

NINTENDO DS™



CSCW To Go:

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Overview of our presentation

- Description of the DS from our literature review
- Comparative evaluation of the DS
- Discuss our study's scope
- Interviews with DS users
- Heuristic evaluation of four DS games
- Focused usability testing

An Overview of the DS

- Portable gaming device
- Manufactured by Nintendo
- Has two screens at 256x190 resolution
- Bottom screen is touch sensitive
- Contains a microphone
- 802.11b wi-fi connection and proprietary low-power short-range wireless

History of Nintendo Portables

- 1989 – Gameboy
- 1998 – Gameboy Color
- 2001 – Gameboy Advance
- 2003 – GBA SP
- 2004 – Original DS
- 2005 – DS Lite

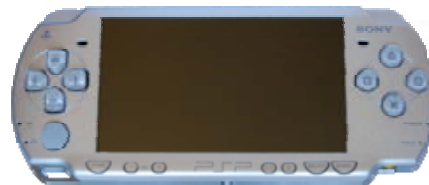


Literature Review

- We visited online forums at sites such as Gamespot to see how people used their DS
- Used Wikipedia to research different games
- Checked the ACM Digital Library for papers on mobile devices
- Located testing heuristics on Nokia forums

Comparative Evaluation

- Identified the major DS Competitor, the Sony PSP
- Wanted to test a cellphone as well
 - Decided to use the discontinued Nokia N-Gage



Comparative Evaluation Continued

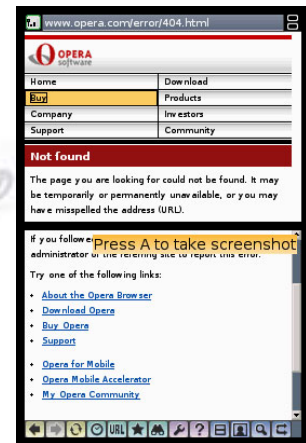
	Nintendo DS Lite	Sony PSP Slim	Nokia N-Gage QD
<i>Release Date</i>	November 2004	March 2005	October 2003
<i>Screen Size</i>	Two 256x190 pixel, 3 inches each	480x272 pixel, 4.3 inches	176x208 pixel,
<i>Weight</i>	275 grams	189 grams	143 grams
<i>Wireless</i>	802.11b WiFi	802.11b WiFi	GPRS cellular
<i>Processor</i>	ARM at 67&33 MHz	MIPS at 333 MHz	ARM at 104 MHz
<i>Storage</i>	Custom flash Up to 128 MB	UMD – 1.8 GB Flash – up to 8GB	MMC flash – up to 512 MB
<i>Extras</i>	Pictochat	Videos, music, web browser	Phone, WAP web browser
<i>Total Sales*</i>	57 million	27 million	2 million
<i>Current Price</i>	\$129	\$169.99	\$99 (discontinued)

Comparative Evaluation Conclusion

- DS focused on gaming, price, portability
 - Fast to boot up
 - No complicated menus
- PSP media focus and size detracted from experience
- Original N-Gage had ergonomic problems
 - Poor cell phone experience
- Multi-function devices not always best
 - Focus on gaming

Refining Scope

- The DS has over 500 games and applications – can't evaluate them all
- Quickly decided that we wanted to focus on specific aspects of the DS, particularly related to CSCW
- Initial ideas:
 - Opera Browser
 - PictoChat
 - Multiplayer games



Multiplayer: Three Variables

- For multiplayer, we decided to focus on three different variables (2 binary):
 - Co-location vs. separation of participants
 - Cooperative vs. Competitive games
 - Learning curve for a game
 - Later changed to the difference in skill level between participants

Interviews

- Interviewed 7 DS users
 - 6 SI students, one middle-schooler
- Questions focused on
 - Level of DS experience
 - Games played
 - Our multiplayer variables (Internet vs. short-range network play in particular)
 - PictoChat and Opera use

Interview Results

- **Level of DS experience**
vs.
PictoChat and Opera use
 - **more than 50%** interviewees are in advanced level
i.e. two of them own two DS for more than 1 year
 - **Only two** have ever used PictoChat
 - **Four** of them **didn't know** what PictoChat was
 - **Only two** have ever used Opera

Interview Results

Single-player games are fun in general

What they usually play:

Mario Kart, Mario Brothers, Brain Age, Elite Beat Agents

- **The games are fun because:**

- can be played anywhere anytime by oneself
- kill small blocks of spare time
- train game-playing skills
- be noticed

“When I played NintendoDogs, it was catching girls eyes with dogs – ‘So cute – I like this!’ “ –User 03

Interview Results

Be Self-Controlled

- **The single-player games are Not-so-Fun when:**
 - the games are time-consuming

“Some single-player games are too long – nothing seems new, so you want it to be over.”-User 02

“When playing the game, I feel like being controlled by the game. ”-User 04

“I don’t like it to eat up my time. ”-User 06

Interview Results

Interaction is King

- **Fun for playing with friends and family members**

*“We yield and curse to each other when playing that game and it was fun!”
-User 04*

- **Fun for seeing other players’ expression**

“Good to always have human players to play against. People use interesting techniques to gain an advantage.”-User 02

“The best part was beating him! And watching his expression.”-User 07

Interview Results

Better when playing with someone known

- **Multi-Player Game are Not-so-Fun when playing with strange someone**

“I curse when I play. Playing with someone I don’t know can’t let me have more reactions than that.” -User 04

“I never play with strangers. It’s weird.” -User 05

Interview Results

Better when players with close skill levels are matched

- **Not-so-Fun when playing with someone has a quite different skill level**

“I may best enjoy my experience when I find someone close to my skill level.” -User 07

*“I was frustrated when people leave if they are getting easily beaten.”
-User 01*

Interview Results

Playing over short-ranged network vs. Playing over the Internet

- **Short-ranged network**

Good – Easy to set up
– can know who is (are) other players

Bad – wi-fi dose not work when passwords are needed

Interview Results

Playing over short-ranged network vs. Playing over the Internet

- **The Internet**

Good – can play with anyone randomly
– can encounter un-expected strategies

Bad – long time to connect to a specific game
– “Friend Code” is needed

Evolving Scope

- After our interviews, we decided that multiplayer usage was far more common than PictoChat or Opera use
- Began designing multi-player centered usability tests that would measure the effect of our three variables to the level of fun and performance
- Compiled a list of multiplayer games from interviews and literature review for the tests and chose four from that list
- Decided to focus heuristic evaluation on identifying the best game for our tests from the four we tested.

Heuristic Evaluation

- We evaluated 4 Nintendo DS games:
 - Clubhouse Games
 - Elite Beat Agents
 - Mario Kart DS
 - Metroid Prime Hunters
- Used 15 of Nokias heuristics for mobile games
- Each team member had 2 games and 6 heuristics

Heuristics Considered

- Gaming Experience Heuristics (7)
 - Layout
 - Visibility of current state (game + system)
 - Consistency in navigation and control
 - Feedback on player's actions (self+others)
 - Error Recovery
 - Help Options in Game

Heuristics Considered

- Gameplay Design Heuristics (7)
 - Goals
 - Rewards (Progressive and Meaningful)
 - First Experience encouraging ?
 - Repetition and Boring tasks ?
 - Support expression of feeling to other players
 - Support for Competitive vs. Cooperative play
 - Use of orthogonal unit differentiation

Analyzing Results

- Severity Ratings

4
3
2
1
0

Severe usability problem; immediate action needed

Major usability problem; high priority

Minor usability problem; Low Priority

Tertiary usability problem; priority depends on resources

Does not pose a usability problem

Mario Kart

Mario Kart is a racing game where players can pick up and use a variety of colorful items on their opponents



Mario Kart

Observation	Heuristic	Severity
Can do some basic movements like jumping up and down, but no actual communication during multiplayer game over the Internet.	Ability to express one's feelings	2
Banana peels cause slipping and shells can be shot at players; larger characters slower to accelerate, smaller characters faster.	Orthogonal differentiation	0
Automatically searches and adds players who are searching for opponents too and notifies you. Does not support automatically resuming game with same opponent if connection broken.	Support Mobile Play	2

Metroid Prime Hunters

Metroid Prime Hunters is a first person shooter and adventure game where players take the role of a bounty hunter to fight alien space pirates.



Metroid Prime Hunters

Observation	Heuristic	Severity
You can choose your name and select from a list of avatars, but not express your feelings.	Ability to express one's feelings	2
Energy power-ups are represented by small circles, but it is easy to forget what does what. Certain switches that allow doors to open can blend in with the background and be missed.	Orthogonal differentiation	0
The first time experience is not very encouraging. It is difficult for novices to know where to move and they end up going around the same area.	Is the first experience encouraging?	3

Elite Beat Agents

Elite Beat Agents is a rhythm game where the user taps the DS touch screen in time with beats from songs and colorful stories playing in the background



Elite Beat Agents

Observation	Heuristic	Severity
In multiplayer, not much you can do to communicate with the other player, except select avatars.	Ability to express one's feelings	2
The energy bar locating on the top of the screen isn't very useful because game requires continuous attention; however agent behavior can indicate energy level which ameliorates problem.	Indication about current state	1
Out of the games reviewed, EBA probably has the least flexibility. In the multiplayer mode, players can team up against another player(s), but only if there are 3 or more players	Supports different styles of playing?	2

Clubhouse Games

Clubhouse Games allows players to play a number of traditional card games like Hearts and Poker, and other games like darts and battleship.



Clubhouse Games

Observation	Heuristic	Severity
In multiplayer, have a basic ability to send predefined chat messages that seem to work well for basic games. There isn't a way to express emotion otherwise though.	Ability to express one's feelings	1
Bowling/Word Balloon/Balance game has each player's current status to keep the player informed other people's progress.	Feedback about the state of players	0
A highlighting indicates current player. There is an indication for the current player to show what to click on. However, sometimes these different indications are not very intuitive.	Indication of current state	1

Usability Testing

- Used a “mobile usability lab” to bring the test to subjects on either central or north campus



Test Setup

- Used cameras to record each participant in separate rooms
- More important to capture users than the screen



Test Setup Continued

- Moderator took notes on paper, used laptop to communicate with other moderator via IM



Test Script: Introduction

- Users are escorted to separate rooms upon arrival
- One moderator is in each room
- Moderator reads overview of test
- User reads and signs consent form
- User fills out preliminary questionnaire
- User views tutorial video to provide introduction to future tasks on the DS
- User begins tasks

Usability Tutorial Video

QuickTime™ and a
H.264 decompressor
are needed to see this picture.

Usability Tasks

1. Single Player match with AI opponents
 2. Multiplayer separated competitively
 3. Multiplayer separated cooperatively
 - *One participant moves to room with other participant*
 4. Multiplayer co-located cooperatively
 5. Multiplayer co-located competitively
- Each task is done twice.
 - Task order for cooperative and competitive tasks is randomized
 - Participants fill out a questionnaire after each task

Usability testing Analysis

- Focus:
 - What and how does different setting of distance, game type and familiarity affect Nintendo DS players' user experience?
 - What are the mental models of players when playing in different modes?

Test Design

		Distance			
		Co-located		Co-distant	
Game Type		Competitive	Cooperative	Competitive	Cooperative
Familiarity	Beginner				
	Advanced				

2 levels of each independent variables:
Game type(2) x distance (2) x familiarity (2)
= 8 combinations of inputs

Usability testing Analysis

12 players, 48 session inputs (39 cleaned)

- Qualitative data
 - Verbal and non-verbal cues from video
 - Questionnaires
- Quantitative data
 - Record of performance
 - Likert scale ratings for Fun

Usability testing Analysis

	Qualitative data	Quantitative data
Qualitative analysis	Content Analysis	Interpretation of data
Quantitative analysis	Content Analysis (aggregated data)	Statistic Analysis: <ul style="list-style-type: none">•Basic measures•Linear Mixed Model Analysis

Findings

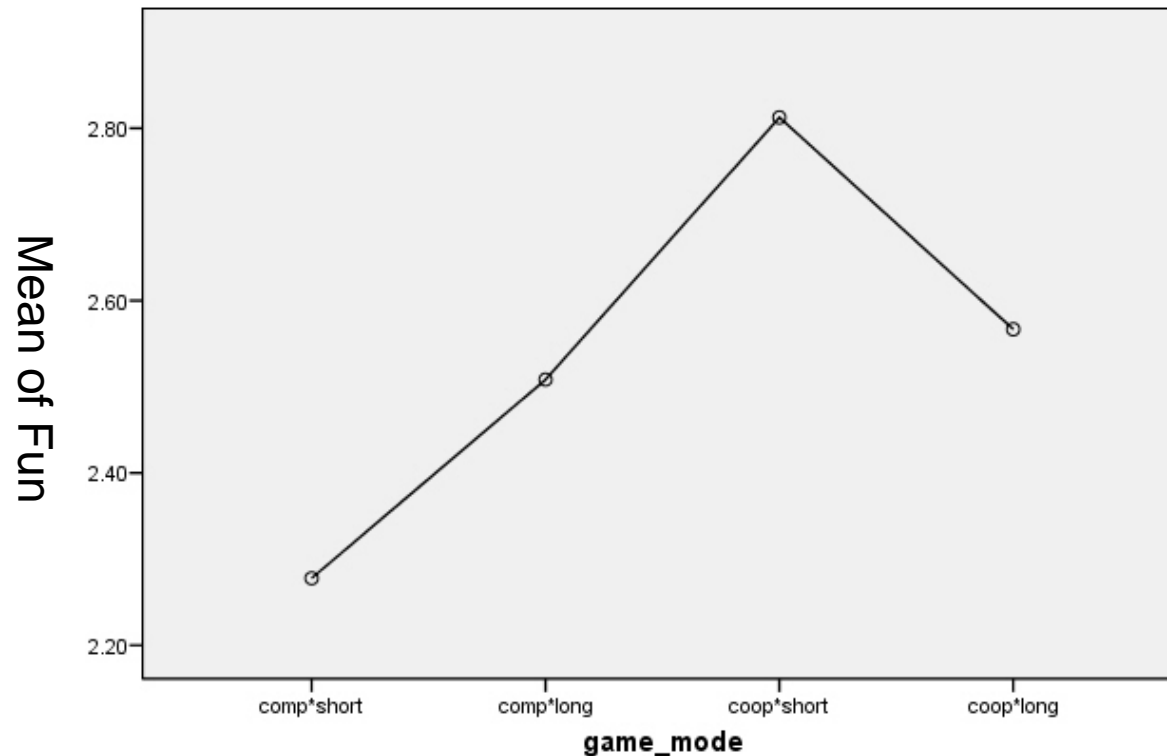
- No statistically significant difference in fun and performance for different modes of gaming settings
- However, we noticed potential interaction effect between 3 independent variables
- Interesting mental models presented in different modes of gaming sessions

Hypothesis testing

	Hypothesis	Result	Rejected?
Game Type	NO EFFECT for different settings	No significant difference $P > 0.1$	Can't reject
Distance		No significant difference $P > 0.1$	Can't reject
Familiarity to DS		No significant difference $P > 0.1$	Can't reject

Interaction Effects

Estimated Marginal Means of fun



Noticeable difference in different game modes

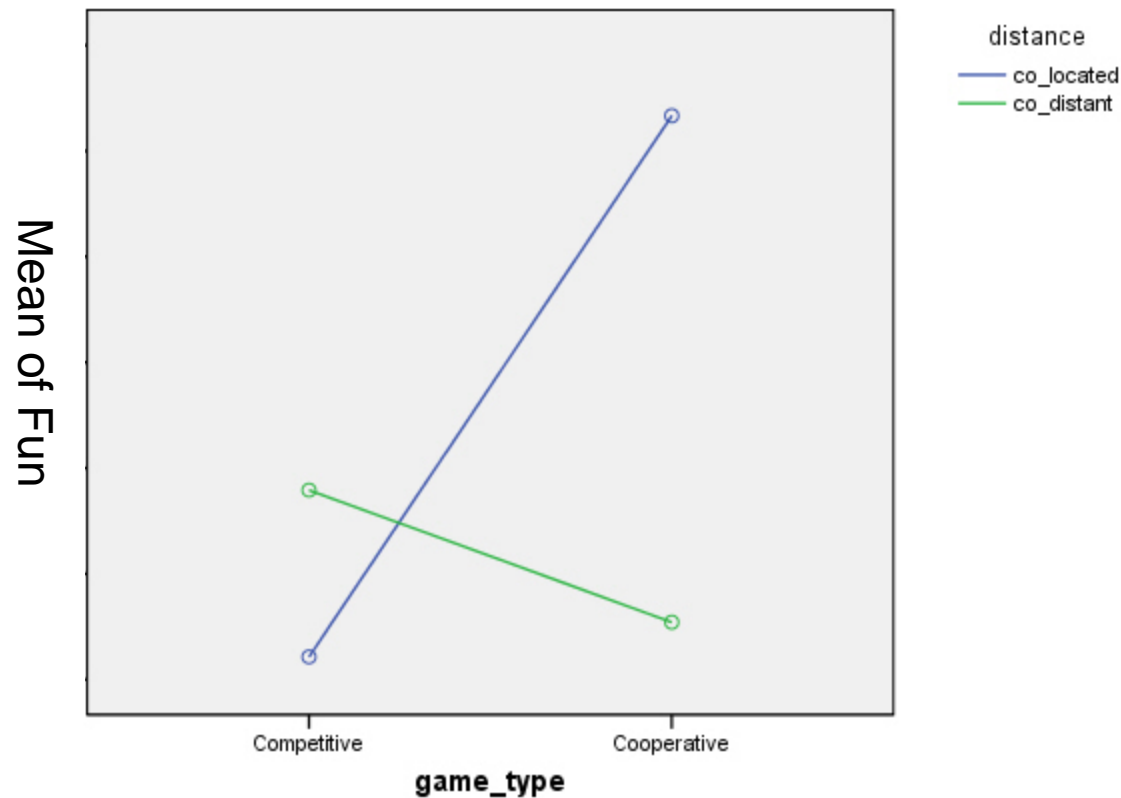
- Highest:
cooperative game in the same room
- Lowest:
competitive game in the same room

Interaction Effects to Fun

Interaction effects between
Game Type and **Distance**
Familiarity and **Distance**

Interaction Effects

Game Type vs Distance



Finding:

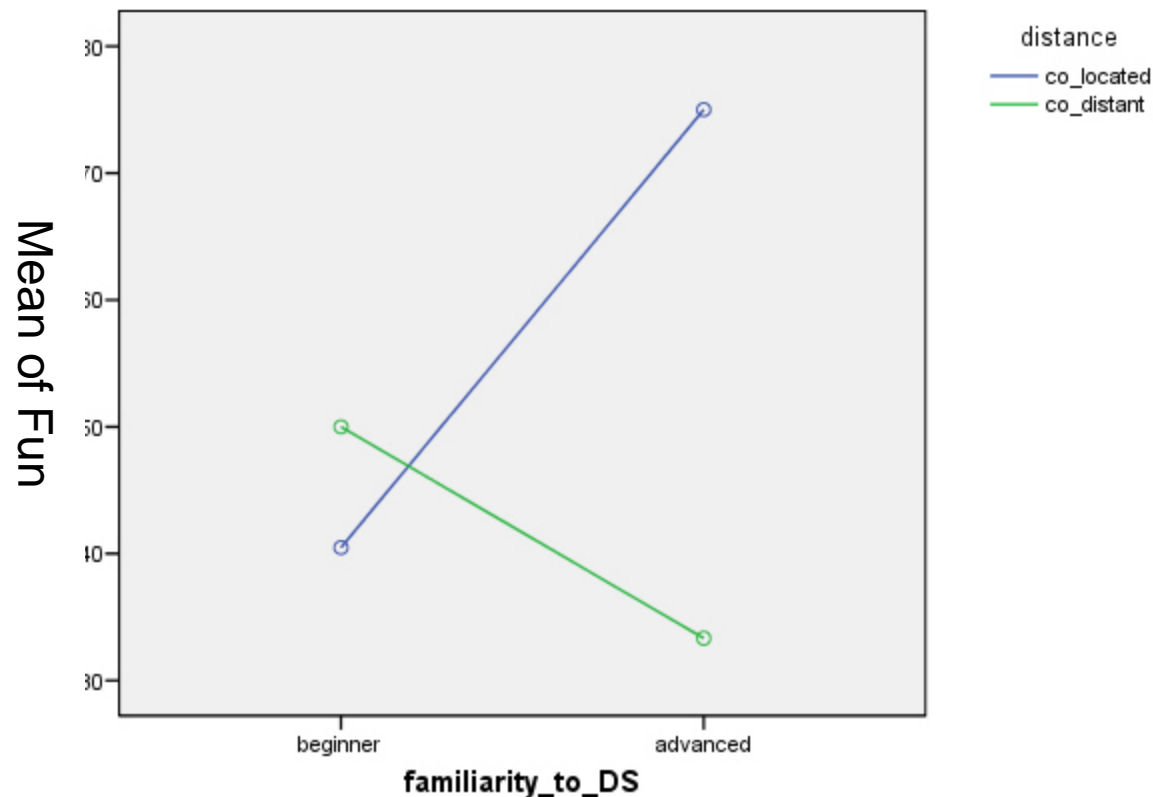
- Players have less fun when competing in the same room
- However, they gain more fun when cooperating in the same room

Interpretation

- Players didn't like to play against each other (strangers) within the same room.
 - *“I can't express my feeling when I am winning or losing because I don't know her in person”*
 - *“Fun to play while attacking the computer and not necessary against another person. No one gets hurt”*
- Players like to be able to communicate with other players when cooperating
 - *“We can communicate with each other about the strategy”*
 - *“Being in the same team is much more fun and it's good to communicate with the teammate!”*

Interaction Effects

Familiarity vs Distance



Finding:

- Advanced players gained more fun when playing co-located
- Beginners gained same amount of fun regardless the distance

Interpretation

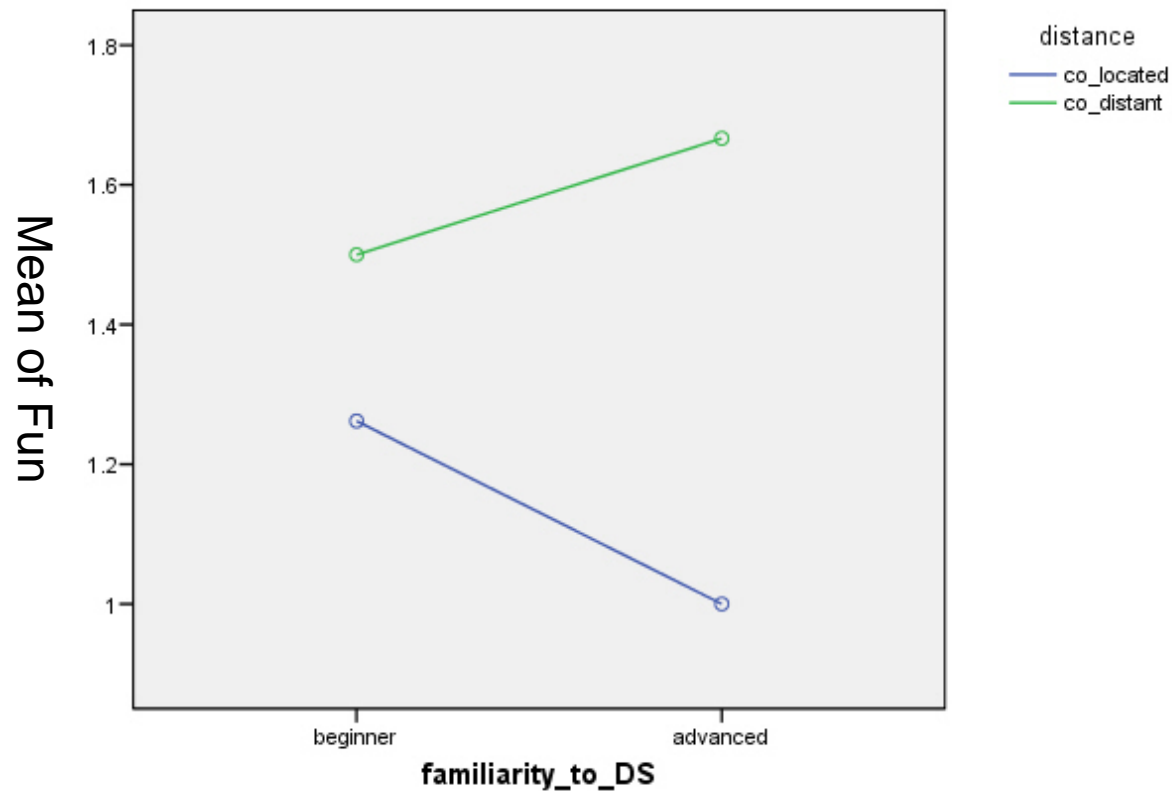
- For Advanced players, they sensed more difference between playing with human in the same room
 - *“I can tell how he is doing by their reactions and the sound of the game”*
 - *“I liked it when I played and helped other players. I have more satisfaction”*

Interaction Effects to Performance

Interaction effects between
Familiarity and Distance

Interaction Effects

Familiarity vs Distance



Finding:

- Players performed better when playing co-distant
- Advanced players performed much worse when playing in the same room

Interpretation

- Advanced Players didn't try their best when matched with others who have very different skill levels (mismatching)
 - *“I don't feel the sense of achievement when I play with the beginners – advanced player”*
 - *“Last task, I think he let me won - beginner”*

Recommendations

- Matching skill levels promotes fun and performance
 - Some games already support this at a basic level, but it could be better
- Cooperative play promotes more fun than competitive play when co-located
 - Few games support cooperative play now
- Gaming is a social activity when people can see each other
 - Support social interactions in remote gaming (audio communication)
 - Recreate the co-located experience at a distance

Lessons Learned

- Difficulties with no-shows was magnified by our use of pairs
 - Next time, would have better fallback plan if one person does not show
- Information travels quickly on the Internet
 - We posted on Facebook marketplace and si.all.open looking for users
 - Posting migrated to www.slickdeals.net
- Test design and Analysis are hard!
 - Needs thorough planning before launched

Thank you for watching

- Any Questions?