Contents

A	Abstract Acknowledgments		
\mathbf{A}			
1	Introduction		
	1.1	Chapter Introduction	1
	1.2	Background	1
	1.3	Problem Statements	4
	1.4	Research Objectives and Significance	5
	1.5	Structure of Dissertation	7
2	${ m Lit}\epsilon$	erature Review	9
	2.1	Chapter Introduction	9
	2.2	Motion in Mind Model	9
	2.3	Background on Gacha in Video Games	15
		2.3.1 Controversy with Gacha	15
		2.3.2 Pity system in Gacha	16
	2.4	Gambling and Addiction Theories	17
	2.5	Chapter Summary	21
3	Res	earch Methodology	22
	3.1	Chapter Introduction	22
	3.2	Data Collection	22
		3.2.1 Gacha from Genshin Impact	22

		3.2.2	Sports Games	23
		3.2.3	MOBA Games	23
		3.2.4	Overcooked! 2	23
	3.3	Experin	mental Design	24
	3.4	Data A	nalysis	24
	3.5	Chapte	r Summary	24
4	Eva	luating	Random Reward Games	26
	4.1	Chapte	r Introduction	26
	4.2	Backgro	ound of Gacha in Genshin Impact	26
	4.3	Data C	ollection and Analysis	29
	4.4	Border	between Gaming and Gambling	34
	4.5	Designi	ng an Ideal Gacha Game	36
	4.6	Signific	ance of the number of attempts η	43
	4.7	Chapte	r Summary	45
5	Pre	ssure aı	nd Difficulty in Games	47
5	Pre : 5.1		nd Difficulty in Games	47 47
5		Chapte	·	
5	5.1	Chapte	r Introduction	47
5	5.1	Chapte Formul 5.2.1	r Introduction	47 47
5	5.1 5.2	Chapte Formula 5.2.1 Finding	r Introduction	47 47 49
5	5.1 5.2	Chapte Formul 5.2.1 Finding 5.3.1	r Introduction	47 47 49 49
5	5.1 5.2	Chapte Formula 5.2.1 Finding 5.3.1 5.3.2	r Introduction	47 47 49 49
5	5.1 5.2	Chapte Formula 5.2.1 Finding 5.3.1 5.3.2 5.3.3	r Introduction	47 47 49 49 49 51
5	5.1 5.2	Chapte Formul. 5.2.1 Finding 5.3.1 5.3.2 5.3.3 5.3.4	r Introduction	47 47 49 49 49 51 52
5	5.15.25.3	Chapte Formul 5.2.1 Finding 5.3.1 5.3.2 5.3.3 5.3.4 Compa	r Introduction	47 47 49 49 51 52 53
	5.15.25.35.45.5	Chapte Formul. 5.2.1 Finding 5.3.1 5.3.2 5.3.3 5.3.4 Compa. Chapte	r Introduction	47 47 49 49 51 52 53 55
5	5.15.25.35.45.5	Chapte Formul 5.2.1 Finding 5.3.1 5.3.2 5.3.3 Compa Chapte mitoring	r Introduction	47 47 49 49 51 52 53 55

6.2 Experiment A: Random reward games			iment A: Random reward games	58
		6.2.1	Background of gacha in Genshin Impact	59
		6.2.2	Experimental Procedures	60
		6.2.3	Results and analysis	62
		6.2.4	Discussion	68
		6.2.5	Limitations	69
	6.3	Exper	iment B: Cooperation focused game	69
		6.3.1	Background of Overcooked! 2	70
		6.3.2	Experimental Procedures	72
		6.3.3	Results and analysis	73
	6.4	Chapt	er Summary	80
7	Con	clusio	n	82
7.1 Addressing the Research Questions			ssing the Research Questions	82
		7.1.1	Boundary between game and gambling	82
		7.1.2	Significance of pity system and designing an ideal gacha	83
		7.1.3	Influence of number of players in a teamwork setting	85
		7.1.4	Differences between pressure and mass in motion in mind	88
		7.1.5	Emotional link to motion in mind	89
	7.2	Conclu	uding Remarks	90
	7.3	Futura	- Works	91

List of Figures

2-1	The depiction of the intersections between v , a , and j in the context	
	of solved uncertainty over game progress	14
4-1	Screenshot of the price of gem bundles in Genshin Impact (2023), image	
	courtesy of Hoyoverse	28
4-2	Trend of reward frequency N across subsequent gacha attempts $$	33
4-3	The depiction of the border between gambling and gaming	36
4-4	Scatter plot of the pity against the probability gacha games with in-	
	creasing probability pity from Table 4.3	40
4-5	Scatter plot of the pity against the price per attempt of gacha games	
	with specific item guarantee and spark pity system from Table 4.3	41
4-6	The depiction of Magnitude of Extraordinary Experience (MEE) and	
	its relationship with Potential Reinforcement Energy (PRE) of varying	
	number of attempts η for events located within GR zone	44
6-1	Screenshot of Gacha animation for 4-star and 5-star characters (2023),	
	Image courtesy of Hoyoverse	60
6-2	Screenshot of experimental set up	61
6-3	Demographic data on age and location	62
6-4	Player Spending Habits	63
6-5	Player Motivation to Gacha	64
6-6	Example heart rate recorded from experiment of respondent with idle	
	heart rate of 72 bpm	65

6-7	Scatter plot of the increment of heart rate with respect to the number	
	of attempts to obtain the 5-star item	66
6-8	Emotions felt by players during the Experiment	67
6-9	Screenshot of the kitchen layout in Overcooked! 2. Important game	
	elements are highlighted using labels	70
6-10	Number of completed orders for respective levels throughout the ex-	
	periment	74
6-11	Velocity v_1 for respective levels throughout the experiment	76
6-12	Velocity v_2 for respective levels throughout the experiment	77
6-13	Heart rate of players during the end of the game with an idle heart	
	rate of 71 bpm	80

List of Tables

4.1	Summary of gacha wish history recorded from player	30
4.2	Motion-in-mind measures for average, luckiest, unluckiest and worst-	
	case based on gacha history	30
4.3	Summary of probability, price per attempt, pity counter and pity type	
	of various gacha games	39
5.1	Motion in mind values for soccer and futsal	50
5.2	Motion in mind values for 3x3 and basketball	51
5.3	Summary of motion in mind values for Badminton Singles and Doubles	52
5.4	Comparison of density and pressure of each MOBA modes	54
6.1	Summarized results from Questionnaire	64
6.2	Summarized results from Post-Experiment Survey	67
6.3	Examples of positive and negative emotions	67
6.4	Summary of results obtained from the experiments	73
6.5	Velocity for each level with respect to number of players	75
6.6	Average velocity, density, and pressure for each level with respect to	
	number of players	78
6.7	Average, minimum and maximum heartrate in beats per minute bpm	79