14	village affairs	yearly	800	8	12	365	80	640	1.753424658	home	village committee	<1KM
	15	town affairs	yearly	500	5	12	365	60	300	0.821917808	home	town government	
	16	county affairs	yearly	500	5	12	365	40	200	0.547945205	home	Shaxi terminal station	2-3.5KM
	17	visiting	yearly	23335	233.35	12	365	50	11667.5	31.96575342	home	villages	1-2KM
	18	prince festival	6th-8th Feb	20000	200	1	3	1	200	66.66666667	home	Sideng temple	2-3.5KM
	19	torch festival	25th Jun	23335	233.35	1	1	1	233.35	233.35	home	village plaza	<1KM
	20	ShiBao festival	27th Jul-1st Aug	3166	31.66	1	6	1	31.66	5.276666667	home	Shibao mountain	
	21	primary school	yearly	2193	21.93	11	260	480	10526.4	40.48615385	home	village primary school	<1KM
	22	junior middle school	yearly	1142	11.42	11	260	480	5481.6	21.08307692	home	Shaxi middle school	2-3.5KM
	23	senior middle school	yearly	1125	11.25	11	104	96	1080	10.38461538	home	Shaxi terminal station	2-3.5KM
	26	Mapingguan	tourist season	20	0.2	4	120	1	0.2	0.001666667	Sideng	Mapingguan	>9KM
	27	Huacong	tourist season	50	0.5	4	120	2	1	0.008333333	Sideng	Huacong	>9KM
	28	Shibao mountain	tourist season	23000	230	4	120	1	230	1.916666667	Sideng	Shibao mountain	
	29	Bailong lake	tourist season	25000	250	4	120	1	250	2.083333333	Sideng	Bailong lake	3.5-5KM
	30	villages	tourist season	10000	10	4	120	1	10	0.083333333	Sideng	Sifang street	2-3.5KM
total									96435.85	754.0702098			
average									3214.528333	25.13567366			

APPENDIX Aerial map of Shaxi