

# Nintendo Expansion into Freemium Gaming

## Risks Faced During Transition Process



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DNSC 6254 Risk Management

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## **1. Introduction and Background Information**

Nintendo has been a staple in the gaming community for over 30 years. They have prided themselves on producing consoles and gaming titles that have lasting effect on our memories, driving gamers back to their products for years to come. Over the past few decades, their business model has been relatively stable, relying on consumers to purchase their consoles and their gaming titles alike. Now, the gaming industry has taken an alternative path, focusing on providing the games free to consumers and relying on heavy in-game purchasing to drive revenues. Moreover, the platform in which gamers utilize to play these titles has also changed dramatically, moving from consoles in consumer basements and dens to basically anywhere that a smartphone can acquire a wireless signal. This risk assessment will examine potential barriers to success in transitioning from Nintendo's tried and true business model to this new "freemium" model that seems to be having much success recently. Nintendo has tested out this model with three titles to date: Mario Run!, These are the first fully licensed freemium Nintendo gaming titles available for purchase and play on not only their own consoles, but also Apple and Android devices as well.

## **2. Project Structure**

### **a. Identifying Objectives**

- i. **Financial** - The main objective for the transition into freemium gaming is to take advantage of the potential financial opportunity it presents. Recently, gaming companies have been able to use this business model with great success. In-game purchasing is not completely new to the Nintendo business model, but the complete reliance on in-game purchasing is relatively uncharted territory for Nintendo. Epic's Fortnite has accumulated billions of dollars in revenue, and they continue to build their users on a monthly basis. It is important that Nintendo takes a part of market share in the freemium business to maintain their standing in the gaming community. Not only should freemium gaming provide another revenue stream for Nintendo, but the transition should set their business up to be competitive in the future. In this payment model, revenues are predominantly generated through the top 1-2% of users, as opposed to a much more equal distribution of revenue historically produced through up-front sales.
- ii. **Reliability, Availability, and Maintainability** - Transitioning to this business model means that Nintendo must become more reliant on servers and data warehouses. Player information, game settings, progress, and much more have to be housed on servers for the game to be functional. It is much more difficult to maintain than personalized consoles. Even as more gaming titles become increasingly connected to the internet for many of their gaming functions, the old model of purchasing a console and title at least allows for offline play in many, if not all cases. The freemium model's extensive dependence on these servers and connectivity for gameplay make it

absolutely imperative that the software and hardware associated with gameplay and payment processing must be reliable and relatively maintainable with a well-trained staff. Downtime and connectivity issues need to be kept to a minimum. Moreover, Nintendo needs to be furnished with enough server space for bandwidth fluctuations, and should be available for gameplay at all times, unless pre-determined updates or patches need to be installed.

- iii. **Performance** - Nintendo wants to have high-quality products that are known for the highly capabilities and functionalities. The software and hardware alike need to run smoothly to allow for the most user-friendly experience. This is extremely important to Nintendo, as they have been known for simplicity and usability in their gameplay. This is readily apparent in their Switch and Wii products that have been wildly successful. This is also very important due to the amount of channels Nintendo utilizes for gameplay. Not only do they allow mobile gaming on cellular phones, but the Switch is another console that can be used as a mobile gaming center. It's important that the gameplay not suffer when transitioning play from one device to the next. Gameplay performance is one of the larger drivers of drawing consistent levels of users, as clunky and difficult gameplay interfaces tend to push players away.
- iv. **Safety** - Maybe above all else is the level of safety or security this transition needs to be successful. Moving to this business model that is so heavily based on web connections, servers, and payment processors, Nintendo must ensure consumer data is protected. Server security is imperative to protect client information, from their credit card information to their personal data as well. Furthermore, the Nintendo software and hardware needs to be secure enough to ensure it cannot be used to bridge into other devices for hacking purposes. Effectively securing servers is not a cheap endeavor, but neither are lawsuits involving lost consumer data. Insurance policies are beginning to soar to cover the liability of lost information. Most have heard the saying that there are two types of companies, "ones who've been hacked, and those who don't know they've been hacked". These highly-connected online gaming interfaces provide an ideal cyber-playground for hackers to phish and extort other information from players. Security breaches, especially one's involved in payment processing, can be crucial turning points for companies, and have the potential to drive away players for fears of having their personal information compromised. This topic, or concern, will only continue to increase in importance as the ever-growing connectivism expands.
- v. **Public Relations** - Maintaining the reputation as one of the leading innovators in the gaming industry is important to Nintendo. Providing high-quality gaming titles is only the beginning to maintaining standing in the gaming community. Not only must Nintendo develop enticing titles that capture the attention of gamers worldwide, but they also must be able to provide a safe and secure environment to do so. Public relations nightmares surrounding data breaches and questionable integrity behind data collection practices are becoming all too common. Leaders have started to be called to Congress to explain their shortcomings involving data breaches and data misuse. If Nintendo were to get a bad reputation regarding how they utilize or sell their user data, we could expect a sharp decrease in gamers, and in turn, losses to monthly revenue. Nintendo wants to continue

into the future of gaming by introducing interactive games for all demographics, continuing to cement its reputation as a leader in not only gameplay, but also how they put further push the envelope developing long-lasting player relations.



Figure 1. Company Objectives

## b. Identifying Risk Events

- i. **Gaming Interface Failure** - If the software or hardware cannot meet the capabilities and functionalities necessary for seamless gameplay, there undoubtedly will be barriers to a successful transition. With freemium-gaming this is so much more important than that of the older up-front payment model. With the old model, players could at least play their title on their consoles without having to be connected to the Internet, but now the freemium model must have continued and uninterrupted connectivity throughout gameplay. Normally, gaming interfaces that are powered by the console have little to no risk of failing to provide at least some level of gameplay. With this freemium model powered by servers and Internet connections, gaming interfaces are more prone to limiting gameplay functionality. Gaming interface failures could be the result of

unqualified employees not having the experience needed for optimal gaming development, or just bad overall coding techniques. Furthermore, there is a chance that the gaming interface shortfalls could be totally out of Nintendo's control, as server failures and Internet connection issues can be caused by third party vendors. Technology in the gaming industry used to move much more slowly, with consoles only being released every four to five years. Now, software must be developed to be compatible with many mobile phone specifications, which receive updates on a yearly basis at a minimum.

- ii. **High-Quality Talent Exodus** - Some companies undervalue their human capital and this can lead to some difficult times, especially in the midst of a business move such as this respective transition. If Nintendo were to have a good amount of quality talent leave, they would be burdened with maintaining these new cumbersome projects shorthanded. Developing gaming software is long and arduous, burning out many employees in the process. Moreover, with the ever-growing competitive landscape in the gaming community, employees may be pressured into taking new and more lucrative roles with other gaming companies. As the need for more gaming innovation increases, the need for creative talent increases as well. Nintendo must ensure their workforce is properly maintained and staffed for desired productivity levels. Furthermore, Nintendo also must ensure to provide a culture that is conducive to their objectives. Engineers want to be challenged with new projects and given more opportunities, but they must also be properly compensated with salary, benefits, and the flexibility to keep them happy in their place at Nintendo.
- iii. **Failed Marketing Campaign** - With such little experience in marketing for freemium gaming, the potential to miss the mark in a marketing campaign is a possibility. Nintendo could have a strong bias towards marketing for the older business model of paying up-front costs for gaming titles. If they were to use their historical data, it could backfire due to its lack of correlation to the new market Nintendo is trying to segment, target, and position themselves. Data is so important to marketing campaigns, and if Nintendo's market data does not represent the targeted consumers, it will likely fall short of objectives. Furthermore, Nintendo must be creative in addressing the various marketing channels available to them, and not only use multi-channel marketing techniques, but they should also explore omnichannel marketing strategies to successfully connect their users to their products and services. Nintendo does have the resources to engage in widespread marketing campaigns, and may even be able to shoulder the burden of some smaller missteps, but it is important that they find an ideal way to reach their gamer base in creative ways.
- iv. **Missed Revenue Forecast** - A major concern for transitions in any company is the potential affect it could have on their bottom line. Moving into this freemium model, Nintendo should cap their expectations since they have such little experience working with this business model. So, first and foremost it needs to be realistic in forecasting their revenue projection. Missing guidance on revenue could stem from a plethora of reasons during this transitional period. Server, software, or hardware troubles could limit the amount of uninterrupted gameplay, which in turn limits the amount of in-game

purchasing gamers are completing. Moreover, this also limits the amount of time for players to use non-diminishing items, further resulting in less of a need to replenish those items through in-game purchases. Revenue misses could also be an outcome of ineffective marketing techniques, and the inability for Nintendo to maintain necessary average monthly users. The in-game purchases need to be enticing for players to buy. They should make the gaming experience more enjoyable for the consumer. If they do not feel the need to succeed in the game, then they will likely abstain from buying the item.

- v. **Server Failure** - All of us have experienced issues with connecting to the Internet before, and it can be quite frustrating. With the freemium model the connectivity capabilities of the games are absolutely essential for actual gameplay. The connection to servers needs to be sufficient for the estimated bandwidth, and should be able to handle excessive traffic at peak times without much interruption to the gaming interface. Server failure will ultimately lead to the inability to connect to the gaming interface. There could be a abundance of reasons that servers could go down. Data centers are susceptible to weather and power outages, and at times can be completely inoperable. Moreover, servers are becoming increasingly subject to hacking and other data breach problems. Bottom line, if Nintendo cannot contract with reliable server vendors or procure data centers of their own, the move into freemium gaming will likely be met with obstacles that could prove much too daunting to overcome.
- vi. **Payment Processing System Failure** - Successfully processing payments is a necessity of every organization that exchanges some type of product or service. In the freemium gaming model, it is such a crucial aspect of generating revenues. If Nintendo cannot properly and reliably handle processing payments for gamers' in-game purchases, than it will struggle to compete in an increasingly competitive market. If Nintendo cannot partner with a reliable payment processor, it will struggle to maintain viability in the freemium market. Since this model is so heavily reliant on in-game purchasing, the payment processor needs to be highly effective at quickly and securely processing payments. Moreover, it needs to be incredibly secure, as if Nintendo loses consumers' credit card information, it will likely lead to a significant reduction in average monthly users and revenue.
- vii. **Consumer Data Breach** - Data breaches seem like they occur on a daily basis with many large companies. They are targeted by hackers for the plethora of consumer data they have stored on their servers. This has been leading to organizations losing customers due to their fear of having their personal information targeted and stolen. The sheer amount of data breaches lately has many consumers concerned with the security of their personal data. Unfortunately, unless you live completely off the grid, the chances are that you are eventually going to be subject of a data breach from one company or another. Nintendo needs to ensure all controls are in place to mitigate this risk, as they do not want to be part of any potential lawsuit and corresponding liability, nor would they like to be called in front of Congress to explain their shortfalls. Moreover, Nintendo would not want to lend any additional evidence that would warrant extensive regulations

being placed on the company. Nevertheless, losing consumer data is unacceptable, and proper precautions need to be put in place to reduce the probability of it occurring.

Unique ID		Events
[02]	i	Gaming Interface Failure
[03]	i	High-Quality Talent Exodus
[04]	i	Failed Marketing Campaign
[06]	i	Missed Revenue Forecast
[08]	i	Server Failure
[10]	i	Payment Processing System Failure
[11]	i	Consumer Data Breach

Figure 2. Risk Events

### c. Identifying Sources of Risk Events

- i. **Technological Infrastructure Failure** - Considering the depth and breadth of the necessary technological tools needing to be functional, there are many risk sources that need to be addressed at this specific level. Again, if the interface fails, Nintendo lacks a way to produce revenue from the game, as in-game purchasing and average users suffers. Failures associated with technological could include software or hardware obsolescence. Nintendo should have the proper resources to ensure the infrastructure is up to date, but being so inexperienced in this model, they could potentially overlook things that other gaming companies utilize for better gameplay experience. Implementing new technologies is crucial in keeping up with the frontrunners in gaming, and using the most effective software or hardware should keep Nintendo at the forefront of the gaming community. Additionally, most web-based freemium games are subject to server troubles, and could be overloaded with traffic, causing the system to crash or fail to maintain gameplay. Peak times need to be identified to let engineers know when additional servers are necessary for the high bandwidths. Lastly, failing to have a functional payment processor will likely lead to players not being able to make in-game purchases, which are the main driver of revenue in this freemium model.
- ii. **Human Capital Issues** - One of a company's largest assets is its workforce and their accompanying knowledge. Organizations are always worried about a "brain drain" from their workforce, and rightfully so. These are the people they entrust to "get the job done" and push projects forward to be successful. Obviously, they must ensure their pay structures and benefit packages are enough to keep good staff employed, as well as lure prospective workers to Nintendo. These days it is also very important to employees to be able to be flexible in the working schedule and where they work from, therefore Nintendo needs to provide family-friendly policies for their workforce. Furthermore, workers need to be challenged with new projects, and if Nintendo cannot offer exciting

new projects, they may see employees look elsewhere for new and enticing roles. Nintendo must also provide a positive work culture and environment that allows for employees to feel comfortability in expressing themselves candidly in discussions. Nintendo could also run into issues with not having the proper workforce to complete this transition, as most of the software engineers are likely experienced in the up-front payment model. These workers would either need to be trained in mobile gaming or placed on projects that are more suited for their abilities. It may be necessary to launch a large recruiting campaign to grab talent from other mobile or freemium gaming companies.

- iii. **Marketing Failures** - Without a well-planned marketing strategy and ill-conceived organizational objectives, it is highly possible to run into some obstacles in marketing for this entirely new business venture. Surveys may not be as reliable as they once were, especially since Nintendo is attempting to break into a new market. This is one occurrence when the “flaw of averages” can mislead management into marketing towards a segment that they are not effectively positioned to target. If Nintendo can identify a niche for their product, they may fall short of projected monthly users. Additionally, this old data could lead them to using ineffective channels to reach consumers, and disregard new techniques that could provide larger financial benefits. It also could be possible, but unlikely, they Nintendo would not budget enough resources to launch an effective marketing campaign.
- iv. **Human Error** - Minimizing human error, especially ones that occur as a result of negligence, is a major concern for all companies. These missteps commonly occur from improperly trained employees or due a lack of well-documented policies and procedures. Lucky for Nintendo, these errors should be confined to software or hardware issues that can be easily fixed and controlled. Nintendo needs to be proactive in planning for these risks, and put specific processes in place in case of gaming infrastructure failure. Errors in analysis could also be found in the marketing department, and lead to wrong niche’s being targeted or improper channels utilized. Nintendo needs to maintain an experienced workforce, with the expertise and skill set to reliably handle their duties and role as a staff member at the company.
- v. **Gaming-Policy** - This is not particularly new territory for the gaming industry, as violent video games have been scrutinized by politicians for the last couple decades. There could potentially be new regulation on the horizon for the gaming industry, Recently, there have been reports of manipulation of in-game purchases by companies that have resulted in much less value than is promised. Some politicians are now calling for regulation regarding these “loot boxes” and other microtransactions. This could greatly limit their ability to generate revenue. If they were required to provide much more value from the purchases, then players would likely need less purchases to acquire all their desired add-ons to the freemium game. There is so little research done in this aspect that neither gaming companies nor elected officials have much of an idea on how to address these growing issues.

	▲ Sources
	▲ Technological Infrastructure Failure
	System Software Technology Obsolescence
	System Hardware Technology Obsolescence
	New Cutting-Edge Technology Available
	System Failure
	Server Bandwidth Incapable of Traffic Levels
	Ineffective Payment Processing
	▲ Human Capital Issues
	Competitive Pay/Benefits
	Lack of New Projects
	Flexibility of Work
	Culture
	Work Locale Issues
	Developers/Engineers Not Familiar with Mobile Gaming
	▲ Marketing Failures
	Ineffective Surveying
	Bad Market Data
	Ineffective Channels
	Difficulty Identifying Market Niche
	Insufficient Budget for Marketing
	▲ Human Error
	Inadequately Trained Staff
	Ineffective Policies, Process, or Procedures.
	Lack of Documented Policies, Process, or Procedures.
	Developers Failure to Properly Install Updates/Patches
	Developers Failure to Properly Handles Bugs
	▲ Gaming Policy-Related
	Complicated UI
	Endless Ads
	Free to Play
	No Restriction on Purchasing
	Distribution Platform Contracts (Apple, Android, etc.)

Figure 3. Sources of Risk

### 3. Participants and Roles

Our team not only included Hong and Frank as Project Managers, but it also included hypothetical input from two leadership executives at Nintendo to allow for more depth in the evaluation process. Each participant has specific events and sources to address according to their role in the company or in the project. The roles can be examined below, as well as an example of an evaluator lending his input by objective.

Participant Name	Permission	Has Data?
Frank Preketes	Project Manager	Yes
Furukawa	Evaluator	Yes
Hong Zou	Project Manager	Yes
Nicholas Stavrakakis	Project Manager	No
Professor Forman	Project Manager	No
Shigeru Miyamoto	Evaluator	Yes

Figure 4. List of Participants and Roles

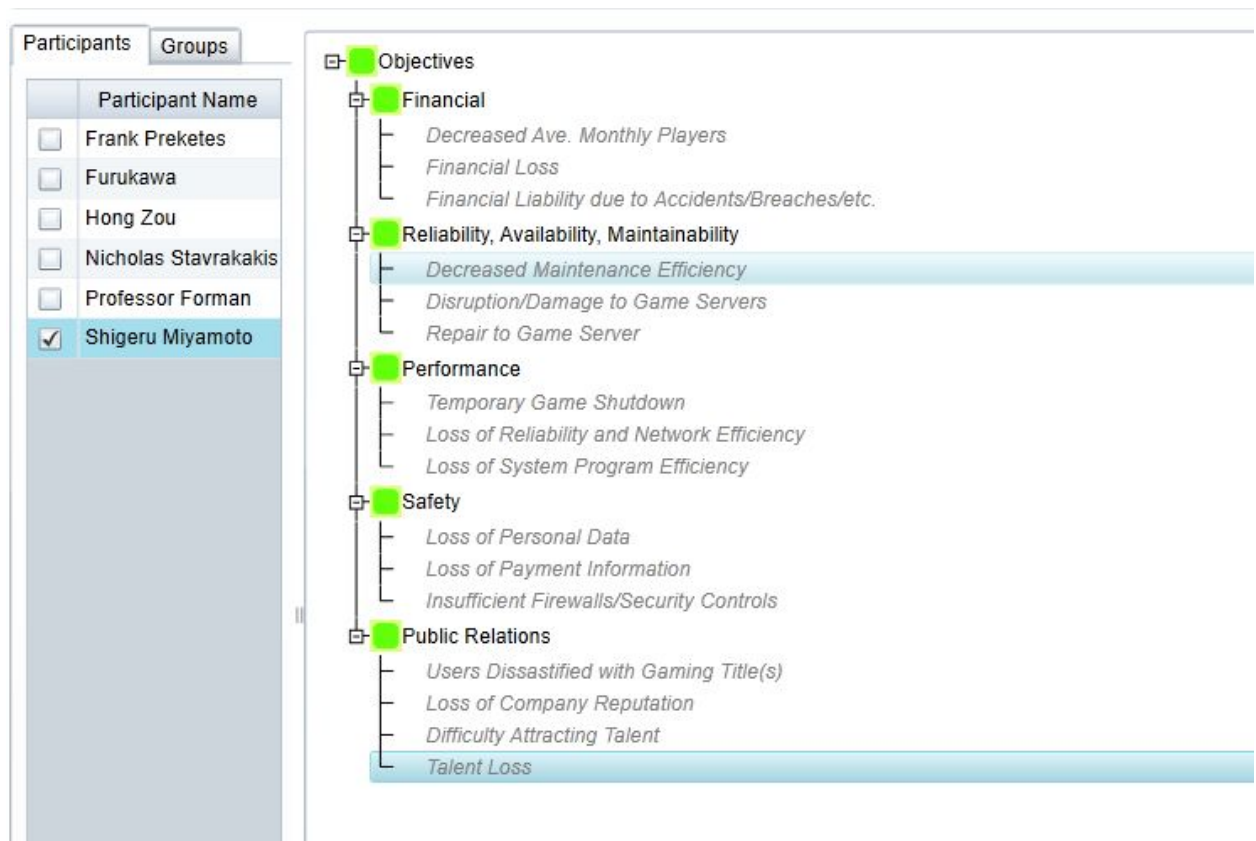


Figure 5. Example of Participant's Role in Identifying Objectives

#### 4. Likelihood of Events

The grids below illustrate the association between the identified events and their respective sources. We see that each event may or may not be linked to more than one source, which drive the likelihood of the event occurrence.

Events	Sources														
	Technological Infrastructure Failure						Human Capital Issues						Marketing Failures		
	System Software	System Hardware	New Cutting-Edge	System Failure	Server Bandwidth	Ineffective Payme	Competitive Pay/E	Lack of New Proj	Flexibility of Work	Culture	Work Locale Issu	Developers/Engin	Ineffective Survey	Bad Market Data	Ineffective Chann
<input type="checkbox"/> Gaming Interface Failure	<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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> High-Quality Talent Exodi	<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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Failed Marketing Campai	<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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Missed Revenue Forecas	<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"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Server Failure	<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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Payment Processing Sys	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input 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 type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Consumer Data Breach	<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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 6. Vulnerabilities Grid

#### 5. Impact of Events

This grid represents the association between the identified risk events and the consequences to which they may result. These sources of risk drive the particular consequences. Again, as we saw with the Vulnerabilities grid, each event may or may not be linked to multiple consequences.

Events	Objectives/Consequences														
	Financial			Reliability, Availability, Maintainability			Performance			Safety			Public Relations		
	Decreased Ave. M	Financial Loss	Financial Liability	Decreased Maint	Disruption/Damag	Repair to Game S	Temporary Game	Loss of Reliability	Loss of System P	Loss of Personal I	Loss of Payment I	Insufficient Firms	Users Disaffected	Loss of Company	Talent Loss
<input checked="" type="checkbox"/> Gaming Interface Failure	<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 checked="" 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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> High-Quality Talent Exodi	<input type="checkbox"/>	<input checked="" 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"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Failed Marketing Campai	<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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Missed Revenue Forecas	<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 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"/> Server Failure	<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 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"/> Payment Processing Sys	<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 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"/> Consumer Data Breach	<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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Figure 7. Impacts Grid

## Risk Measurement Methods and Scale

#### 6. Methods for Measuring Likelihood

Utilizing Riskeon, our team chose the ideal measurement scale and methods to evaluate the risk events. To measure the risk, the team used both the rating scale and pairwise method. Riskeon integrates the Analytical Hierarchy Process to assign specific weights to events and

objectives to allow for a mathematical approach to assist in determining overall importance. Each participant evaluated the events and objectives based on their assigned roles in the project. An example of how each method is approached and executed, as well as the various rating scales are shown in the figures below.

**Given Technological Infrastructure Failure, estimate the likelihood of each of the following Sources**

Technology Obsolescence | Technological Infrastructure Failure | System Software Technology Obsolescence | given Technological Infra... | Scale description

Source	Likelihood
Technological Infrastructure Failure System Software Technology Obsolescence	Somewhat Unlikely (One in 10) 10.00%
Technological Infrastructure Failure System Hardware Technology Obsolescence	Somewhat Unlikely (One in 10) 10.00%
Technological Infrastructure Failure New Cutting-Edge Technology Available	One in 3 33.30%
Technological Infrastructure Failure System Failure	Very Unlikely (One in 50) 2.00%
Technological Infrastructure Failure Server Bandwidth Incapable of Traffic Levels	Very Unlikely (One in 50) 2.00%
Technological Infrastructure Failure Ineffective Payment Processing	Highly Unlikely 1.00%

**System Software Technology Obsolescence**

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	

Figure 8. Rating Scale Measurement

**Which of the two Sources below is more likely**

Human Capital Issues | Marketing Failures

Extremely Very strongly Strongly Moderately Equal Moderately Strongly Very strongly Extremely

Human Capital Issues | Marketing Failures

Human Capital Issues given Sources | Marketing Failures given Sources

Erase Judgment

Figure 9. Pairwise Comparison Measurement

## **7. Methods for Events**

### a. Likelihood of Events for Events

Measure Event Likelihoods	Measurement Type Default: Rating Scale	Measurement Scale or Given Likelihood
<b>▲ Sources</b>		
— <b>▲ Technological Infrastructure Failure</b>		
System Software Technology Obsolescence	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
System Hardware Technology Obsolescence	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
New Cutting-Edge Technology Available	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
System Failure	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Server Bandwidth Incapable of Traffic Levels	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Ineffective Payment Processing	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
— <b>▲ Human Capital Issues</b>		
Competitive Pay/Benefits	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Lack of New Projects	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Flexibility of Work	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Culture	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Work Locale Issues	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Developers/Engineers Not Familiar with Mobile Gaming	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
— <b>▲ Marketing Failures</b>		
Ineffective Surveying	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Bad Market Data	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Ineffective Channels	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Difficulty Identifying Market Niche	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Insufficient Budget for Marketing	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
— <b>▲ Human Error</b>		
Inadequately Trained Staff	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Ineffective Policies, Process, or Procedures.	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Lack of Documented Policies, Process, or Procedures.	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Developers Failure to Properly Install Updates/Patches	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Developers Failure to Properly Handles Bugs	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
— <b>▲ Gaming Policy-Related</b>		
Complicated UI	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Endless Ads	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Free to Play	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
No Restriction on Purchasing	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
Distribution Platform Contracts (Apple, Android, etc.)	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼

Figure 10. Event Measurement (Likelihood)

### b. Impact of Events for Events

Measure Events With Respect To	Measurement Type Default: Rating Scale	Measurement Scale
<ul style="list-style-type: none"> <li>Objectives               <ul style="list-style-type: none"> <li>Financial                   <ul style="list-style-type: none"> <li>Decreased Ave. Monthly Players</li> <li>Financial Loss</li> <li>Financial Liability due to Accidents/Breach</li> </ul> </li> <li>Reliability, Availability, Maintainability                   <ul style="list-style-type: none"> <li>Decreased Maintenance Efficiency</li> <li>Disruption/Damage to Game Servers</li> <li>Repair to Game Server</li> </ul> </li> <li>Performance                   <ul style="list-style-type: none"> <li>Temporary Game Shutdown</li> <li>Loss of Reliability and Network Efficiency</li> <li>Loss of System Program Efficiency</li> </ul> </li> <li>Safety                   <ul style="list-style-type: none"> <li>Loss of Personal Data</li> <li>Loss of Payment Information</li> <li>Insufficient Firewalls/Security Controls</li> </ul> </li> <li>Public Relations                   <ul style="list-style-type: none"> <li>Users Dissatisfied with Gaming Title(s)</li> <li>Loss of Company Reputation</li> <li>Difficulty Attracting Talent</li> <li>Talent Loss</li> </ul> </li> </ul> </li> </ul>		
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale
	Rating Scale	Default Impact Scale

### Figure 11. Events Measurement (Impact)

## **8. Methods for Sources and Objectives**

### a. Likelihood of Events for Sources

Measure Likelihood	Measurement Type	Measurement Scale or Given Likelihood
▲ Sources	Pairwise Comparison ▼	
▶ Technological Infrastructure Failure	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
▶ Human Capital Issues	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
▶ Marketing Failures	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
▶ Human Error	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼
▶ Gaming Policy-Related	Rating Scale ▼	WIDE LIKELIHOOD RATING SCALE ▼

Figure 12. Source Measurement (Likelihood)

### b. Impact of Events for Objectives

As for measuring the impact of events for the objectives, the team decide on using a pairwise comparison method in Riskeon to assist with the evaluation. Using this method, it allowed the project managers and evaluators to take each event and objective and measure it against another event or objective. This allows for the team to determine the weight (importance) each holds in the overall determination.

Measure Importance With Respect To	Measurement Type	Measurement Scale
▲ Objectives	Pairwise Comparison ▼	
▲ Financial	Pairwise Comparison ▼	
Decreased Ave. Monthly Players		
Financial Loss		
Financial Liability due to Accidents/Breach		
▲ Reliability, Availability, Maintainability	Pairwise Comparison ▼	
Decreased Maintenance Efficiency		
Disruption/Damage to Game Servers		
Repair to Game Server		
▲ Performance	Pairwise Comparison ▼	
Temporary Game Shutdown		
Loss of Reliability and Network Efficiency		
Loss of System Program Efficiency		
▲ Safety	Pairwise Comparison ▼	
Loss of Personal Data		
Loss of Payment Information		
Insufficient Firewalls/Security Controls		
▲ Public Relations	Pairwise Comparison ▼	
Users Dissatisfied with Gaming Title(s)		
Loss of Company Reputation		
Difficulty Attracting Talent		
Talent Loss		

Figure 13. Measurement Methods for Objectives

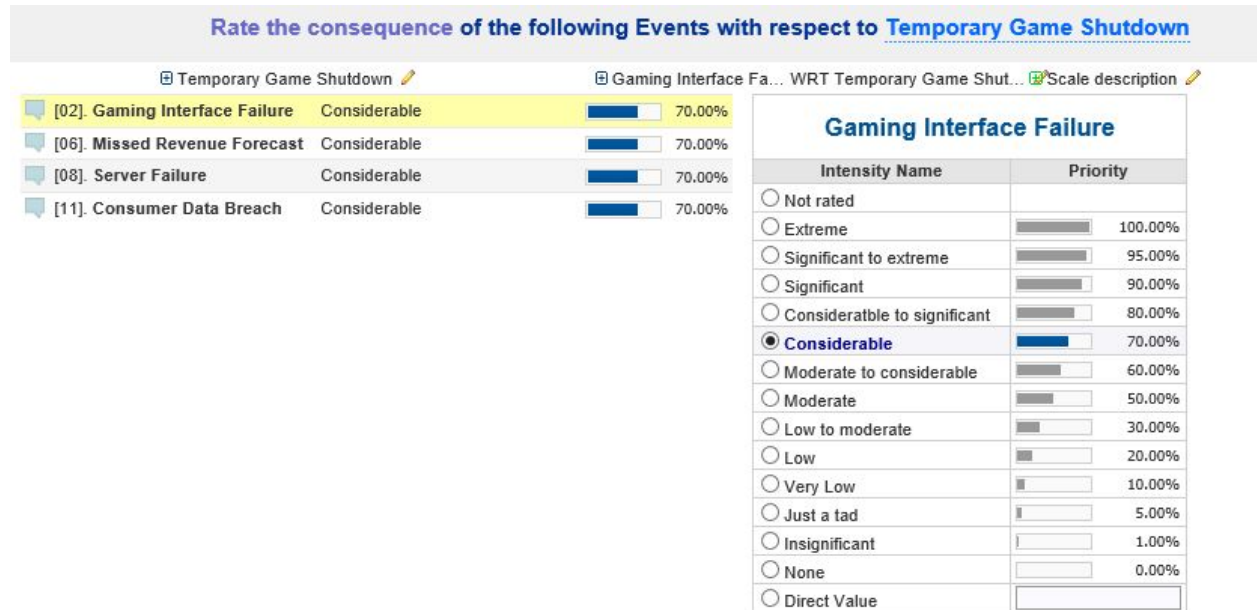


Figure 14. Pairwise Comparison Model

## 9.Synthesis/Sensitivity Analysis

### Synthesis: Likelihood of Events and Sources

These graphs are the synthesis/sensitivity graphs for our project on Riskion. In the figure Likelihood of Threats, Human Error, Marketing Failures and Technological Infrastructure stand out. Controls on these factors are crucial to our project.

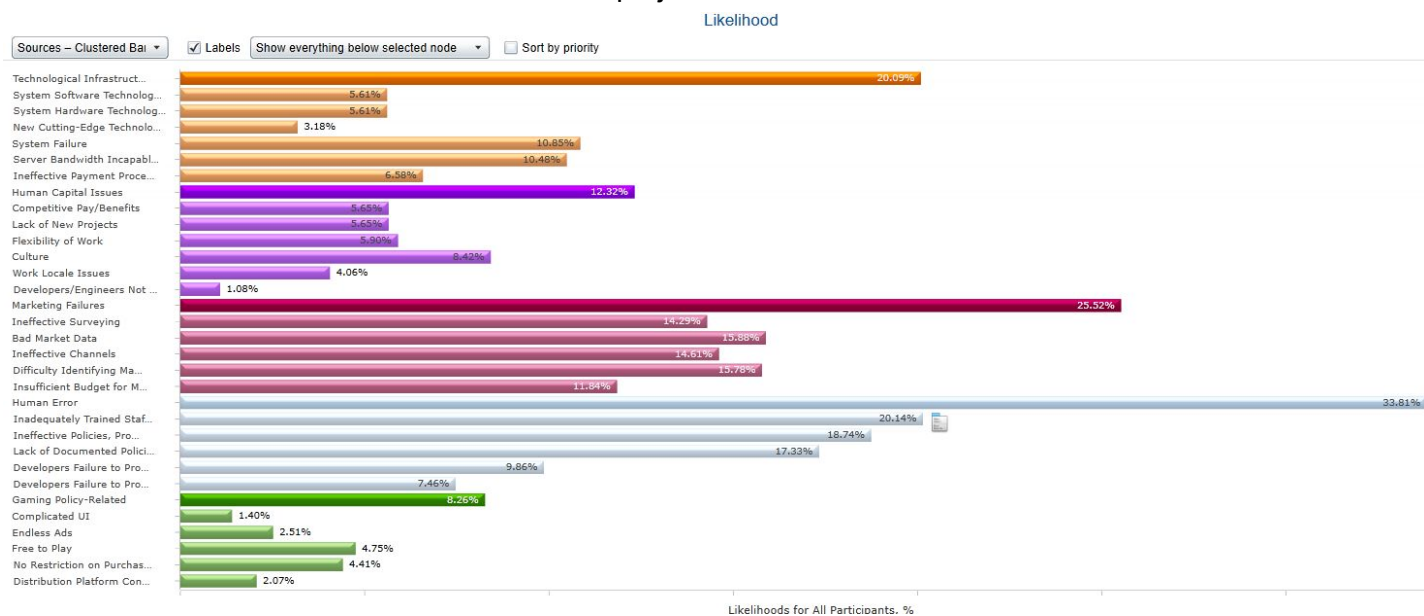


Figure 15. Likelihood of Threats

In the Figure. Likelihood of Events, it shows us that Missed Revenue Forecast, Failed Marketing Campaign and Gaming Interface Failure have the highest probabilities. This is understandable for adapting a brand new freemium mode means a totally different revenue mode for a company. Marketing campaign must be redirected at this point.

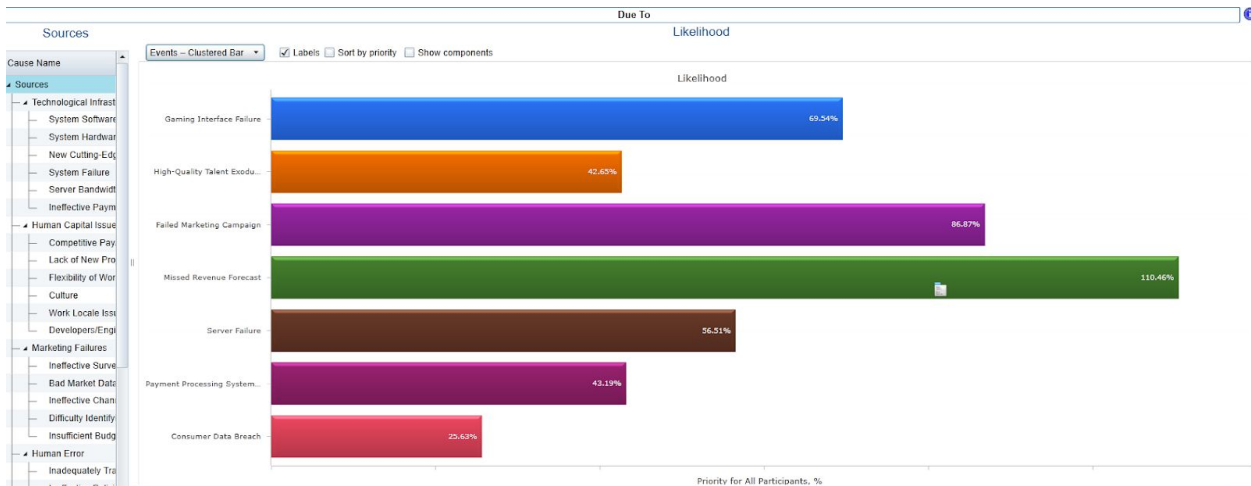


Figure 16. Likelihood of Events

The Figure. Impact of Events of Objectives tells us the most serious impact the risks could have. The financial issue is the main impact that would have on the company from the risks.

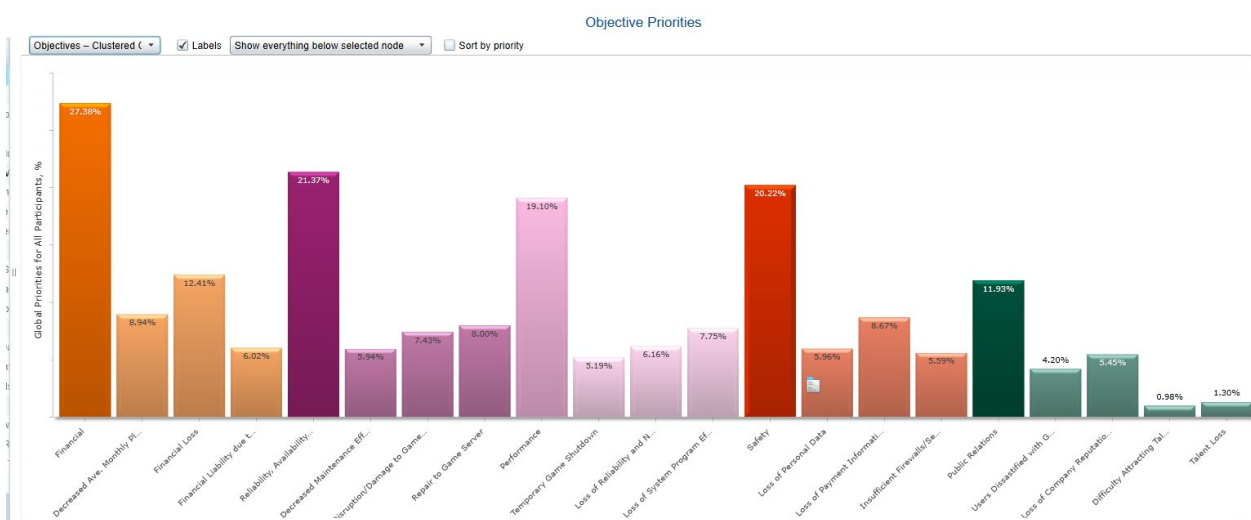


Figure 17. Impacts of Events of Objectives

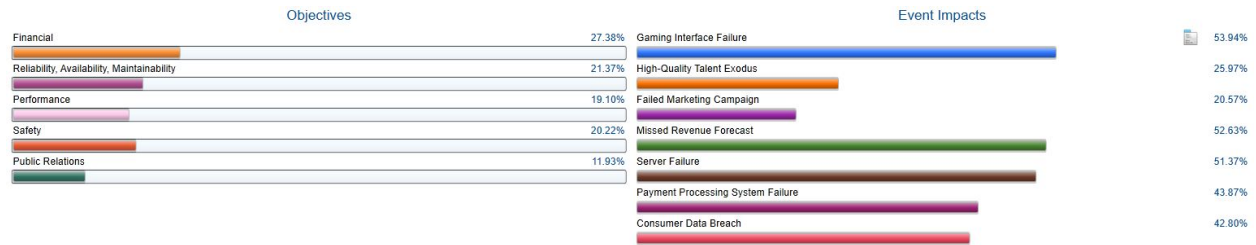


Figure 18. Sensitivity (Dynamic) of Objectives

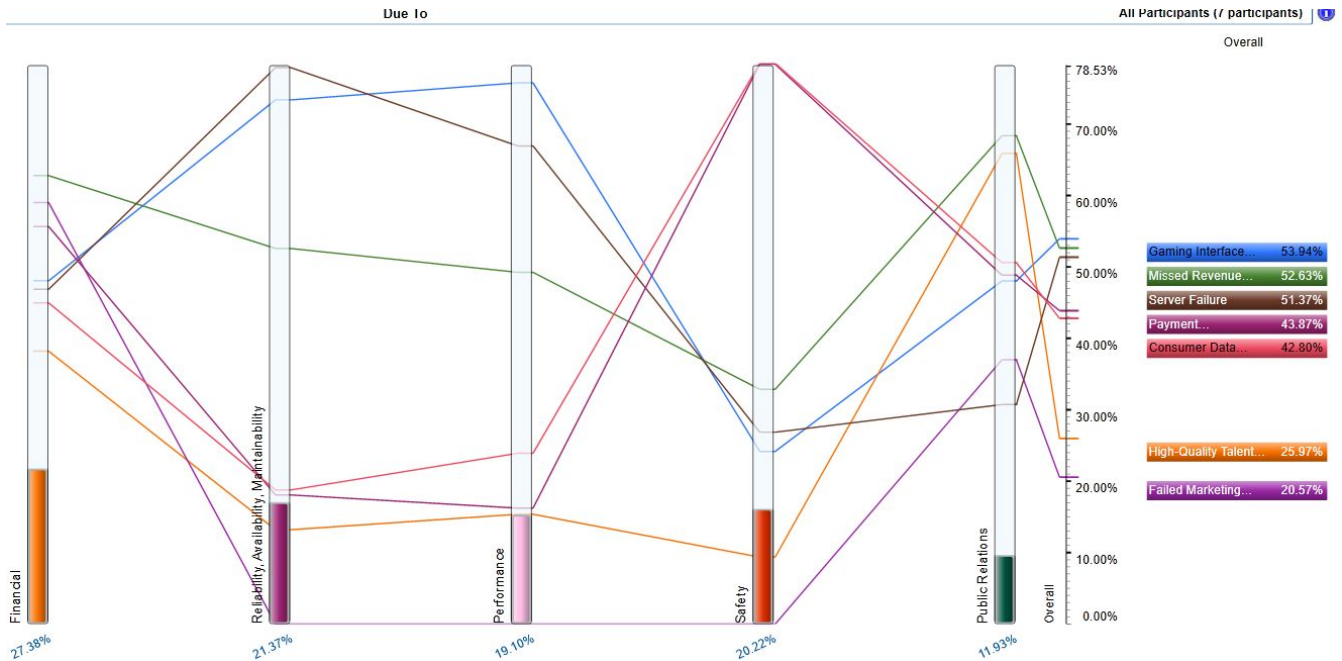


Figure 19. Sensitivity (Performance) of Objectives

## 10.Overall Risk (without controls)

Figure. Computed Overall Risk without Controls give us a full picture of the computed overall risks of our project. In this figure, Riskion give us the computed likelihood, impact and risk in a single form in non-monetary and monetary way. We could easily identify the main issues through the form.

No. ▲	Event		All Participants		
			Likelihood Computed	Impact Computed	Risk Computed
[02]	Gaming Interface Failure	≡	69.54%	53.94%	37.51%
[03]	High-Quality Talent Exodus	≡	42.65%	25.97%	11.08%
[04]	Failed Marketing Campaign	≡	86.87%	20.57%	17.86%
[06]	Missed Revenue Forecast	≡	110.46%	52.63%	58.14%
[08]	Server Failure	≡	56.51%	51.37%	29.03%
[10]	Payment Processing System Failure	≡	43.19%	43.87%	18.95%
[11]	Consumer Data Breach	≡	25.63%	42.80%	10.97%

Figure 20. Computed Overall Risk without Controls(Non-monetary)

No. ▲	Event		All Participants		
			Likelihood Computed	Impact, \$ Computed	Risk, \$ Computed
[02]	Gaming Interface Failure	≡	69.54%	4,584,517	3,188,029
[03]	High-Quality Talent Exodus	≡	42.65%	2,207,678	941,551
[04]	Failed Marketing Campaign	≡	86.87%	1,748,108	1,518,512
[06]	Missed Revenue Forecast	≡	110.46%	4,473,907	4,941,699
[08]	Server Failure	≡	56.51%	4,366,622	2,467,632
[10]	Payment Processing System Failure	≡	43.19%	3,729,296	1,610,739
[11]	Consumer Data Breach	≡	25.63%	3,638,175	932,583

Figure 21. Computed Overall Risk without Controls(Monetary)

Figure. Simulated Overall Risk without Controls give us a full picture of the simulated overall risk in one form, including likelihood, impact and risk.

No. ▲	Event		All Participants		
			Likelihood Simulated	Impact Simulated	Risk Simulated
[02]	Gaming Interface Failure	≡	53.80%	26.97%	14.51%
[03]	High-Quality Talent Exodus	≡	36.90%	13.18%	4.86%
[04]	Failed Marketing Campaign	≡	60.80%	9.73%	5.92%
[06]	Missed Revenue Forecast	≡	68.90%	30.87%	21.27%
[08]	Server Failure	≡	45.70%	24.39%	11.15%
[10]	Payment Processing System Failure	≡	36.10%	20.89%	7.54%
[11]	Consumer Data Breach	≡	24.20%	20.41%	4.94%

Figure 22. Simulated Overall Risk without Controls(Non-monetary)

No. ▲	Event		All Participants		
			Likelihood Simulated	Impact, \$ Simulated	Risk, \$ Simulated
[02]	Gaming Interface Failure	≡	53.80%	2,292,400	1,233,311
[03]	High-Quality Talent Exodus	≡	36.90%	1,120,315	413,396
[04]	Failed Marketing Campaign	≡	60.80%	827,233	502,958
[06]	Missed Revenue Forecast	≡	68.90%	2,623,998	1,807,935
[08]	Server Failure	≡	45.70%	2,073,446	947,565
[10]	Payment Processing System Failure	≡	36.10%	1,775,790	641,060
[11]	Consumer Data Breach	≡	24.20%	1,735,076	419,888

Figure 23. Simulated Overall Risk without Controls(Monetary)

## 11.Bow-Tie Diagram

Bow-Tie diagram offers us a vision of the causal relationships in different risk scenarios.

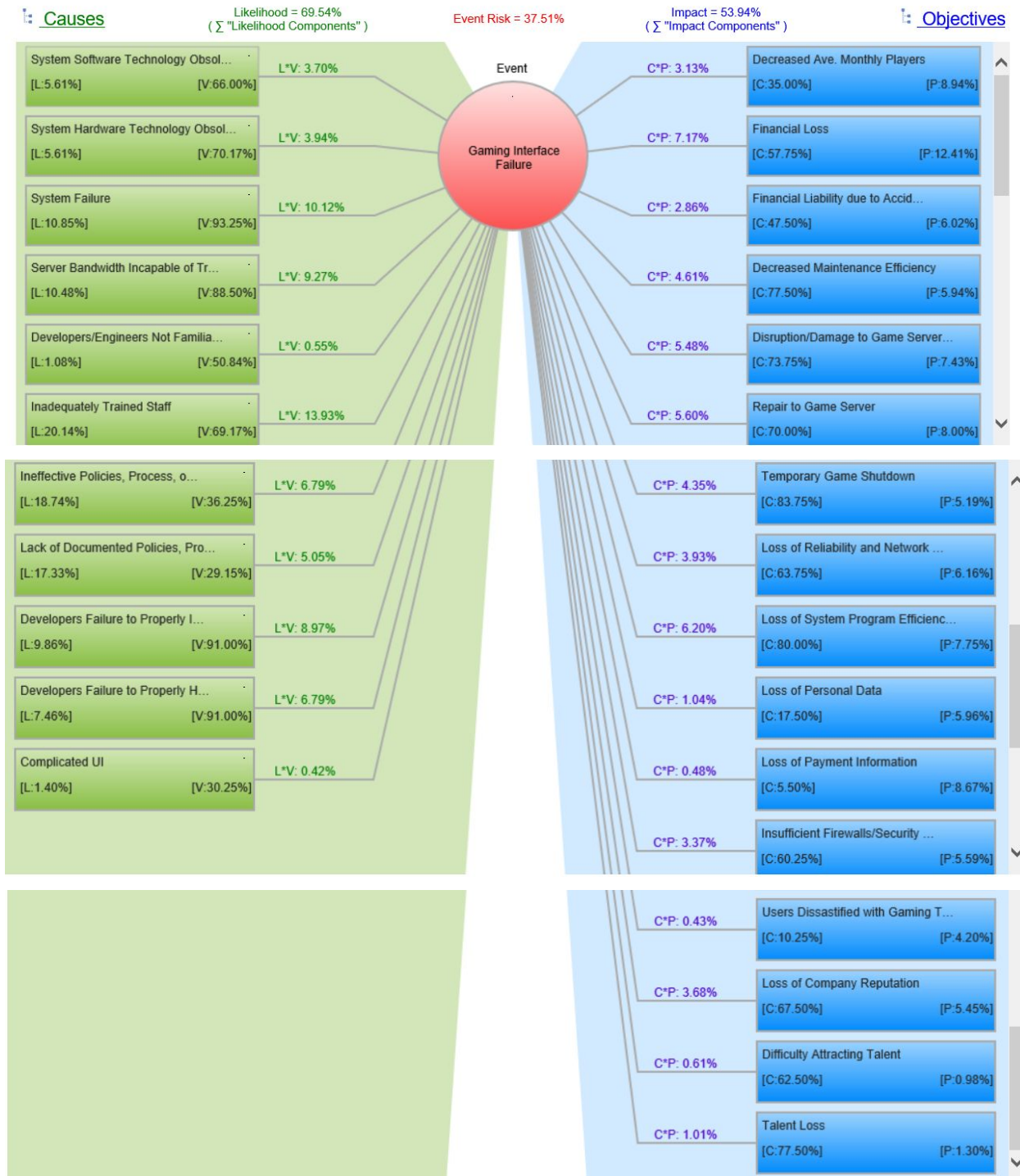


Figure 24. Bow-Tie Diagram(without controls)

## 12.Heat Map (without controls)

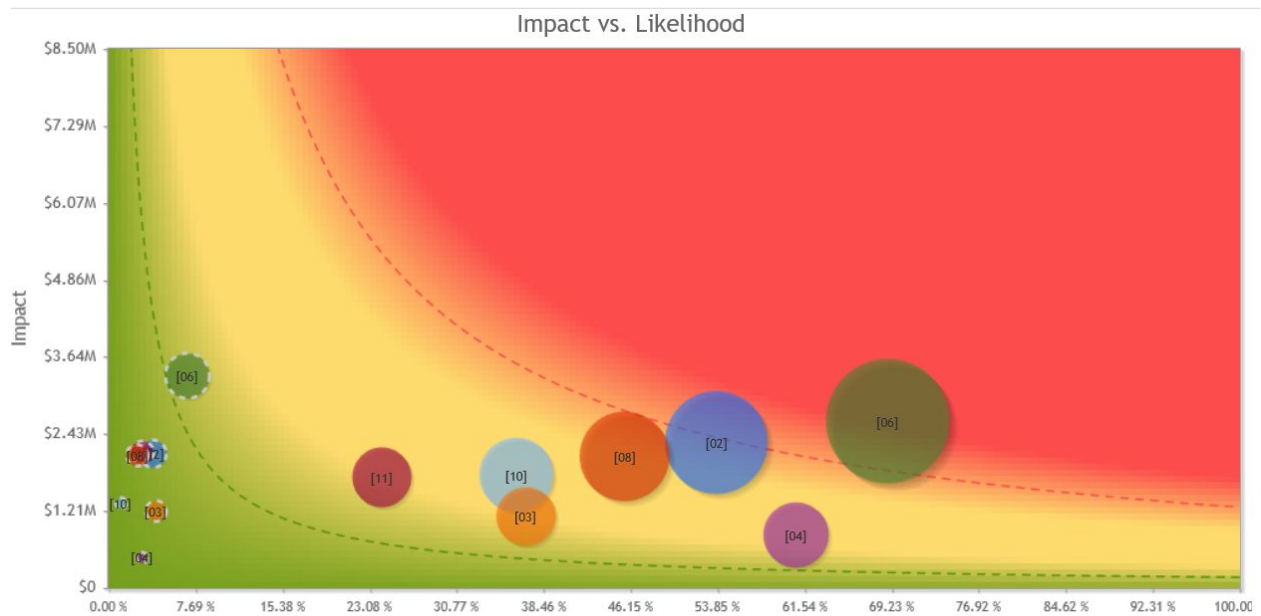


Figure 25. Heat Map without controls

## 13.Loss Exceedance Curve

From the Loss Exceedance Curve, we can see that there is a 5% probability that 8.5M dollars would be lost due to the risks.

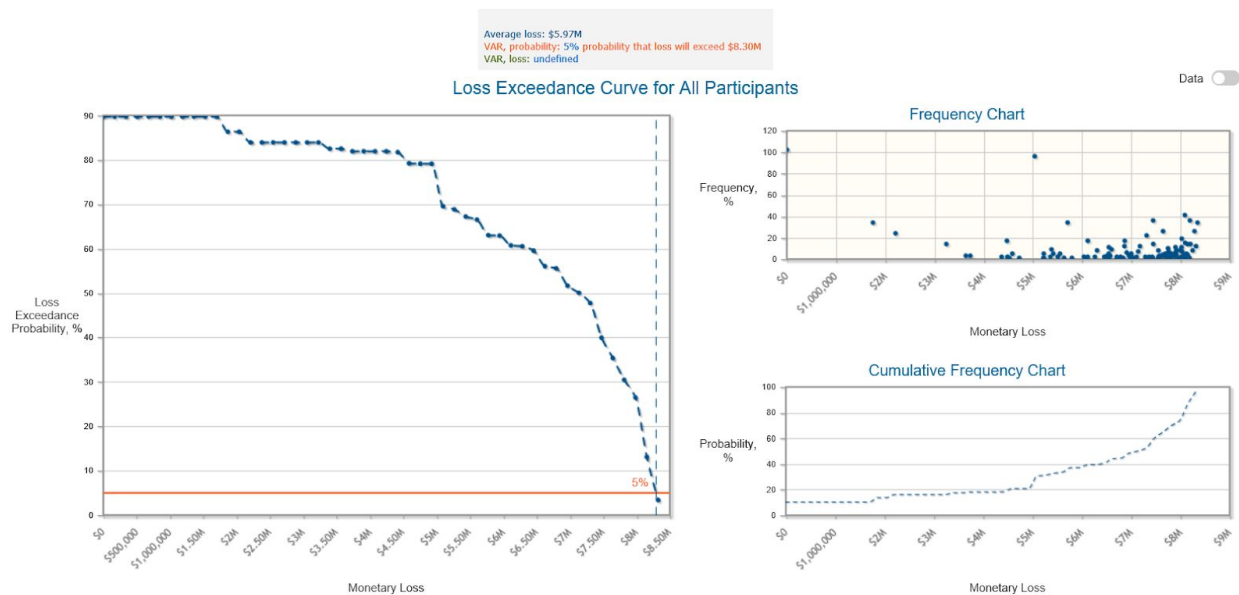


Figure 26. Loss Exceedance Curve

## 14. Manually Selected Controls

We have identified 20 controls at total for sources, events and objectives and we selected the most efficient controls manually to apply to our project.

Index	Selected	Control Name	Control for	Selected	Cost	Applications	Categories	Must	Must Not
01	<input checked="" type="checkbox"/>	Marketing Campaign	Cause	Yes	500000	12		<input type="checkbox"/>	<input type="checkbox"/>
02	<input checked="" type="checkbox"/>	Hardware Technology Update	Cause	Yes	70000	27		<input type="checkbox"/>	<input type="checkbox"/>
03	<input checked="" type="checkbox"/>	Software Technology Update	Cause	Yes	70000	12		<input type="checkbox"/>	<input type="checkbox"/>
04	<input checked="" type="checkbox"/>	Talent Attraction/Recruiting	Cause	Yes	70000	13		<input type="checkbox"/>	<input type="checkbox"/>
05	<input checked="" type="checkbox"/>	Employee Training	Cause	Yes	30000	16		<input type="checkbox"/>	<input type="checkbox"/>
06	<input type="checkbox"/>	Working Location Infrastructure	Cause		1500000	6		<input type="checkbox"/>	<input type="checkbox"/>
07	<input checked="" type="checkbox"/>	Distribution Platform Support	Cause	Yes	30000	12		<input type="checkbox"/>	<input type="checkbox"/>
08	<input checked="" type="checkbox"/>	Back up Server Lease	Cause	Yes	200000	7		<input type="checkbox"/>	<input type="checkbox"/>
09	<input checked="" type="checkbox"/>	Well-Documented Procedures	Cause	Yes	50000	3		<input type="checkbox"/>	<input type="checkbox"/>
10	<input type="checkbox"/>	Competitive Pay (Top-10)	Cause		5000000	5		<input type="checkbox"/>	<input type="checkbox"/>
11	<input checked="" type="checkbox"/>	Consumer Analysis	Vulnerability	Yes	140000	19		<input type="checkbox"/>	<input type="checkbox"/>
12	<input checked="" type="checkbox"/>	Technology Update	Vulnerability	Yes	70000	15		<input type="checkbox"/>	<input type="checkbox"/>
13	<input checked="" type="checkbox"/>	Game Repair	Vulnerability	Yes	8000	15		<input type="checkbox"/>	<input type="checkbox"/>
14	<input checked="" type="checkbox"/>	Talent Attraction	Vulnerability	Yes	30000	37		<input type="checkbox"/>	<input type="checkbox"/>
15	<input checked="" type="checkbox"/>	Business Analysis	Vulnerability	Yes	150000	17		<input type="checkbox"/>	<input type="checkbox"/>
16	<input checked="" type="checkbox"/>	Consumer Info Protection	Vulnerability	Yes	3000	10		<input type="checkbox"/>	<input type="checkbox"/>
17	<input checked="" type="checkbox"/>	New (More Aggressive) Marketing Campaign	Vulnerability	Yes	400000	16		<input type="checkbox"/>	<input type="checkbox"/>
18	<input checked="" type="checkbox"/>	Consumer Compensation	Consequence	Yes	30000	28		<input type="checkbox"/>	<input type="checkbox"/>
19	<input checked="" type="checkbox"/>	Game Repair	Consequence	Yes	10000	35		<input type="checkbox"/>	<input type="checkbox"/>
20	<input type="checkbox"/>	Increased Awards for Talent	Consequence		0	8		<input type="checkbox"/>	<input type="checkbox"/>

Figure 27. Selected Controls for Sources, Events and Objectives

## 15. Optimization (Compare to manually selected controls)

Level 1--700,000 dollars budget

We optimize our controls with the standard of no exceeding the 700,000 dollars budget. Then Riskion automatically help us optimize our controls regarding the efficiency and the cost of each control.

01	<input type="checkbox"/>	Marketing Campaign	≡	Cause		500000	12	+		<input type="checkbox"/>	<input type="checkbox"/>
02	<input checked="" type="checkbox"/>	Hardware Technology Update	≡	Cause	Yes	70000	27	+		<input type="checkbox"/>	<input type="checkbox"/>
03	<input checked="" type="checkbox"/>	Software Technology Update	≡	Cause	Yes	70000	12	+		<input type="checkbox"/>	<input type="checkbox"/>
04	<input checked="" type="checkbox"/>	Talent Attraction/Recruiting	≡	Cause	Yes	70000	13	+		<input type="checkbox"/>	<input type="checkbox"/>
05	<input checked="" type="checkbox"/>	Employee Training	≡	Cause	Yes	30000	16	+		<input type="checkbox"/>	<input type="checkbox"/>
06	<input type="checkbox"/>	Working Location Infrastructure	≡	Cause		1500000	6	+		<input type="checkbox"/>	<input type="checkbox"/>
07	<input checked="" type="checkbox"/>	Distribution Platform Support	≡	Cause	Yes	30000	12	+		<input type="checkbox"/>	<input type="checkbox"/>
08	<input type="checkbox"/>	Back up Server Lease	≡	Cause		200000	7	+		<input type="checkbox"/>	<input type="checkbox"/>
09	<input checked="" type="checkbox"/>	Well-Documented Procedures	≡	Cause	Yes	50000	3	+		<input type="checkbox"/>	<input type="checkbox"/>
10	<input type="checkbox"/>	Competitive Pay (Top-10)	≡	Cause		5000000	5	+		<input type="checkbox"/>	<input type="checkbox"/>
11	<input checked="" type="checkbox"/>	Consumer Analysis	≡	Vulnerability	Yes	140000	19	+		<input type="checkbox"/>	<input type="checkbox"/>
12	<input type="checkbox"/>	Technology Update	≡	Vulnerability		70000	15	+		<input type="checkbox"/>	<input type="checkbox"/>
13	<input checked="" type="checkbox"/>	Game Repair	≡	Vulnerability	Yes	8000	15	+		<input type="checkbox"/>	<input type="checkbox"/>
14	<input checked="" type="checkbox"/>	Talent Attraction	≡	Vulnerability	Yes	30000	37	+		<input type="checkbox"/>	<input type="checkbox"/>
15	<input checked="" type="checkbox"/>	Business Analysis	≡	Vulnerability	Yes	150000	17	+		<input type="checkbox"/>	<input type="checkbox"/>
16	<input checked="" type="checkbox"/>	Consumer Info Protection	≡	Vulnerability	Yes	3000	10	+		<input type="checkbox"/>	<input type="checkbox"/>
17	<input type="checkbox"/>	New (More Aggressive) Marketing Campaign	≡	Vulnerability		400000	16	+		<input type="checkbox"/>	<input type="checkbox"/>
18	<input checked="" type="checkbox"/>	Consumer Compensation	≡	Consequence	Yes	30000	28	+		<input type="checkbox"/>	<input type="checkbox"/>
19	<input checked="" type="checkbox"/>	Game Repair	≡	Consequence	Yes	10000	35	+		<input type="checkbox"/>	<input type="checkbox"/>
20	<input checked="" type="checkbox"/>	Increased Awards for Talent	≡	Consequence	Yes	0	8	+		<input type="checkbox"/>	<input type="checkbox"/>

Figure 28. Optimization Level 1

Level 2--500,000 dollars budget

In level 2, we optimize our controls with the standard of no exceeding the 500,000 dollars budget. Same as level 1, Riskion again automatically help us optimize our controls regarding the efficiency and the cost of each control.

01	<input type="checkbox"/>	Marketing Campaign	≡	Cause		500000	12	+		<input type="checkbox"/>	<input type="checkbox"/>
02	<input checked="" type="checkbox"/>	Hardware Technology Update	≡	Cause	Yes	70000	27	+		<input type="checkbox"/>	<input type="checkbox"/>
03	<input type="checkbox"/>	Software Technology Update	≡	Cause		70000	12	+		<input type="checkbox"/>	<input type="checkbox"/>
04	<input checked="" type="checkbox"/>	Talent Attraction/Recruiting	≡	Cause	Yes	70000	13	+		<input type="checkbox"/>	<input type="checkbox"/>
05	<input checked="" type="checkbox"/>	Employee Training	≡	Cause	Yes	30000	16	+		<input type="checkbox"/>	<input type="checkbox"/>
06	<input type="checkbox"/>	Working Location Infrastructure	≡	Cause		1500000	6	+		<input type="checkbox"/>	<input type="checkbox"/>
07	<input checked="" type="checkbox"/>	Distribution Platform Support	≡	Cause	Yes	30000	12	+		<input type="checkbox"/>	<input type="checkbox"/>
08	<input type="checkbox"/>	Back up Server Lease	≡	Cause		200000	7	+		<input type="checkbox"/>	<input type="checkbox"/>
09	<input checked="" type="checkbox"/>	Well-Documented Procedures	≡	Cause	Yes	50000	3	+		<input type="checkbox"/>	<input type="checkbox"/>
10	<input type="checkbox"/>	Competitive Pay (Top-10)	≡	Cause		5000000	5	+		<input type="checkbox"/>	<input type="checkbox"/>
11	<input type="checkbox"/>	Consumer Analysis	≡	Vulnerability		140000	19	+		<input type="checkbox"/>	<input type="checkbox"/>
12	<input type="checkbox"/>	Technology Update	≡	Vulnerability		70000	15	+		<input type="checkbox"/>	<input type="checkbox"/>
13	<input checked="" type="checkbox"/>	Game Repair	≡	Vulnerability	Yes	8000	15	+		<input type="checkbox"/>	<input type="checkbox"/>

14	<input checked="" type="checkbox"/>	Talent Attraction	Vulnerability	Yes	30000	37	+		<input type="checkbox"/>	<input type="checkbox"/>
15	<input checked="" type="checkbox"/>	Business Analysis	Vulnerability	Yes	150000	17	+		<input type="checkbox"/>	<input type="checkbox"/>
16	<input checked="" type="checkbox"/>	Consumer Info Protection	Vulnerability	Yes	3000	10	+		<input type="checkbox"/>	<input type="checkbox"/>
17	<input type="checkbox"/>	New (More Aggressive) Marketing Campaign	Vulnerability		400000	16	+		<input type="checkbox"/>	<input type="checkbox"/>
18	<input checked="" type="checkbox"/>	Consumer Compensation	Consequence	Yes	30000	28	+		<input type="checkbox"/>	<input type="checkbox"/>
19	<input checked="" type="checkbox"/>	Game Repair	Consequence	Yes	10000	35	+		<input type="checkbox"/>	<input type="checkbox"/>
20	<input checked="" type="checkbox"/>	Increased Awards for Talent	Consequence	Yes	0	8	+		<input type="checkbox"/>	<input type="checkbox"/>

Figure 29. Optimization Level 2

## 16. Efficient Frontier

Efficient frontier can give us information on what actions to take at a specific time to produce the most efficient and satisfying output.

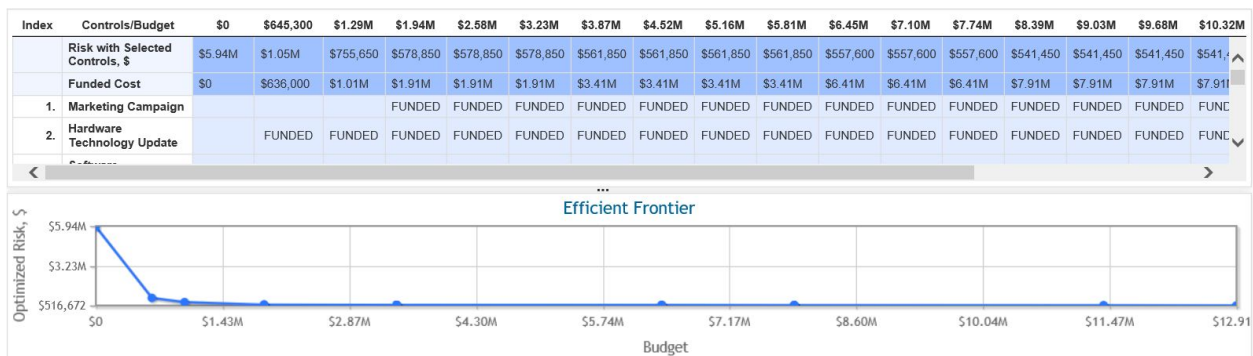


Figure 30. Efficient Frontier

## 17. Overall Risk(with controls)

The following graphs show the overall risks when we apply controls to the project.

No. ▲	Event		All Participants		
			Likelihood Computed	Impact Computed	Risk Computed
[02]	Gaming Interface Failure	≡	7.39%	34.04%	2.52%
[03]	High-Quality Talent Exodus	≡	8.06%	18.15%	1.46%
[04]	Failed Marketing Campaign	≡	6.77%	8.83%	0.60%
[06]	Missed Revenue Forecast	≡	13.71%	46.69%	6.40%
[08]	Server Failure	≡	6.22%	31.72%	1.97%
[10]	Payment Processing System Failure	≡	3.12%	26.49%	0.83%
[11]	Consumer Data Breach	≡	2.64%	39.20%	1.04%
# Controls			Computed		
14			Risk Reduction 168.72%		
Cost of Controls					
\$691,000					
How Selected					
Manually selected					

Figure 31. Computed Overall Risk with Controls(Non-monetary)

No. ▲	Event		All Participants		
			Likelihood Computed	Impact, \$ Computed	Risk, \$ Computed
[02]	Gaming Interface Failure	≡	7.39%	2,893,361	213,782
[03]	High-Quality Talent Exodus	≡	8.06%	1,542,580	124,305
[04]	Failed Marketing Campaign	≡	6.77%	750,899	50,804
[06]	Missed Revenue Forecast	≡	13.71%	3,968,741	544,291
[08]	Server Failure	≡	6.22%	2,695,875	167,768
[10]	Payment Processing System Failure	≡	3.12%	2,251,471	70,273
[11]	Consumer Data Breach	≡	2.64%	3,331,998	88,088
# Controls			Computed		
14			Risk Reduction \$14,341,433		
Cost of Controls					
\$691,000					
How Selected					
Manually selected					

Figure 32. Computed Overall Risk with Controls(Monetary)

No. ▲	Event		All Participants		
			Likelihood Simulated	Impact Simulated	Risk Simulated
[02]	Gaming Interface Failure	≡	6.10%	26.38%	1.61%
[03]	High-Quality Talent Exodus	≡	7.90%	16.21%	1.28%
[04]	Failed Marketing Campaign	≡	6.40%	7.74%	0.50%
[06]	Missed Revenue Forecast	≡	12.60%	40.61%	5.12%
[08]	Server Failure	≡	6.20%	24.51%	1.52%
[10]	Payment Processing System Failure	≡	2.90%	21.26%	0.62%
[11]	Consumer Data Breach	≡	3.40%	29.08%	0.99%
# Controls			Simulated		
14			Risk Reduction 58.56%		
Cost of Controls					
\$691,000					
How Selected					
Optimized based on simulated input and output with budget of \$700,000					

Figure 33. Simulated Overall Risk with Controls(Non-monetary)

No. ▲	Event		All Participants		
			Likelihood Simulated	Impact, \$ Simulated	Risk, \$ Simulated
[02]	Gaming Interface Failure	≡	6.10%	2,242,436	136,788
[03]	High-Quality Talent Exodus	≡	7.90%	1,377,751	108,842
[04]	Failed Marketing Campaign	≡	6.40%	658,245	42,127
[06]	Missed Revenue Forecast	≡	12.60%	3,451,768	434,922
[08]	Server Failure	≡	6.20%	2,083,744	129,192
[10]	Payment Processing System Failure	≡	2.90%	1,807,216	52,409
[11]	Consumer Data Breach	≡	3.40%	2,471,865	84,043
# Controls		Cost of Controls	How Selected		
14		\$691,000	Optimized based on simulated input and output with budget of \$700,000		
				Risk Reduction	Simulated \$4,977,789

Figure 34. Simulated Overall Risk with Controls(Monetary)

## 18.Heat Map(with controls)

Heat map give us a direct view of the likelihood and impact of risks. Figure Heat Map with controls is the graph showing the likelihood and impact of risks when we apply controls to our project.

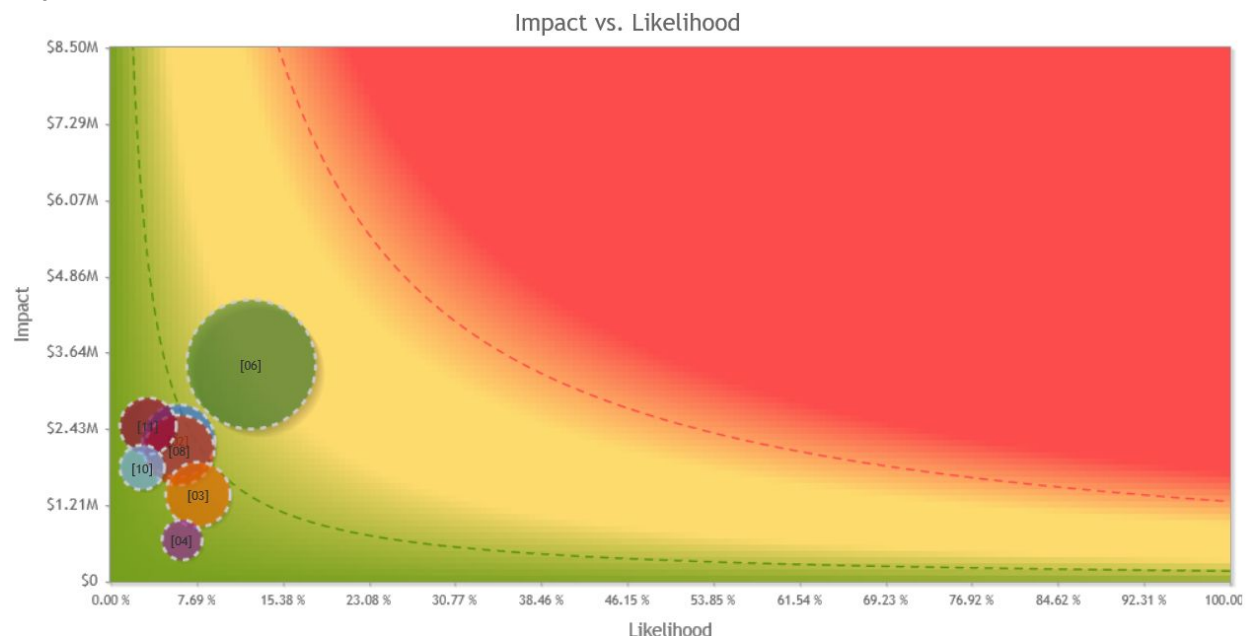


Figure 35. Heat Map with controls

## 19.Loss Exceedance Curve(with controls)

The figure below shows us that with applying controls, the lost and impact could be mitigated by approximately 3M dollars.

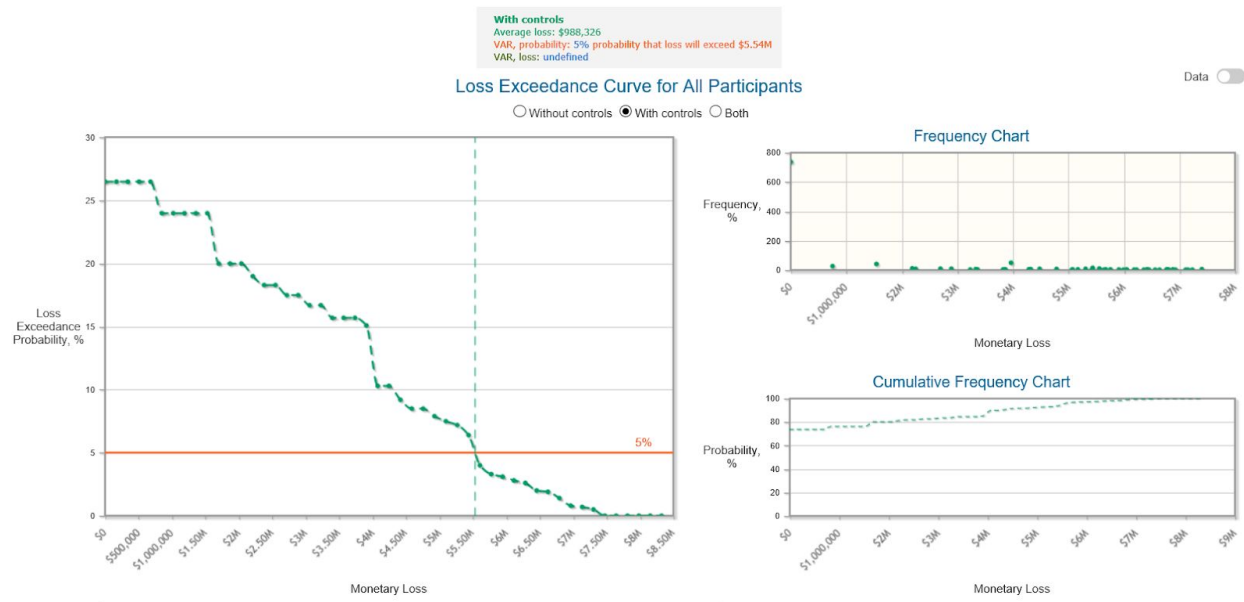


Figure 36. Loss Exceedance Curve with controls

## 20. Conclusion and Recommendation

With the unparalleled success of Epic's Fortnite, it is no wonder why many other gaming companies will explore transitioning to the freemium payment model that leans on in-game purchases, as opposed to up-front costs, to drive revenues. Analysis of the risks associated with Nintendo's potential transition into freemium gaming culminated in the evaluation of a plethora of risks associated with undertaking this extensive business model transition. By no means would this be a small feat, as Nintendo has been a staple in the gaming community for decades using their current business model.

It is this fact that makes it so crucial to be proactive and put various controls in place to limit the risk exposure of Nintendo before, during, and after this transition takes occurs. If this were a legitimate undertaking by Nintendo, they would need to thoroughly vet their objectives to ensure most, if not all, risk events have been identified to provide the best opportunity for a successful transition.