

Masterarbeit Disputation

Konzeption und Entwicklung einer asymmetrischen AR-/3D-Multiplayer-Anwendung zur Beobachtung des Kommunikationsverhaltens zwischen Individuen

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(O. V. 2024)





Problemstellung

- Durch COVID-19 Lockdowns und soziale Distanzierung
 - -> verstärkte Einsamkeit und psychische Belastung
- Studien stellen Online-Gaming als Bewältigungsstrategie heraus (vgl. Lewinson et al. 2023):
 - Reduktion von Stress, Angst, Depression und Einsamkeit
 - Besonders wirksam durch soziale Interaktion im Spiel

- Nach Pandemie: anhaltende Einsamkeit bei jungen Erwachsenen (vgl. Peer/AFP 2024)
- Wenig persönliche / telefonische Kommunikation verstärkt Problematik (vgl. Sakurai et al. 2021, S. 3)
- -> Soziale Interaktion gezielt anstoßen und strukturell unterstützen
- -> Spiel- und Interaktionssysteme aktiv zur Prävention von Isolation einsetzen

Problemstellung

Stand der Forschung und Anknüpfung

- Setzt an der Arbeit von Nasir et al. 2013 und Nasir et al. 2015 an, bei denen es das Kennenlernen und zusammenarbeiten durch ein gestaltetes "Ice-Breaking" Spiels geht
 - Erweiterung im Sinne der direkten Kommunikationsverbesserung von Individuen vorher und nachher
- Integrierung von Co-Lokalisiertem Spiel zur Verbesserung der Kommunikation (vgl. Goddard et al. 2016)

- Interdependence (Abhängigkeit): beschreibt das Ausmaß, in dem Gruppenmitglieder aufeinander angewiesen sind, um ihre Aufgaben effektiv zu erfüllen (vgl. Depping/Mandryk 2017, S. 451)
 - Erwähnt in Harris et al. 2014, Harris et al. 2016 und Harris/Hancock 2019
- Degress of Interdependence: Grad der Abhängigkeit der Rollen (vgl. Harris/Hancock 2019, S. 7)
- Soziale Präsenz: beschreibt das Gefühl, mit einem anderen zusammen zu sein (vgl. Biocca et al. 2003, S. 1)

Wichtige Begriffe

Forschungsfragen

- Kann eine spielbasierte Umgebung für die Untersuchung und Verbesserung von Kommunikation zwischen zwei oder mehreren Personen realisiert werden?
- Welche spezifischen Eigenschaften muss eine solche Umgebung aufweisen und welche Kommunikationsparameter werden dabei angesprochen?
- Welche Verbesserungen in der Kommunikation zwischen den Anwendern können durch ein asymmetrisches Multiplayer-Spiel mit zwei verschiedenen Spielerklassen beobachtet werden?
- Welche Unterschiede können in der Art das Kommunikationsverhalten bei der Verwendung von zwei unterschiedlichen Anwendungen (AR und 3D) (festgestellt/beobachtet) werden?
- Wie stehen die Nutzer zu einem spielerischen Ansatz und zur Verbesserung der Kommunikation, insbesondere auch im Umgang mit Fremden?

Methodisches Vorgehen

Analyse des Stands der Technik Konzeption und Entwicklung der Anwendung

Vortestphase der Anwendungen Haupttestphase der Versuchsdurchführung Auswertung und Interpretation der Ergebnisse

Analyse des Stands der Technik







- Wechselseitige Abhängigkeiten (Interdependenzen) -> als zentraler Faktor für Kommunikation und Kooperation
- Designprinzipien: Mehrstufige Rätsel, über und untergeordnete Rätselkomponenten, bidirektionaler Spielfluss
- Alleinstellungsmerkmale: Ansicht auf die (fast) gleiche Spielwelt mit verborgener Spielerposition -> Förderung verbaler Kommunikation über Beschreibung

Player:

- der sich innerhalb der Spielwelt bewegt und mit der Spielwelt interagieren kann
- stößt auf Hindernisse/ Rätsel
- entdeckt neue Hilfsgegenstände zum Lösen der Rätsel

Watcher

- der die Spielwelt vor sich hat
- besitzt Inventar mit allen gesammelten Gegenständen
- Kann Gegenstände platzieren, entfernen, drehen, vergrößern und an Player schicken
- Beide Spieler sehen sich gegenseitig nicht

Vorstellung des Spielkonzepts

Entwicklung der Player-Anwendung

Diablo 4



(Coates o. J.), (Blizzard Entertainment 2023)

Baldurs Gate 3

(Dawe 2023), (Larian Studios 2023)





Outlanders



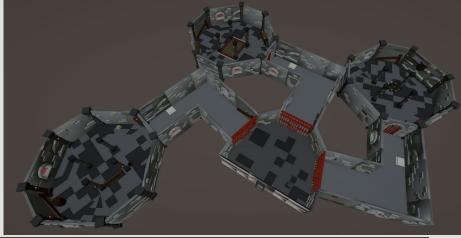
(Coates o. J.), (Pomelo Games 2019)



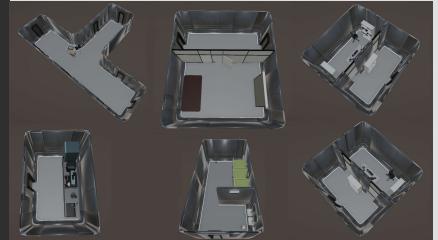


Entwicklung der Watcher-Anwendung

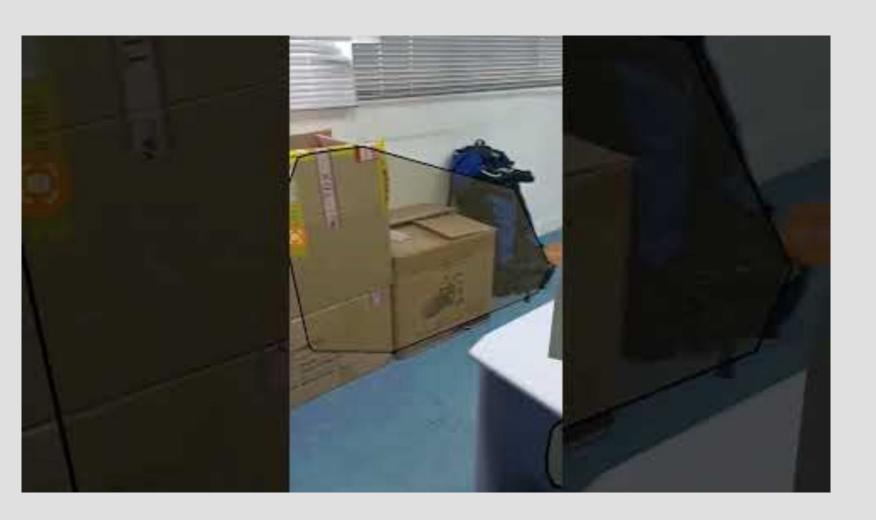
Tutorial







Probleme in der Umsetzung



(O. V. 2025)

 Version 4 der ARFoundation wohl dafür verantwortlich (vgl. aardruss 2023)

Vortestphase der Anwendungen

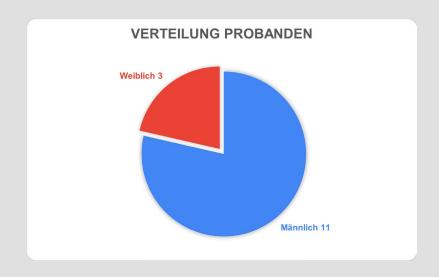






Handlungsempfehlungen

Haupttestphase



WELCHER SPIELERTYP BIST DU?

Socializer: 0

Achiever: 4

Explorer: 7







(Cespedes et al. 2023)

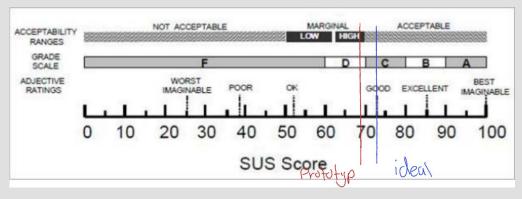






Ergebnisse der Haupttestphase

SUS - Player 69.29 14, 12 W(7) = 0.94, p = 0.78 5US - Player 68.93 14, 28 W(7) = 0.94, p = 0.78 5US - Vatcher 68.93 14, 28 W(7) = 0.97, p = 0.98 6CQ - IGM - Kompetenz 2.54 0.89 0CG - IGM - Kompetenz 2.54 0.89 0CG - IGM - Kompetenz 2.56 0.99 W(7) = 0.98, p = 0.91 6CQ - IGM - Immersion 2.5 0.96 0CG - IGM - Immersion 2.6 0CG - IGM - Immersion 2.7 0CG - IGM - Immersion 2.7 0CG - IGM - Immersion 2.8 0.99 W(7) = 0.84, p = 0.11 0CG - IGM - Immersion 2.9 0.99 W(7) = 0.84, p = 0.11 0CG - IGM - Immersion 2.9 0.99 W(7) = 0.84, p = 0.11 0CG - IGM - Immersion 2.9 0.99 W(7) = 0.98, p = 0.95 0.99 W(7) = 0.9	Fragebogen	Mittelwert	Standardabweichung 💌	Test	Vergleich _
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GEQ - IGM - Flow					
GEQ - IGM - Flow - P					p=0.60; t=2.24
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GEQ - IGM - Anspannung					
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GEQ : IGM - Anspannung - P	GEQ - IGM - Anspannung	0.89			
GEQ - IGM - Anspannung - W				W(7) = 0.7 p = 0.01	n=0.65: LI=20.5
GEQ - IGM - Herausforderung - P GEQ - IGM - Herausforderung - P GEQ - IGM - Herausforderung - W GEQ - IGM - Neg Emotionen GEQ - IGM - Neg Emotionen D, 54 GEQ - IGM - Neg Emotionen - P GEQ - IGM - Neg Emotionen - W D, 5 GEQ - IGM - Neg Emotionen - W D, 5 GEQ - IGM - Neg Emotionen - P GEQ - IGM - Pos Emotionen CIGM - Neg Emotionen - P CIGM - N					p 0.00, 0 20.0
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GEQ : IGM - Herausforderung - W					0 22.11-47
GEQ - ISM - Neg Emotionen					p-0.55, U-17
GEQ : ISM - Neg. Emotionen - P GEQ : ISM - Neg. Emotionen - W 0.5 GEQ - ISM - Neg. Emotionen - W 0.5 GEQ - ISM - Neg. Emotionen - W 0.5 GEQ - ISM - Neg. Emotionen - P 2.93 GEQ : ISM - Pos. Emotionen - P 2.93 GEQ : ISM - Pos. Emotionen - W 3.21 GEQ : ISM - Pos. Emotionen - W 3.21 GEQ : SP - Empathie - P 3.02 GEQ : SP - Empathie - P 3.02 GEQ : SP - Empathie - P 3.02 GEQ : SP - Reg. Getluhle GEQ : SP - Neg. Getluhle GEQ				W(1) = 0.18, p = 0.04	
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GEQ - PGM - Neg. Erfahrungen - P 0.24 0.32 W(7) = 0.73, p = 0.01 p=0.3; U=16 GEQ - PGM - Neg. Erfahrungen - W 0.38 0.3 W(7) = 0.77, p = 0.03 p=0.3; U=16 GEQ - PGM - Müdigkeit - W 0.68 0.82 GEQ - PGM - Müdigkeit - P 0.71 0.91 W(7) = 0.81, p = 0.07 p=0.88; t=2.18 GEQ - PGM - Rückkehr i. d. R. 1.02 0.69 0.69 GEQ - PGM - Rückkehr i. d. R P 0.62 0.36 W(7) = 0.78, p = 0.04 p=0.04; U=8.5 GEQ - PGM - Rückkehr i. d. R W 1.43 0.71 W(7) = 0.95, p = 0.79 p=0.04; U=8.5 IMI - Player 3.49 1.36 W(7) = 0.89, p = 0.22 p=0.45; t=2.21 IMI - Watcher 3.71 1.4 W(7) = 0.99, p = 0.72 p=0.45; t=2.21 NASA TLX - Mental Demand - P 62.66 17.99 W(7) = 0.89, p = 0.33 p=0.86; t=2.22 NASA TLX - Physical Demand - W 64.29 11.34 W(7) = 0.89, p = 0.32 p=0.86; t=2.22 NASA TLX - Physical Demand - P 5.71 7.87 W(7) = 0.77, p = 0.03 p=0.55; U=29 NASA TLX - Temporal Demand - P 2.66 4.88 W(7) = 0.6, p = 0.002 p=0.55; U=29 NASA TLX - T				**(/) 0.04, p 0.00	
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NASA TLX - Performance 75,71 17,85 NASA TLX - Performance - P 74,29 15,12 W(7) = 0.84, p = 0.12 p=0.78; t=2.21 NASA TLX - Performance - W 77,14 21,38 W(7) = 0.89, p = 0.33 NASA TLX - Effort 50,71 19,79 p=0.9; t=2.19 NASA TLX - Effort - P 51,43 22,68 W(7) = 0.95, p = 0.83 p=0.9; t=2.19 NASA TLX - Effort - W 50 18,26 W(7) = 0.93, p = 0.60 NASA TLX - Frustration NASA TLX - Frustration - P 31,43 30,78 W(7) = 0.92, p = 0.52 p=0.86; U=26.5					
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NASA TLX - Performance - W 77, 14 21,38 W(7) = 0.89, p = 0.33 NASA TLX - Effort 50,71 19,79 NASA TLX - Effort - P 51,43 22,68 W(7) = 0.95, p = 0.83 NASA TLX - Effort - W 50 18,26 W(7) = 0.93, p = 0.60 NASA TLX - Frustration 29,29 31 NASA TLX - Frustration - P 31,43 30,78 W(7) = 0.92, p = 0.52 p = 0.86; U=26.5					n=0.78: t=2.21
NASA TLX - Effort 50,71 19,79 NASA TLX - Effort - P 51,43 22,68 W(7) = 0.95, p = 0.83 NASA TLX - Effort - W 50 18,26 W(7) = 0.93, p = 0.60 NASA TLX - Frustration 29,29 31 NASA TLX - Frustration - P 31,43 30,78 W(7) = 0.92, p = 0.52 p=0.86; U=26.5					p 0.70, t-2.21
NASA TLX - Effort - P 51,43 22,68 W(7) = 0.95, p = 0.83 p=0.9; t=2.19 NASA TLX - Effort - W 50 18,26 W(7) = 0.93, p = 0.60 NASA TLX - Frustration 29,29 31 NASA TLX - Frustration - P 31,43 30,78 W(7) = 0.92, p = 0.52 p=0.86; U=26.5					
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NASA TLX - Frustration 29,29 31 NASA TLX - Frustration - P 31,43 30,78 W(7) = 0.92, p = 0.52 p=0.86; U=26.5					p=0.9; t=2.19
NASA TLX - Frustration - P 31,43 30,78 W(7) = 0.92, p = 0.52 p=0.86; U=26.5				W(7) = 0.93, p = 0.60	
NASA TLX - Frustration - W 27 14 33 52 W(7) = 0.78 p = 0.03	NASA TLX - Frustration - P				p=0.86; U=26.5
	NASA TLX - Frustration - W	27,14	33,52	W(7) = 0.78, p = 0.03	



(Brooke 2013, S. 36)

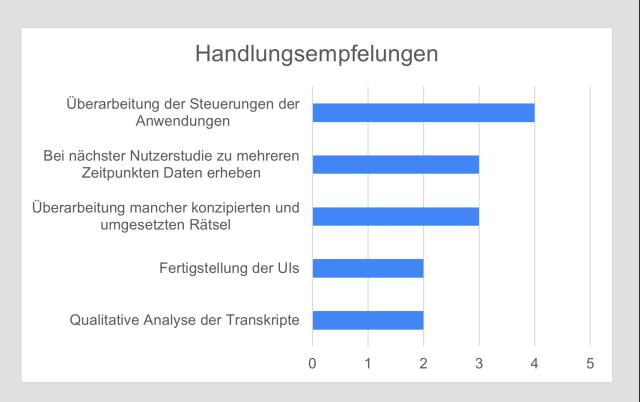
Ergebnisse der Haupttestphase

Fragebogen	Vortest (M)	Vortest (SD)	Nachtest (M)	Nachtest (SD)	Test	▼ P Wert	Effekt Größe	~
IOS	4	1,57	4,79	1,05	KS: D(Pre)=0.17; D(Post)=0.22	p=0.021; t=-2.62	r = 0.33	
SAM - Valenz	2,5	1,45	2,64	1,5	KS: D(Pre)=0.21; D(Post)=0.19	p=0.69; t=-0.39	r = 0.05	
SAM - Activation	6,71	1,44	6,5	2,5	KS: D(Pre)=0.22; D(Post)=0.22	p=0.78; t=0.29	r = -0.04	
SAM - Control	4,93	1,94	5,64	2,13	KS: D(Pre)=0.2; D(Post)=0.12	p=0.22; t=-1.28	r = 0,17	
					·			

Fragebogen	Vortest (M)	▼ Vortest (SD)	7	Nachtest (M)	Nac	chtest (SD) 👱 T	Test Test			P Wert	,	Vergleich	▼ E	Effekt Größe	*
IOS - Player	3,	86	1,46	4,5	57	0,98 V	V(7) = 0.82, p = 0.07 (Pre); V	N(7) = 0.94	p = 0.7 (Post)	p=0.046;	t=2.45	p=0.82; t=2.26	r	= 0.43	
IOS - Watcher	4,	14	1,77		5	1,16 V	N(7) = 0.92, p = 0.54 (Pre); V	N(7) = 0.86	p = 0.15 (Post)	p=0.1723;	t=2.45		r	= 0.28	
SAM - Valenz - Player	2,	43	1,27	2,7	71	1,25 V	V(7) = 0.8, p = 0.056 (Pre); V	N(7) = 0.91	p = 0.49 (Post)	p=0.63; t=	2.45	p=0.71; t=2.19	r	= 0.1	
SAM - Valenz - Watcher	2,	57	1,72	2,5	57	1,81 V	V(7) = 0.84, p = 0.12 (Pre); V	N(7) = 0.81	p = 0.07 (Post)	p=1.0; t=2	2.45		r	= 0	
SAM - Activation - Player		7	1,53	6,1	14	2,97 V	V(7) = 0.84, p = 0.10 (Pre); V	N(7) = 0.83	p = 0.10 (Post)	p=0.5; t=2	2.45	p=0.41; t=2.2	г	=-0.14	
SAM - Activation - Watcher	6,	43	1,4	6,8	36	2,19 V	N(7) = 0.9, p = 0.10 (Pre); W	f(7) = 0.84	p = 0.10 (Post)	p=0.67; t=	2.45		г	= 0.09	
SAM - Control - Player	5,	43	1,72		7	1,91 V	N(7) = 0.78, p = 0.4 (Pre); W	(7) = 0.91,	p = 0.43 (Post)	p=0.06; W	/=0.0	p=0.17; U=35.5	r	= 0.46	
SAM - Control - Watcher	4,	43	2,15	4,2	29	1,38 V	N(7) = 0.94, p = 0.76 (Pre); V	N(7) = 0.92	p = 0.52 (Post)) p=0.88; t=	2.45		г	= -0.03	٠,

Merkmal	✓ Vortest (M)	Vortest (SD)	Nachtest (M)	Nachtest (SD)	Test	7	P-Wert	Vergleich	▼ Effekt Größe ▼
Vörteranzahl (n)	1187,06	331,46	1180,14	337,94	W(7) = 0.98, p = 0.99 (Pre); W(7) = 0.9, p = 0.4 (Post)		p=0.92	-	r = -0.02
Nörterbeitrag Anteil Player	41,82%	0,086	41,20%	0,09	W(7) = 0.91, p = 0.41 (Pre); W(7) = 0.87, p = 0.21 (Pos	st)	p=0.42	p=0.37	r = -0.16
Nörterbeitrag Anteil Watcher	58,36%	0,086	59,46%	0,095	W(7) = 0.92, p = 0.51 (Pre); W(7) = 0.89, p = 0.28 (Pos	st)	p=0.69		r = 0.08
Anzahl Turns (n)	122,62	36,13	125,72	32,12	W(7) = 0.93, p = 0.63 (Pre); W(7) = 0.77, p = 0.03 (Pos	st)	p=0.94; W=13	-	r = 0.06
Pausenhäufigkeit (n)	16,8	12,06	13,64	12,71	W(7) = 0.91, p = 0.41 (Pre); W(7) = 0.89, p = 0.24 (Pos	st)	p=0.19	-	r = -0.27
Pausenzeit (n)	114,76	97,17	84,81	70,37	W(7) = 0.93, p = 0.61 (Pre); W(7) = 0.84, p = 0.12 (Pos	st)	p=0.20	-	r = -0.26
Collaborative Floor Holding (CF)	47,43%	0,098	47,45%	0,18	W(7) = 0.91, p = 0.46 (Pre); W(7) = 0.91, p = 0.41 (Pos	st)	p=0.99	-	r = 0
Single Floor Holding (SF) (Player)	8,12%	0,05	12,44%	0,15	W(7) = 0.97, p = 0.98 (Pre); W(7) = 0.81, p = 0.06 (Pos	st)	p=0.44	-	r = 0.15
Single Floor Holding (SF) (Watcher	23,76%	0,15	26,88%	0,13	W(7) = 0.95, p = 0.86 (Pre); W(7) = 0.88, p = 0.25 (Pos	st)	p=0.6	-	r = 0.11
Gesprächsbeginn (Player)	49,33%	0,18	37,60%	0,15	W(7) = 0.92, p = 0.51 (Pre); W(7) = 0.89, p = 0.28 (Pos	st)	p=0.076	p=0.009	r = -0.38
Gesprächsbeginn (Watcher)	45,60%	0,17	63,27%	0,13	W(7) = 0.94, p = 0.76 (Pre); W(7) = 0.96, p = 0.89 (Pos	st)	p=0.064		r = 0.39

Kategorie	~	Mittelwert	~	Standardabweichung Z
Gamification erleichtrt soziale Interaktion		4,	42	0,61
Akzeptanz / Nutzungsintention gamifizierter Plattformen			3,5	1,27
Soziale Offenheit und Haltung zu spielerischer Kommunikatio	n	3.	77	0.95



Handlungsempfehlungen

Beantwortung der Forschungsfragen

- Kann eine spielbasierte Umgebung für die Untersuchung und Verbesserung von Kommunikation zwischen zwei oder mehreren Personen realisiert werden?
 - Grundsätzlich realisierbar, erfordert jedoch größere Stichprobe und längeren, stärker ausdifferenzierten Spielinhalt
- Welche spezifischen Eigenschaften muss eine solche Umgebung aufweisen und welche Kommunikationsparameter werden dabei angesprochen?
 - Asymmetrischen Informationsverteilung
 - kooperative Problemstellungen
 - immersive Rollenverteilung
- Welche Verbesserungen in der Kommunikation zwischen den Anwendern können durch ein asymmetrisches Multiplayer-Spiel mit zwei verschiedenen Spielerklassen beobachtet werden?
 - Indizien für Verbesserungen bei Pausenhäufigkeiten und –längen, sowie Gesprächsbeginne

Beantwortung der Forschungsfragen

- Welche Unterschiede können in der Art das Kommunikationsverhalten bei der Verwendung von zwei unterschiedlichen Anwendungen (AR und 3D) (festgestellt/beobachtet) werden?
 - Konnte Aufgrund der fehlerhaften Umsetzung nicht durchgeführt werden
- Wie stehen die Nutzer zu einem spielerischen Ansatz und zur Verbesserung der Kommunikation, insbesondere auch im Umgang mit Fremden?
 - Grundsätzlich offene Haltung gegenüber spielerischem Ansatz
 - Tendenzielle Reduktion von Hemmschwellen im Umgang mit unbekannten Personen

Fazit

- zeitnaher Usability-Tests durchführen
- Möglich, dass sich Frustration über Usability in anderen Fragebögen widerspiegelt
- Nutzung eines zusätzlichen Mikrofons
- -> Entwicklung der sozialen Nähe signifikant beweisbar
- Jedoch wären zu weiteren Zeitpunkten Erhebungen nötig gewesen
- -> Durch mittlere und hohe Korrelation deutet auf Entwicklung der Kommunikation hin
- Zu geringe Stichprobe, um Signifikanzen messen zu können

- Können andere Vergleichsszenarien bessere Ergebnisse liefern?
- Kann über die qualitative Auswertung der Transkripte eine Entwicklung festgestellt werden?
- Hat ein finalisierter Prototyp eine stärkere Auswirkung auf die Kommunikationsentwicklung?

Ausblick

Vorstellung des Prototyps

Vielen Dank! Fragen?

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