

DIDI Mobile Transportation Platform



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1.Introduction and Background

Based on the recent series of online car-hailing adverse events occurred in China (female passenger was molested, raped, murdered by drivers). We will work through the DIDI, which the largest mobile transportation platform in China (Like Uber)

DIDI is a mobile phone application based on the sharing economy that can be used to reserve or use a vehicle at a certain time. It provides taxi, private cars and hitch services and works with a number of third-party payment providers, allowing users to easily take a taxi and pay on their mobile phones. As of 2018, the number of users traveling to 550 million people is the world's largest travel service platform.

As for this project, our ultimate goal is to control and reduce the risks from various places to improve the company's reputation, expand the customer base, reduce accidents and improve the company's revenue as well as customer satisfaction and safety. We recognize that to achieve these goals, we must start from multiple perspectives. Analyze the sources of risk, measuring and controlling them. For example, the impact of each risk event on the company and the reasons for it. As aspiring project managers, We will use this project to help Didi analyze and control risk and help the company to develop better in the future.

2. Project Structure

2.1. Participants and Roles

There are several people with critical roles within this project. We identify critical roles that will help us evaluating risks and controls and assign different parts of the sources and events based on the participant's position and level of involvement in the project.

Figure 1: Participants

Email Address	Participant Name	Permission
ceo@gwu.edu	Chief Engineering Officer	Evaluator
cfo@gwu.edu	Chief Finance Officer	Evaluator
hjin01@gwu.edu	Hongjun Jin	Evaluator
forman@gwu.edu	Professor Forman	Project Manager
jade_shiqy@gwu.edu	Qingyu Shi	Project Manager
rdastan7@gwu.edu	Reza Dastan	Evaluator
sm@gwu.edu	System Manager	Evaluator
yzhang96@gwu.edu	Yi Zhang	Project Manager

2.2. Identifying Risk Events

We use the Expert Choice Riskion software to structure our risk model and firstly we identified ten risk events that could impact DIDI through brainstorming based on our investigations on the overall project. The frequency of these ten risk events is relatively high, especially on china, and its impact is vital to the company

Figure 2: Events

Events

Cancellation of order by drivers

Harassing phones

Impoliteness of drivers

Lost items

Murder case

Personal information disclosure

Rape case

Robbery

Terrible interior environment

Traffic accident

Below is a brief description of each event:

1.Cancellation of order by drivers: Some drivers would cancel the orders without reasonable excuses and charge customers for fees then. The event of cancellation for orders will be an issue if the driver cancelled over 20% of his overall orders.

2.Harassing phones: Unwanted phone received from strangers.If more than 100 passengers receive harassing calls per day, this will affect the customer's loyalty to the company and will also reduce the company's reputation.

3.Impoliteness of drivers: Some of the drivers would have impolite behaviours towards passengers. If one single customer encounters such a driver more than 10 times, this will seriously damage the passenger ride experience.

4.Lost items: It would be hard to retrieve lost items on taxis or carpools. Once such a thing happens 10 times per week, the customer will worry about the driver's integrity and thus reduce the company's reputation.

5.Murder case: Murder cases(by drivers or by customers) happened more than once per year will catch more attention of the public. Once it happens, it will cause very bad public opinion. Passengers are worried about their personal safety, and even fear of using DIDI. Seriously reduce the company's reputation and the number of customers.

6.Personal information disclosure: The disclosure of the provided information of more than 20% of all passengers of the company, such as name, phone number, id number, photos.etc.

7.Rape case: Female passengers could be raped by drivers and if rape cases happened more than once a year, that would be a serious situation with bad social influence.

8.Robbery: The crime of taking or attempting to take anything of any value by force. Once this happens, especially when it happens more frequently than conventional taxis, passengers are concerned about their personal safety and property safety. The event will be reported by the media and thus leading to the lost of reputation and potential customer base of the company.

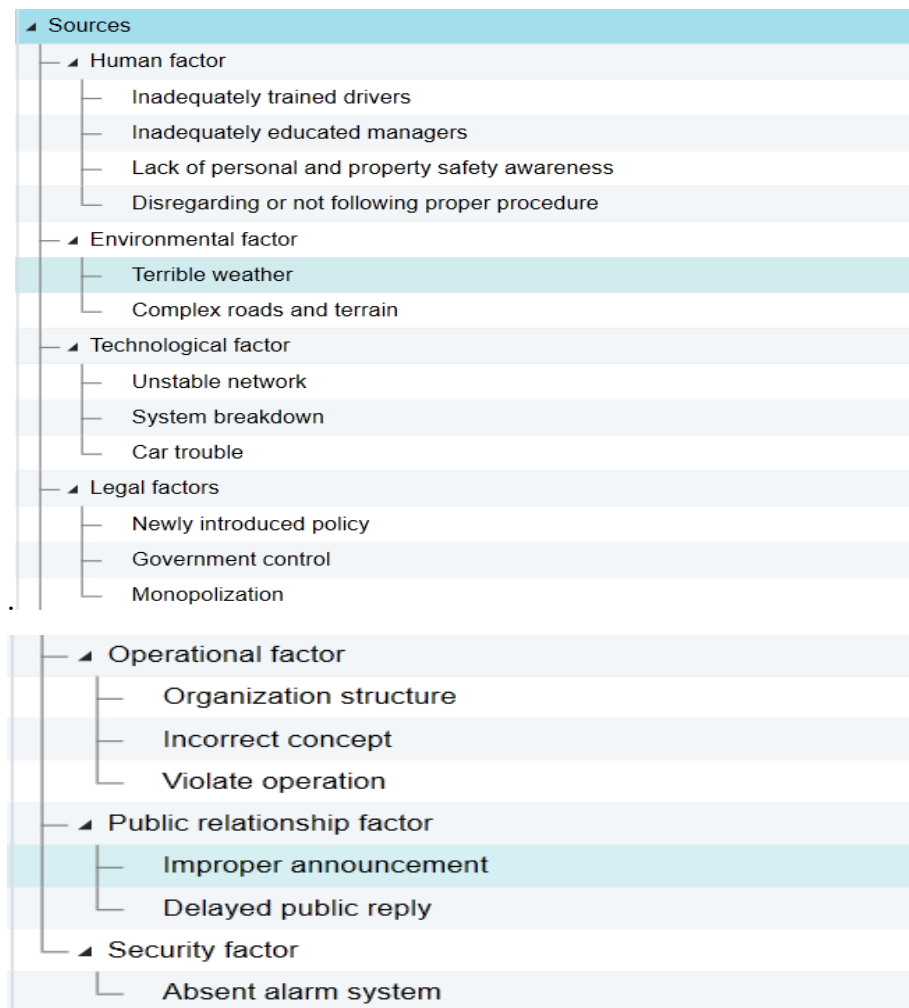
9.Terrible interior environment: The interior environment of some vehicles is disgusting, leading passengers to resent. When more than 20% of passengers encounter such a situation, the company's reputation will be damaged.

10.Traffic accident: The risk of collision could result from speed control, driving skill and alcohol or drugs matters and vehicle collisions lead to death and disability as well as financial costs to both society and the individuals involved.

2.3.Identifying Sources

After we identified the risk events, we began to explore potential sources that could contribute to the occurrence of the risk events. We believe these factors are important reasons for these risk events. As far as our project is concerned, we think these seven factors have the most important impact for the company's better development and better customer experience.They are Human factor, Environmental factor, Technological factor, Legal factor, Operational factor, Public relationship factor and Security factor.

Figure 3: Sources



2.4. Identifying Objectives

As for this part, just as we mentioned before, our ultimate goal is to increase revenues by increasing reputation and expanding our customer base. In order to achieve these goals, we need to start from the customer's point of view. For example, increasing security and improving the ride experience. Second, rectify the company's internal environment and improve the quality of its employees are also important for this project. We know that a good corporate environment and purpose can guide the company on the right path. So we have classified some objectives which were grouped into 3 categories based on their root source:

Figure 4: Objectives

▲ Objectives

— ▲ Company

- Increased income
- Enlarged audience base
- Positive public opinions
- Improved customer satisfaction
- Enhanced company reputation
- More efficient network
- Reduced car accidents

— ▲ Driver

- Personal security
- Driver qualification
- Good quality cars
- Driver satisfaction

— ▲ Customer

- Personal security
- Property security
- Better car experience
- More efficient rides

- More comfortable car interior

3. Events and Source Mapping

Once the risk events, potential sources and organizational objectives were identified, the team began to associate the risk event with the sources that may contribute to its occurrence and the impact that the risk event may have on the objectives. We develop the vulnerability grid to show the connection between risk events and sources and the consequences grid to depict the impact of each event towards specific objectives. Some of the events come from more than one source and will influence more than one objectives.

3.1 Vulnerability Gird

Figure 5: Vulnerability Gird

		Sources																	
		Human factor				Environmental		Technological factor			Legal factors		Operational factor			Public relations		Security	
		<input checked="" type="checkbox"/> Inadequately trained	<input type="checkbox"/> Inadequately educated	<input type="checkbox"/> Lack of personal responsibility	<input type="checkbox"/> Disregarding or neglecting safety	<input type="checkbox"/> Terrible weather	<input type="checkbox"/> Complex roads and traffic	<input type="checkbox"/> Unstable network	<input type="checkbox"/> System breakdown	<input type="checkbox"/> Car trouble	<input type="checkbox"/> Newly introduced	<input type="checkbox"/> Government control	<input type="checkbox"/> Monopolization	<input type="checkbox"/> Organization structure	<input type="checkbox"/> Incorrect concept	<input type="checkbox"/> Violate operation	<input type="checkbox"/> Improper announcement	<input type="checkbox"/> Delayed public response	<input type="checkbox"/> Absent alarm system
Events		<input checked="" type="checkbox"/> Cancellation of order by drivers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/> Harassing phones	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/> Impoliteness of drivers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/> Lost items	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/> Murder case	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		<input type="checkbox"/> Personal information disclosure	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/> Rape case	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		<input type="checkbox"/> Robbery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		<input type="checkbox"/> Terrible interior environment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/> Traffic accident	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.2. Consequences Gird

Figure 6: Consequences Gird

Events	Objectives/Consequences															
	Company							Driver				Customer				
	Increased income	Enlarged audience	Positive public opinion	Improved customer service	Enhanced company image	More efficient network	Reduced car accidents	Personal security	Driver qualification	Good quality cars	Driver satisfaction	Personal security	Property security	Better car experience	More efficient ride	More comfortable ride
- Cancellation of order by customer	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
- Harassing phones	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
- Impoliteness of drivers	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Lost items	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Murder case	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Personal information disclosure	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Rape case	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Robbery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
- Terrible interior environment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
- Traffic accident	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

4. Risk Measurement Methods

We used the Expert Choice Riskion software to determine the appropriate measurement to utilize for our project's objectives. Rating scale (absolute measurement) and pairwise comparison (relative measurement) are used for both the measurement of the likelihood of event and the impact of event. Pairwise comparison is to derive ratio scale likelihoods for the relative importance of each source with each other within its assigned category. As for absolute measurement, we believe the most intuitive and effective method is rating scale. Because we can collect data by searching the Internet, reading news and trying to recognize by many ways, and the result is often accurate and constructively helpful to our projects. On the other hand, for the relative measurement, we agree to use pairwise comparison. Because it is easy to let us know the order of importance of each event and factor. It also gives us a clear understanding of their impact on the company. Each participant was then asked to take a detailed survey with questions related to their expertise. Here is the example of pairwise comparison and rating scales.

4.1.Rating scale

Figure 7: Sample of rating scale

Given **Inadequately trained drivers**, rate the likelihood of the following Events

☒ Cancellation of order by drivers ☒ Inadequately trained drivers ☒ Cancellation of ord... given Inadequately traine... ☒ Scale description

Some drivers would cancel the orders without reasonable excuses and charge customers for fees then.
Time Frame: One time per week

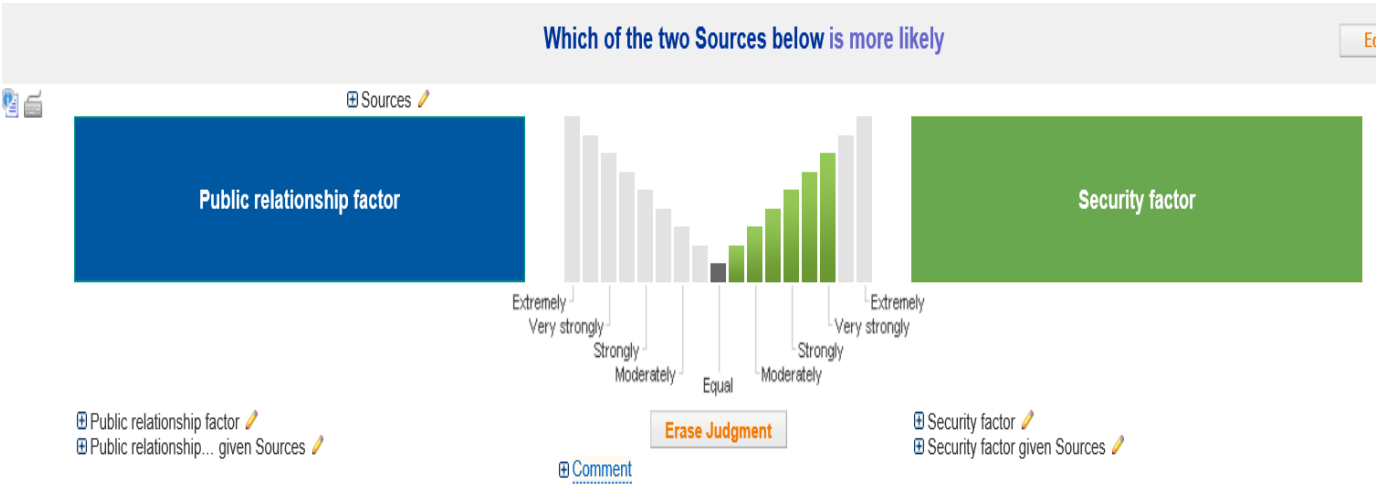
[02]. Cancellation of order by drivers	Somewhat Unlikely (One in 10)	10.00%	
[09]. Harassing phones	One in 5	20.00%	
[04]. Impoliteness of drivers	Somewhat Unlikely (One in 10)	10.00%	
[07]. Lost items	Somewhat Unlikely (One in 10)	10.00%	
[06]. Murder case	Extremely Unlikely	0.10%	
[10]. Personal information disclosure	Highly Unlikely	1.00%	
[05]. Rape case	Extremely Unlikely	0.10%	
[08]. Robbery	One in ten thousand	0.01%	
[03]. Terrible interior environment	Somewhat Unlikely (One in 10)	10.00%	
[01]. Traffic accident	Somewhat Unlikely (One in 10)	10.00%	

Cancellation of order by drivers

Intensity Name	Likelihood
<input type="radio"/> Not rated	
<input type="radio"/> Almost Certain · Almost certain to occur	99.00%
<input type="radio"/> Highly Likely · Highly likely to occur	95.00%
<input type="radio"/> Very likely · Very likely to occur	90.00%
<input type="radio"/> More than likely · More than likely to occur	80.00%
<input type="radio"/> Likely · Likely to occur	66.67%
<input type="radio"/> fifty fifty · fifty fifty to occur	50.00%
<input type="radio"/> One in 3 · One in 3 to occur	33.30%
<input type="radio"/> One in 4 · One in 4 to occur	25.00%
<input type="radio"/> One in 5 · One in 5 to occur	20.00%
<input checked="" type="radio"/> Somewhat Unlikely (One in 10) · Somewhat Unlikely (One in 10) to occur	10.00%
<input type="radio"/> Unlikely (One in 20) · Unlikely (One in 20) to occur	5.00%
<input type="radio"/> Very Unlikely (One in 50) · Very Unlikely (One in 50) to occur	2.00%
<input type="radio"/> Highly Unlikely · One in a hundred	1.00%
<input type="radio"/> Extremely Unlikely · One in a thousand	0.10%
<input type="radio"/> One in ten thousand · One in ten thousand to occur	0.01%
<input type="radio"/> One in one hundred thousand · One in one hundred thousand to occur	0.001%
<input type="radio"/> One in a million · One in a million to occur	0.0001%
<input type="radio"/> One in 10 million · One in 10 million to occur	0.00001%
<input type="radio"/> Direct Value	









































4.2.pairwise comparison

Figure 8: Sample of pairwise comparison



4.3.Measurement Method

Figure 9: Measurement method

Measurement Methods			
<div>For Events <input type="checkbox"/> Details Mode</div> <div>Manage Scales Direct priorities for all nodes in all clusters Pairwise for all nodes in all clusters</div>			
Measure Events With Respect To	Measurement Type Default: Rating Scale	Measurement Scale	Special designations / Action
Objectives			
Company			
Increased income	Rating Scale	Default Impact Scale	   
Enlarged audience base	Rating Scale	Default Impact Scale	   
Positive public opinions	Rating Scale	Default Impact Scale	   
Improved customer satisfaction	Rating Scale	Default Impact Scale	   
Enhanced company reputation	Rating Scale	Default Impact Scale	   
More efficient network	Rating Scale	Default Impact Scale	   
Reduced car accidents	Rating Scale	Default Impact Scale	   
Driver			
Personal security	Rating Scale	Default Impact Scale	   
Driver qualification	Rating Scale	Default Impact Scale	   
Good quality cars	Rating Scale	Default Impact Scale	   

5. Synthesis/Sensitivity Analysis

Once all participants had concluded their evaluations, we start to use Riskion's synthesized results to analyze the information that these data provide to us. We will use these results to test the likelihood and impact of risks, as well as the reasons for their cause. It will make a further assessment of their priorities and threatening. The following figures depict the sensitivities of the hierarchy of sources and objectives relating the events after the computation of of the likelihood and impact of the events.

Figure 10: Synthesis of sources and event likelihoods

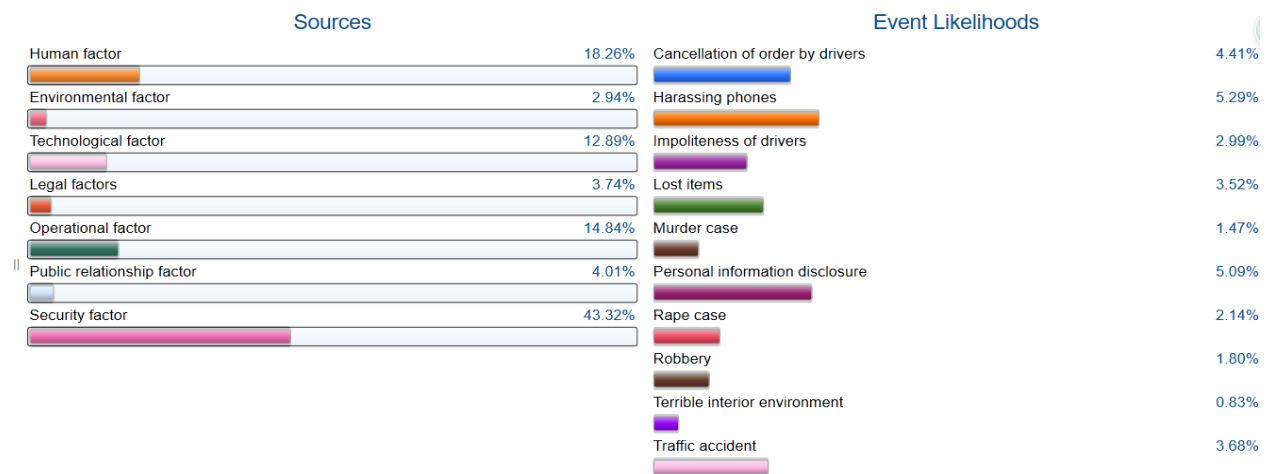
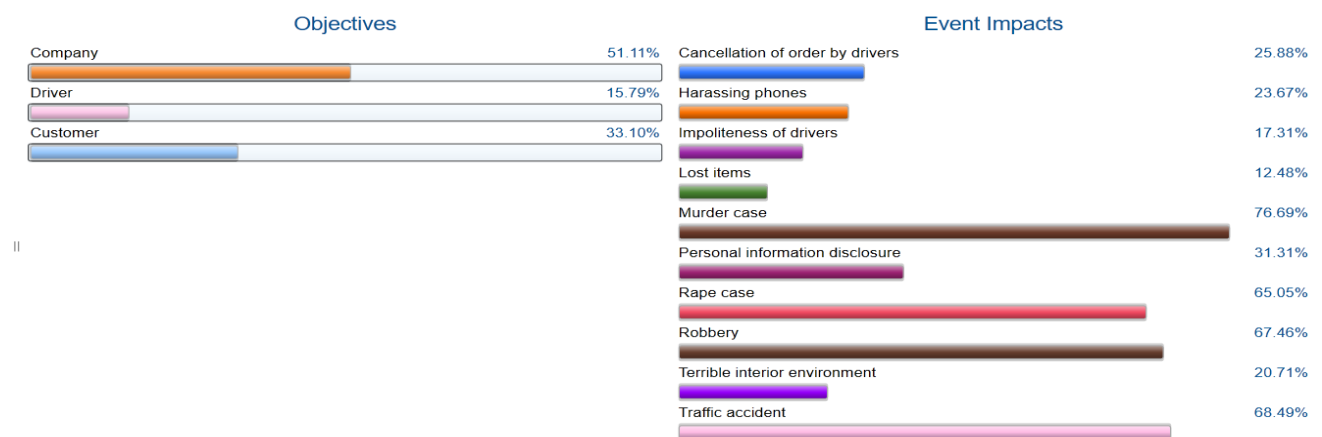


Figure 11: Synthesis of objectives and event impacts



As figure above indicates, the normalized aggregated results from the participant's judgements shows that "Harassing phone" and "personal information disclosure" have the highest probability

of occurrence, which more than 5 percent of both. The relatively lowest likelihood is “Terrible interior environment”, which less than 1 percent. We know the factors that led to these events are diverse. But in combination with the chart, we can find the main sources of these events are “security factor” and “human factor” . From the results, it is precisely because of the incompleteness of the security system that the probability of these risks is high. In addition, human factors are also an important incentive. This includes the choice of employees and the quality of company managers. On the other hand, the high likelihood incidence does not necessarily mean its impact is the biggest. For example, murder and rape, their probability of occurrence is not high, but it will seriously affect the company's reputation and income.

6. Risk Review Overall

6.1. Overall Risk (without Controls)

Risk is computed based on the measurement and synthesized results of the likelihood of events together with the impact of events. The table shows the total expected risk based on the measurements from all participants. The total risk sums up the computed risks of all ten events. The result is determined by conducting a simulation because it avoids double counting and predicts a more accurate depiction without any exaggeration of the envisioned scenario when things are not mutually exclusive. The simulation determines the likelihood of triggering an event and the same event cannot trigger more than once because of different sources, thus reducing the actual risk computation. We valued the project at \$1000000 and the overall likelihood, impact, and risk are shown in figure above (simulated and computed). A monetary value can be attributed to the impact and risk for each event. And a monetary value was given to the impact and risk for each event and therefore it demonstrates that the total risk DIDI faces is \$1,797,587.

Figure 12: Overall likelihoods, impacts and risks

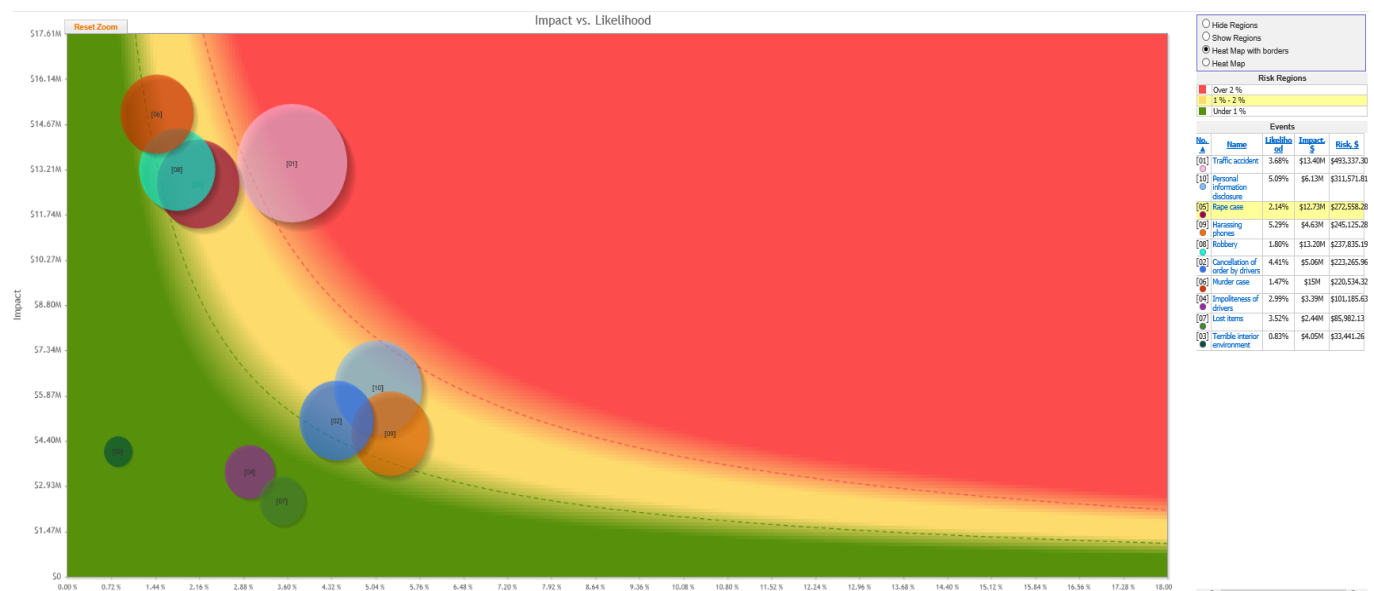
Overall Likelihoods, Impacts, and Risks for RM Project 2018:DIDI mobile transportation platform				
No.	Event	Likelihood Simulated	All Participants Impact, \$ Simulated	Risk, \$ Simulated ▼
[01]	Traffic accident The risk of collision could result from speed control, driving skill and alcohol or drugs matters and vehicle collisions lead to death and disability as well as financial costs to both society and the individuals involved. Time Frame:One time per month.	3.63%	11,446,877	415,521
[10]	Personal information disclosure The disclosure of passengers' provided information, such as name, phone number, id number, photos.etc. Time Frame:One time per week.	5.33%	5,010,822	267,076
[05]	Rape case Some times female passengers could be raped by drivers. Time Frame: One time per year.	2.03%	10,555,325	214,273
[09]	Harassing phones Unwanted phone received from strangers. Time Frame:One time per day.	4.86%	3,663,020	178,022
[08]	Robbery The crime of taking or attempting to take anything og any value by force. Time Frame:One time per year.	1.86%	11,453,884	213,042
[02]	Cancellation of order by drivers Some drivers would concel the orders without reasonable excuses and charge customers for fees then. Time Frame:One time per week.	4.08%	3,898,639	159,064
[06]	Murder case Murder cases(by drivers or by customers) occur some times. Time Frame:One time per year.	1.44%	12,712,938	163,066
[04]	Impoliteness of drivers Some of the drivers would have impolite behaviours towards passengers. Time Frame: One time per week.	2.82%	2,697,746	76,076
[07]	Lost items It would be hard to retrieve lost items on car. Time Frame:One time per week.	3.21%	2,030,555	65,180
[03]	Terrible interior environment The interior environment of some vehicles is disgusting, leading passengers to resent. Time Frame:One time per week.	0.94%	2,793,877	26,262
			Total Risk	Simulated \$1,797,587
			Residual Risk	\$1,797,587

● Likelihood (L) ● Impact (I) ● Risk (R)

6.2.Risk Map (without Controls)

The risk map above represents the risk outputs of events related with likelihood and impact. The size of each bubbles are proportional to their risks and their position in the xy-axis. We set different risk regions to differentiate levels of risk and to visualize events that should be controlled. From the graph, traffic accidents poses the greatest risk to the project. For the purpose of this project we set the Risk appetite to 2% and above (Red Zone) and this is where we would apply controls to sources, vulnerabilities and objectives to lessen the likelihood of them occurring and their impact. After we examined the Risk Maps we proceeded to identify and assign control to sources, vulnerabilities and objectives.

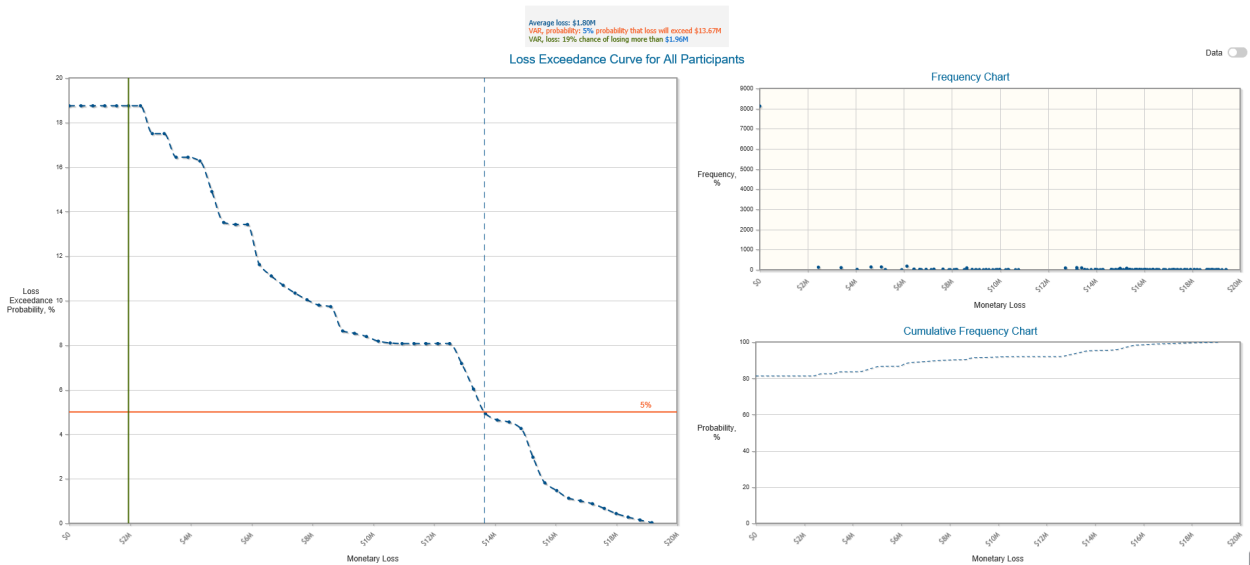
Figure 13: Heat map without control



6.3.Loss curve(without Controls)

A loss exceedance curve was created to observe average loss and other loss probabilities for different enterprise loss on risk events. In the loss curve graph, the line on the graph represents the probability of loss supposed to be approximately 5% when our independent events loss would exceed \$14 million.

Figure 14: Loss curve without control



7. Controls

7.1. Identifying Controls

The final step is to develop controls to lower the risk that the company would suffer from specific sources. Controls are specific actions managers could take to limit or eliminate specific threats, consequences, or vulnerabilities and thus lower the overall risk. We identify controls that can help mitigate risk events and the likelihood of their occurrence and apply them to sources, events, or objectives. We identified 20 controls which cost \$1,797,000 in total. For our projects, we focus most of our control on sources, for example, improving the quality of employees, correcting guidance and developing organizational structure and security system, because we believe that the fundamental way to reduce risk is to manage organization and we also added some control for events and objectives.

7.2. Selecting and optimizing controls

We select different control to see its effectiveness through the total cost of all control and heat map with control. Clearly, the overall amount of money is not readily available for the company to spend on the total risks when the potential loss is approximately \$1.7million. So we set a budget of 800,000 dollars mainly based on the total risk and the total cost of all control all of which are both around \$1,797,000 and we have tried different budget and calculate the efficiency of the automatic optimization of Riskion.

Select Controls									
Total Risk*: \$1,797,587 Risk With Selected Controls*: \$7,526 (Δ: \$1,789,660) Risk With All Controls: \$2,153 (Δ: \$1,795,434) <input checked="" type="checkbox"/> Show Monetary Values (Value of Enterprise: \$10,555,341, Value of "Company": \$10,000,000)				Selected controls: 14 Cost Of Selected Controls: \$797,000 (unfunded: \$1,000,000) Total Cost Of All Controls: \$1,797,000				Simulations Settings Number of trials: 10000 Seed: 271 <input checked="" type="checkbox"/> Keep Seed	
Index	Selected	Control Name	Control for	Selected	Cost	Applications	Categories	Must	Must Not
01	<input checked="" type="checkbox"/>	Promulgate correct guidance	Cause	Yes	1000	11		<input type="checkbox"/>	<input type="checkbox"/>
02	<input checked="" type="checkbox"/>	Training and educating drivers	Cause	Yes	20000	5		<input type="checkbox"/>	<input type="checkbox"/>
03	<input checked="" type="checkbox"/>	Training and educating managers	Cause	Yes	20000	7		<input type="checkbox"/>	<input type="checkbox"/>
04	<input checked="" type="checkbox"/>	Revise the company's charter	Cause	Yes	1000	10		<input type="checkbox"/>	<input type="checkbox"/>
05	<input checked="" type="checkbox"/>	Enhance consumer safety awareness	Cause	Yes	10000	5		<input type="checkbox"/>	<input type="checkbox"/>
06	<input checked="" type="checkbox"/>	Strictly select qualified drivers	Cause	Yes	5000	3		<input type="checkbox"/>	<input type="checkbox"/>
07	<input type="checkbox"/>	Strictly select qualified cars	Cause		50000	1		<input type="checkbox"/>	<input type="checkbox"/>
08	<input checked="" type="checkbox"/>	Alert system development program	Cause	Yes	50000	5		<input type="checkbox"/>	<input type="checkbox"/>
09	<input type="checkbox"/>	Network Development Program	Cause		100000	4		<input type="checkbox"/>	<input type="checkbox"/>
10	<input checked="" type="checkbox"/>	Technology Consultant	Cause	Yes	100000	4		<input type="checkbox"/>	<input type="checkbox"/>
11	<input checked="" type="checkbox"/>	Legal expertise	Cause	Yes	30000	3		<input type="checkbox"/>	<input type="checkbox"/>
12	<input type="checkbox"/>	Dismissing unqualified employees	Cause		50000	3		<input type="checkbox"/>	<input type="checkbox"/>
13	<input type="checkbox"/>	Install cameras	Vulnerability		200000	9		<input type="checkbox"/>	<input type="checkbox"/>
14	<input checked="" type="checkbox"/>	Set the isolation strip	Vulnerability	Yes	50000	9		<input type="checkbox"/>	<input type="checkbox"/>
15	<input checked="" type="checkbox"/>	Strengthen network supervision	Consequence	Yes	100000	62		<input type="checkbox"/>	<input type="checkbox"/>
16	<input type="checkbox"/>	Cooperation with PR company	Consequence		100000	21		<input type="checkbox"/>	<input type="checkbox"/>
17	<input type="checkbox"/>	Insurance company	Consequence		500000	16		<input type="checkbox"/>	<input type="checkbox"/>
18	<input checked="" type="checkbox"/>	Upgrade security system	Consequence	Yes	200000	63		<input type="checkbox"/>	<input type="checkbox"/>
19	<input checked="" type="checkbox"/>	Cars development program	Consequence	Yes	200000	9		<input type="checkbox"/>	<input type="checkbox"/>
20	<input checked="" type="checkbox"/>	Taking customers surveies	Consequence	Yes	10000	4		<input type="checkbox"/>	<input type="checkbox"/>

7.3.Overall Risk (with Controls)

Overall, we incur less than \$8 million in additional costs by implementing 14 of all the controls and reduce risks by \$17 million after the optimization.

Figure 15: Overall risks with control

Overall Likelihoods, Impacts, and Risks for RM Project 2018:DIDI mobile transportation platform										
No.	Event							All Participants Impact, \$ Simulated	Risk, \$ Simulated ▼	
	Traffic accident									
[01]	The risk of collision could result from speed control, driving skill and alcohol or drugs matters and vehicle collisions lead to death and disability as well as financial costs to both society and the individuals involved. Time Frame:One time per month.							0.05%	5,728,199	2,864
	Lost items									
[07]	It would be hard to retrieve lost items on car. Time Frame:One time per week.							0.04%	2,374,517	949
	Cancellation of order by drivers									
[02]	Some drivers would conceal the orders without reasonable excuses and charge customers for fees then. Time Frame:One time per week							0.14%	444,950	622
	Impoliteness of drivers									
[04]	Some of the drivers would have impolite behaviours towards passengers. Time Frame: One time per week.							0.03%	773,187	231
	Terrible interior environment									
[03]	The interior environment of some vehicles is disgusting, leading passengers to resent. Time Frame:One time per week.							0.00%	0	0
	Harassing phones									
[09]	Unwanted phone received from strangers. Time Frame:One time per day.							0.04%	636,793	254
	Robbery									
[08]	The crime of taking or attempting to take anything og any value by force. Time Frame:One time per year.							0.09%	215,263	193
	Rape case									
[05]	Some times female passengers could be raped by drivers. Time Frame: One time per year.							0.05%	172,909	86
	Murder case									
[06]	Murder cases(by drivers or by customers) occur some times. Time Frame:One time per year.							0.02%	113,799	22
	Personal information disclosure									
[10]	The disclosure of passengers ' provided information, such as name, phone number, id number, photos.etc. Time Frame:One time per week.							0.00%	0	0

● Likelihood (L)
 ● Impact (I)
 ● Risk (R)

7.4. Risk Map (with Controls)

We can see how these controls works through the heat map with control. All the risks in the map are mitigate to a safe level after the selecting of controls. We can clearly see that these risks are weakened. All risk events are concentrated in the green area. On the other hand, we also found that some risk areas are still relatively large. Such as traffic accidents. It's worth noting that we've worked hard to find the cause from multiple perspectives and try to minimize the risk. Unfortunately, our budget cannot be exceeded, and more human and weather factors are beyond our control. But we can still find that our control is effective on this project.

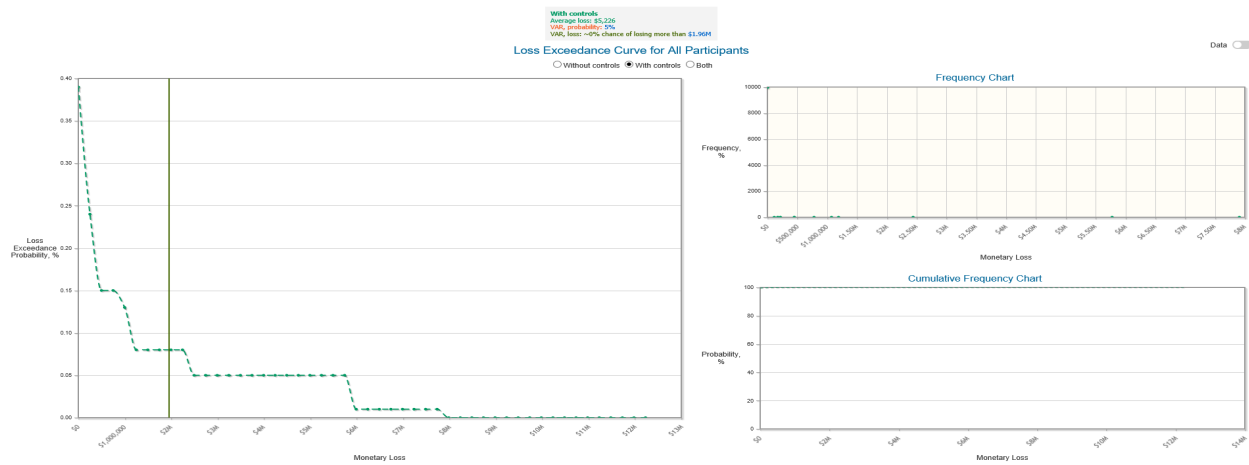
Figure 16: Risk map with control



7.5. Loss Curve(with Controls)

After the controls of risks, we can get from the loss exceedance curve that the potential monetary loss is reduced to \$8million at 0.01%

Figure 17: Loss curve with control

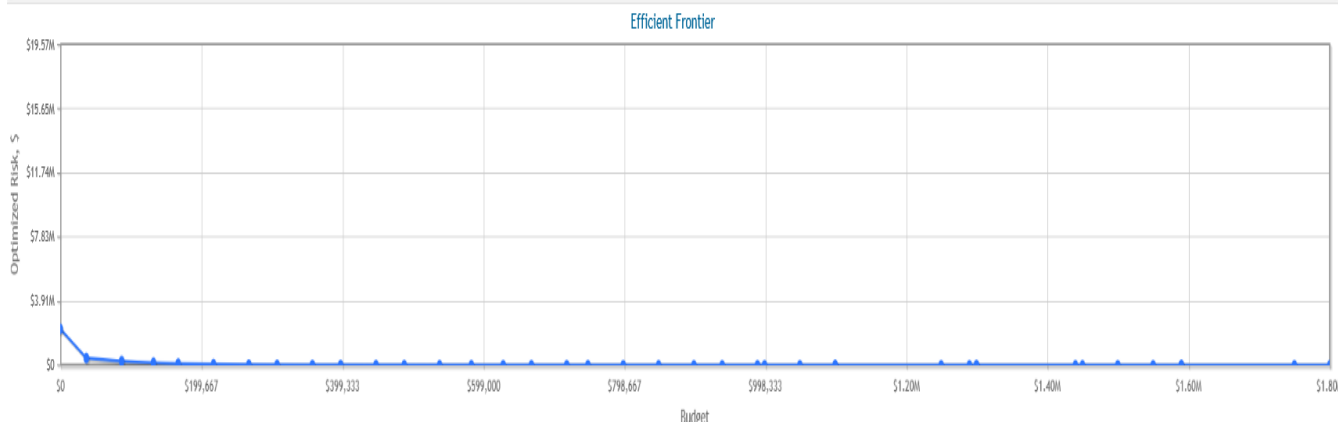


7.6. Efficient Frontier

Efficient frontier is an optimal portfolio at a budget represented by the x value of the point and the risk represented by the y axis value of the point. We can what action we should take at specific time and budget to get the most efficient output.

Figure 18: Efficient Frontier

Controls/Budget	\$0	\$44,925	\$89,850	\$134,775	\$179,700	\$224,625	\$269,550	\$314,475	\$359,400	\$404,325
Risk with Selected Controls, \$	\$2,22M	\$444,133.28	\$254,349.44	\$152,809.87	\$101,739.78	\$88,478.70	\$38,130.88	\$27,391.48	\$18,985.34	\$17,808.81
Funded Cost	\$0	\$37,000	\$87,000	\$132,000	\$187,000	\$217,000	\$287,000	\$307,000	\$367,000	\$397,000
Funded Events	1. Promulgate correct guidance 2. Training and educating drivers 4. Revise the company's charter 5. Enhance consumer safety awareness 8. Strictly select qualified drivers	1. Promulgate correct guidance 2. Training and educating drivers 4. Revise the company's charter 5. Enhance consumer safety awareness 8. Strictly select qualified drivers 8. Alert system development program	1. Promulgate correct guidance 2. Training and educating drivers 4. Revise the company's charter 5. Enhance consumer safety awareness 15. Strengthen network supervision	1. Promulgate correct guidance 2. Training and educating drivers 3. Training and educating managers 4. Revise the company's charter 5. Enhance consumer safety awareness 6. Strictly select qualified drivers 10. Technology Consultant 20. Taking customers surveies	1. Promulgate correct guidance 2. Training and educating drivers 3. Training and educating managers 4. Revise the company's charter 5. Enhance consumer safety awareness 6. Strictly select qualified drivers 8. Alert system development program 10. Technology Consultant 20. Taking customers surveies	1. Promulgate correct guidance 2. Training and educating drivers 3. Training and educating managers 4. Revise the company's charter 5. Enhance consumer safety awareness 6. Strictly select qualified drivers 7. Strictly select qualified cars 8. Alert system development program 15. Strengthen network supervision 20. Taking customers surveies	1. Promulgate correct guidance 2. Training and educating drivers 3. Training and educating managers 4. Revise the company's charter 5. Enhance consumer safety awareness 6. Strictly select qualified drivers 8. Alert system development program 15. Strengthen network supervision 10. Technology Consultant	1. Promulgate correct guidance 2. Training and educating drivers 3. Training and educating managers 4. Revise the company's charter 5. Enhance consumer safety awareness 6. Strictly select qualified drivers 7. Strictly select qualified cars 8. Alert system development program 15. Strengthen network supervision 10. Technology Consultant	1. Promulgate correct guidance 2. Training and educating drivers 3. Training and educating managers 4. Revise the company's charter 5. Enhance consumer safety awareness 6. Strictly select qualified drivers 7. Strictly select qualified cars 8. Alert system development program 15. Strengthen network supervision 10. Technology Consultant	1. Promulgate correct guidance 2. Training and educating drivers 3. Training and educating managers 4. Revise the company's charter 5. Enhance consumer safety awareness 6. Strictly select qualified drivers 7. Strictly select qualified cars 8. Alert system development program 15. Strengthen network supervision 10. Technology Consultant 11. Legal expertise 20. Taking customers



8. Recommendation and Conclusion

In summary, the risks of mobile transportation platform is indeed there. The results of the risk analysis is very plausible that “traffic accident” is rated as the highest risk DIDI team faces before and after the controls because it is difficult to predict and prevent. Although from the result, some of the risks, for instance robbery rape and murder cases, are not very high, these issues usually have a great social impact. Through our research we found that the majority of these risks are manageable. As we mentioned before, companies should focus on internal adjustment and standardization, upgrading technology program and improving security systems. In other words, the company need to consider more about its customers. Because this is the best way to improve the company's reputation and gain the satisfaction of customers. On the other hand, as consumers, they also hope DIDI can provide customers with better security and ride experience while maintaining convenience. We believe that, with a regnization of all the risks and controls, the team can proceed to proper action and in the future these problems within DIDI will be solved eventually.

9. Reference

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