

## ABIZ Online Seminar Series – 3

# Two empirical studies on human-less service technologies at fast food restaurant chains

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**Dalhousie University**



**DALHOUSIE  
UNIVERSITY**



# ABiz ONLINE SEMINAR SERIES

**[강석방업]**  
**ZOOM을 활용한 온라인 참여**  
 회의주소 : 833 2644 3594 / 암호 : 0000



회차	일자	시간	주제	강사 / 소속
1	3/9(화)	12:00 - 13:00	Social acceptability of technology innovation : Managerial Perspective	정우성 교수 (포항공대)
2	3/23(화)	12:00 - 13:00	A gradient boosting model for the directional change of stock market returns	이흥재 교수 (아주대학교)
3	4/13(화)	12:00 - 13:00	Two empirical studies on humanless service technologies at fast food restaurant chains	이경영 교수 (Dalhousie University)
4	4/27(화)	12:00 - 13:00	Bio-Stickers in Remote Healthcare Settings	이지환 교수 (Purdue University)
5	5/11(화)	12:00 - 13:00	Information efficiency in the cryptocurrency market: the efficient-market hypothesis	이상근 교수 (서강대학교)
6	5/25(화)	12:00 - 13:00	The Future of Science Technology and Industrial Convergence	이주연 교수 (아주대학교)
7	6/8(화)	12:00 - 13:00	Maxing Out: Lottery or Price Pressure	장지원 교수 (아주대학교)

# Agenda

- **Intro to Kyung Young Lee (5 Min)**
- **Research (Work in Progress) – Effect of Social Interaction Anxiety & Language Proficiency on Users' Continuance Intention and Net Benefits with Mobile Apps and Self-Service Kiosks: Evidence from McDonald's restaurant customers (Two studies) (40 Min)**
- **Q&A (10~12 Min)**

The slide available @ <https://tinyurl.com/abiz20210413klee>

# Introduction to Kyung

## • Academic Background

- Teaching in University since 2010 (McGill, Bishop's & Dalhousie)
- Associate Professor at Dalhousie University since Fall 2016
- Program Director for MScB (Master of Science in Business)
- Dept Coordinator of Tech, Innovation Management, & Entrepreneurship
- Enterprise Computing and Analytics Coordinator (SAP University Alliance Coordinator) of Rowe School of Business
- PhD in Management from McGill (Major in MIS and Minor in Statistics)
- Two MBA's (U of Ottawa and Yonsei U South Korea) in 2005 & 2002
- Radio Telecom Engineering (Yonsei U South Korea) in 1998

## • Teaching: Business Analytics, Research Seminar, Research Methods & MBA MIS Intro

## • Professional Background (SK Telecom 1998 ~ 2003)

- Telecom Engineer (Cellular Phone Systems)
- Technical Sales Manager (Internet Ads, Web-Hosting...)
- Project Management (VoIP Phone Service)
- Knowledge Management Officer (Human Resource)





# Introduction to Kyung



Academic Journey

Dalhousie

Halifax



# Dalhousie University

- Founded in 1818
- Located in Halifax, Nova Scotia, Canada
- Student enrollment: over 19,000 (60% out of province, 22% International)
- Avg. entering grades of 1<sup>st</sup>-year students: 87.6%
- Over 200-degree programs across 13 faculties located in Nova Scotia, on Canada's eastern coast.
- A member university of U-15 (<https://u15.ca/>) research-oriented universities of Canada



# Dalhousie University – Rowe School of Business

- **AACSB Accredited**
- **Two undergraduate programs** (500 + students per year)
  - Bachelor of Commerce (Mandatory Co-op)
  - Bachelor of Management
- **Three graduate programs** (100 + students per year)
  - Corporate Residency MBA
  - MBA for Financial Service and Leadership (Blended: Online + F2F intensive)
  - **Master of Science in Business**
- 63 full-time faculty members
- Accounting, Finance, Management, Marketing, Management, Supply Chain & Decision Science, **Technology, Innovation Management & Entrepreneurship (TIME)**
- **SAP University Alliance Student Award** (Three mandatory courses: MIS, Business Analytics, & Enterprise Computing)

# My research

[Kyung Young Lee's Homepage \(google.com\)](#)

[Kyung Young Lee - Google Scholar](#)

## Tourism & Hospitality (Text Analytics, Machine Learning)

- [SIJ, Under Review](#)  
(Supervised-ML Approaches to Detect Fake Reviews)
- [IJHM 2020](#) (Fake Review vs. Linguistic Characteristics -Yelp)
- [JHTT 2020](#) (Social Influence embedded in Online Reviews vs. Review Helpfulness - Yelp)
- [IPM 2019](#) (Heuristics of Online Reviews vs. Best Place to Visit Ratings - Qyer)

## Tourism & Hospitality (User Behavior, Survey, PLS-SEM)

- [Internet Research & C.B.SN \(Social Interaction Anxiety and Human-less Service Techs in Fast-food Restaurants.\)](#)
- [EM 2021](#) (Chatbot Info Quality – Chinese OTA)
- [JTTM 2018](#) (Hospitality Exchange Network - Couchsurfing)
- [I&M 2017](#) (Tourism Info Quality vs. Destination Image Formation - Sina Weibo)
- [Applying Partial Least Squares in Tourism and Hospitality Research 2018](#) (Formative vs. Reflective measurement)

## MIS

### (Text Analytics, Image Analytics, User Behavior, Case Study, PLS-SEM)

- [NewMedia&S, Under Review](#)  
(Reflection of Everyday Lives using Social Media Images – Image Mining Approach, Flickr)
- [ITD 2021](#) (Privacy Issues with Traceable Information with E-scooter sharing services)
- [IR \(Under the 2<sup>nd</sup> review\), ISF 2020, ITP 2019](#) (Smart Technology Adoption: S-phone, S-watch, S-speaker, S-enterprise apps)
- [DSS \(In-prep\)](#) (Mobile TV Streaming Behaviors)
- Social Media (Corporate pages)
- Online Product Reviews (Human-rating & Text-mining)
- ...



# Effect of Social **Interaction Anxiety & Language Proficiency** on Users' Continuance Intention and Net Benefits with Mobile Apps and Self-Service Kiosks: Evidence from McDonald's restaurant customers

Work-In-Progress (Data Collected)

**Kyung Young Lee**

**Sung-Byung Yang**

**Sooil Shin**

**Sumin Han**

Dalhousie University  
kyunglee@dal.ca

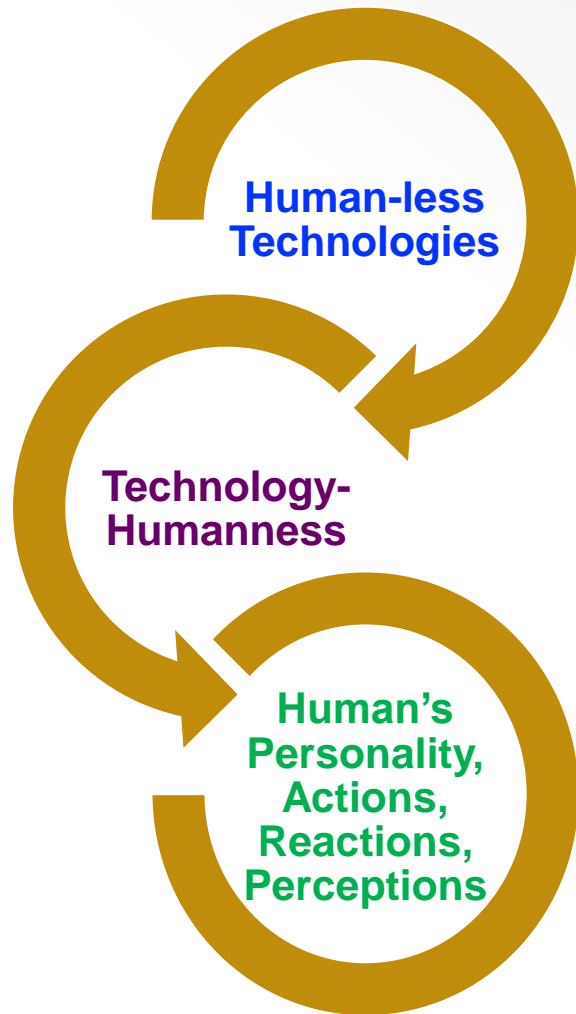
Kyung Hee University  
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Kennesaw State University  
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Auburn University  
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# Research Topic – Human-less Technologies



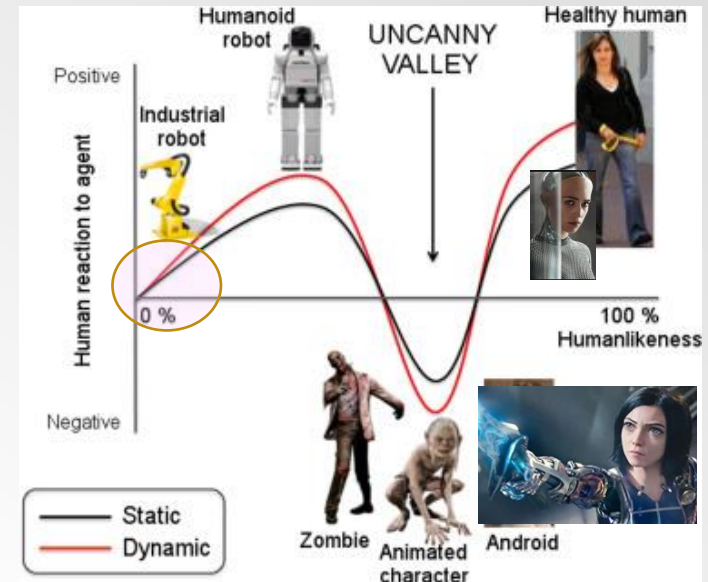
- **Fixed & HW:** Self-service kiosks, ATM, Smart speakers, Service robots (ICN Airport),...
- **Web, Mobile, & SW:** Online customer service, Mobile apps, Online/mobile chatbots,...

- **Technology humanness (a variable)**
- **Mori's (1970) uncanny valley theory**

- **Personality:** Technology readiness (anxiety), Innovativeness, Social anxiety, Language ability, Intro(Extro)version, Big-five traits,...
- **Actions:** (Continued) Use,...
- **Reaction:** Emotions, Recommendation, Resistance, Abandonment, Personification,...
- **Perceptions:** Quality, Tech beliefs (e.g., PU), Perceived performance, Satisfaction, Trust,...

# Research Topic – Technology Human-ness

- **The *uncanny valley theory (UVT)* (Mori, 1970),**
  - People tend to experience **less uncanny effect** when using simpler text-based chatbots than when using chatbots serving with animated (obviously robot-looking) avatars (Ciechanowski et al., 2019).
  - As such, it is believed that the **human-like interactive and contextual language processing capability** of chatbot services may positively influence the way users react to the chatbot technology (Li et al. 2021)



(Urgen et al., 2018)

- ***The technology humanness (Lankton et al., 2015)***
  - Users' perceived similarity of a technology device to humans in their motions (behaviors) and physical appearances, which is operationalized on a continuum from 'system-like' to 'human-like' (Kamide et al., 2014; Lankton et al., 2015).
  - Users' perceived humanness of a device is positively associated **with users' trust in and emotional reactions to the device**, which leads to the adoption (Kamide et al., 2014; Lankton et al., 2015).
- ***The personification of technology (Purington et al., 2017): Hey Alexa! NUGUO!***

# Background – Human-less technologies

- Even before the COVID-19 Lockdown, many human-less technologies in the restaurant industry are adopted. (Berezina et al., 2019)



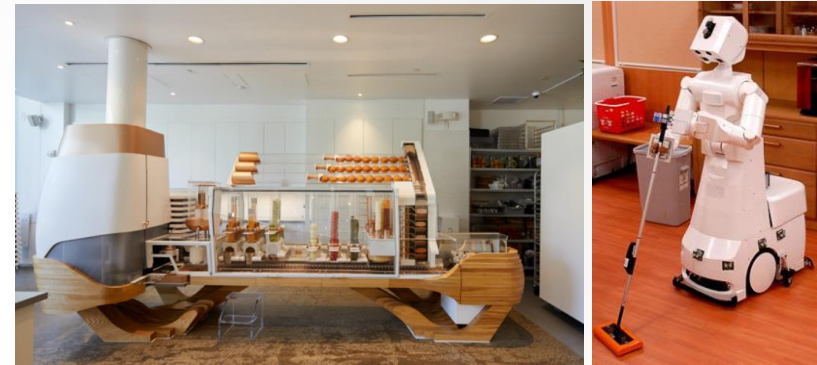
- **Customer-facing**

- Ordering & Delivering
- Serving



- **Non-customer-facing**

- Cooking
- Cleaning



- More demands for **un-tact** ways of serving restaurants' customers. (After the pandemic)





# Background – Fast-food Ordering

- Self-Service Kiosks
- Mobile Food Ordering Apps
  - Dedicated apps for franchises
  - Food delivery apps
- Web-ordering (E.g., Pizza hut)
- Voice activated ordering? (Alexa – Skill)



KFC  
★★★★☆ 10  
Free Download  
Available instantly on your connected Alexa device.

**Who will use FF mobile apps & kiosks? & Why?**  
**What are the benefits?**

# When we order!!

- **If someone finds it difficult to talk to people...**
  - Bothering the restaurant employees to customize my food is not something that I can easily do...
  
- **If I order something in a fast-food restaurant in a foreign country (e.g., I do not speak Swedish.)...**
  - Customizing my food with the restaurant employees is not something that I can easily do...
  
- **Order customizing... (Can I do it verbally?)**
  - [WE MADE THE BIGGEST BURGER POSSIBLE AT MCDONALD'S SINGAPORE'S "CREATE YOUR OWN TASTE" KIOSK – YouTube](#)

# An interesting case study...

Yang, Q., Goodsir, W., & Poulston, J. (2019). **Automation of the fast-food industry: Gen Z perspectives of self-service kiosks versus employee service.** *Hospitality Insights*, 3(2), 7-8.

- “Kiosks also provided clear food categories with **pictures, simple English language instructions**, and generally simple ordering and payment processes... respondents **felt a sense of empowerment and control over** their ordering process.
- Kiosks provided the ability to customise meals, discuss menu choices and change orders **without feeling as if they were annoying an employee or holding up other customers**. This sense of empowerment and control provided **relief from the pressure to place quick orders** at the service counter or delay other customers.
- Many respondents were afraid of annoying employees or becoming an annoying customer in public. They cared about the perception of counter staff, while at the same time, they also cared about **their personal image in public**. The fast-paced restaurant environment and **the need to be decisive with their menu selection added to the pressure and stress when purchasing takeaways**.
- Additionally, **those who spoke English as a second language** faced **increased stress** while trying **to select the right words and communicate with employees** in front of others.”

# Background – Anxieties & Technology use

- **Social Interaction Anxiety**

- Definition: “a state of anxiety resulting from the prospect or presence of interpersonal evaluation in real or imagined social settings” (Leary, 1983b, p. 67).
- Often related to problematic Internet or social media use of young people.



- **Scales (Mattick and Clarke 1998)**

- 1) I have difficulty making eye-contacts with others.
- 2) I become tense if I have to talk about myself or my feelings.
- 3) I feel tense if I am alone with just one other person.
- 4) I have difficulty talking with other people.
- 5) I worry about expressing myself in case I appear awkward.
- 6) I am nervous mixing with people I don't know well.
- 7) I feel I'll say something embarrassing when talking.



→ *Is this personal trait anything to do with the use of human-less technologies??*



# Background – Language Proficiency & Technology use

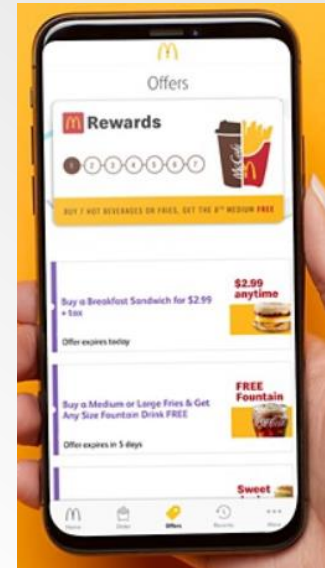
## • Language Proficiency & Technology Use

- Language fluency/proficiency → Comfortable in public speaking (Too obvious to find a reference article!)
- “The use of **visual aids and multimedia** can help the students to absorb the content and become interactive in the classroom with no fear of giving wrong answers” (Halwani, 2017)



→ Is a user's language proficiency anything to do with the use of human-less technologies??

# Two Human-less Technologies (Participation Item)



Similarity

Human-less Tech, Cost-saving (Firms), Time-saving, Money-saving, difficult, error,...

Difference

Fixed, HW,...

Mobile, SW,...

# Research Purposes

## • Accessible hospitality & tourism

- Kalargyrou, V., & Volis, A. A. (2014). [Disability inclusion initiatives](#) in the hospitality industry: An exploratory study of industry leaders. *Journal of Human Resources in Hospitality & Tourism*, 13(4), 430-454.
- Harju-Myllyaho, A., & Jutila, S. (2016). Viewpoints on inclusion in tourism—From accessible tourism to [accessible hospitality](#). *Matkailututkimus*, 12(2), 33-44.
- Darcy, S., Cameron, B., & Pegg, S. (2010). Accessible tourism and sustainability: a discussion and case study. *Journal of Sustainable Tourism*, 18(4), 515-537.
- Darcy, S., & Dickson, T. J. (2009). A whole-of-life approach to tourism: The case for [accessible tourism experiences](#). *Journal of Hospitality and Tourism Management*, 16(1), 32-44.

→ **Accessibility of hospitality services for people with mental/linguistic challenges using human-less technologies**

# Research Purposes



User Satisfaction with the tech.

Actual Use Frequency

Use Continuance Intention

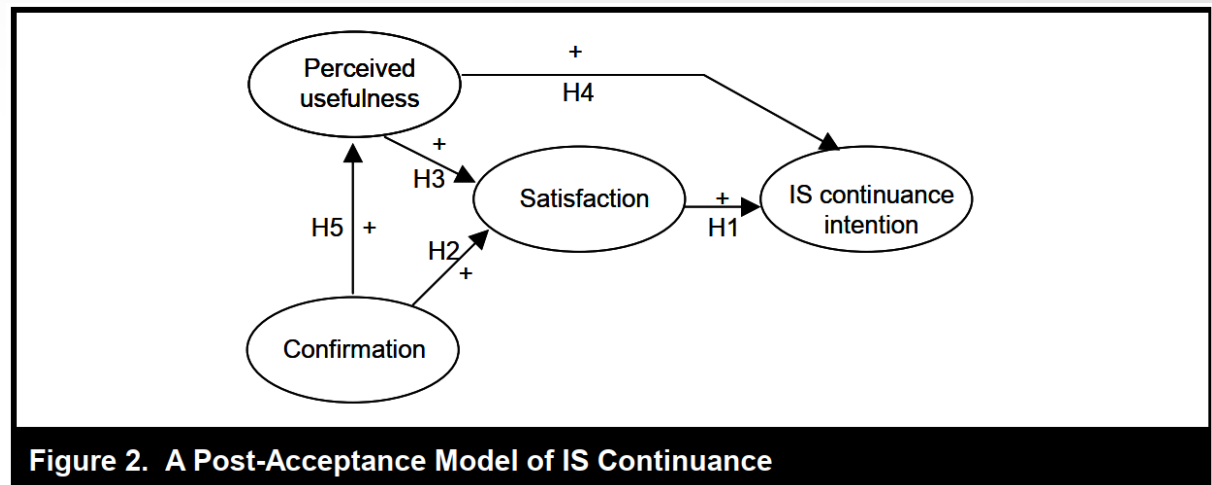
Individual Benefits  
(Ordering Performance)

Organizational Benefits  
(Improved Satisfaction with the  
Restaurant Franchise)



# Research Questions (1) – Use continuance

- Who is more likely to continue to use the human-less ordering technologies? (Bhattacharjee, 2001)



- Those who found that the technologies are useful and confirmed their initial expectations, useful and satisfactory. (Too obviously, Yes!)
- Will those who have **less language proficiency** be more likely to **continue to use** the technologies?
- Will those who have **higher social interaction anxiety** be more likely to **continue to use** the technologies?

# Research Questions (2) – Net benefit

- **Who feels that the technologies have improved their performance of food-ordering in the restaurants and have improved their satisfaction with the restaurant chains? (DeLone & McLean, 2003)**

- Those who use the techs more often than others and who found that the technology is satisfactory (Too obviously, Yes!)

- Will those who have **less language proficiency** be more likely to **actually use** the technologies?
- Will those who have **less language proficiency** be more likely to feel that the technology improved their food-ordering **performance and satisfaction** with the restaurants?
- Will those who have **higher social interaction anxiety** be more likely to **actually use** the technologies?
- Will those who have **higher social interaction anxiety** be more likely to feel that the technology improved their food-ordering **performance and satisfaction** with the restaurants?

24 DeLONE AND McLEAN

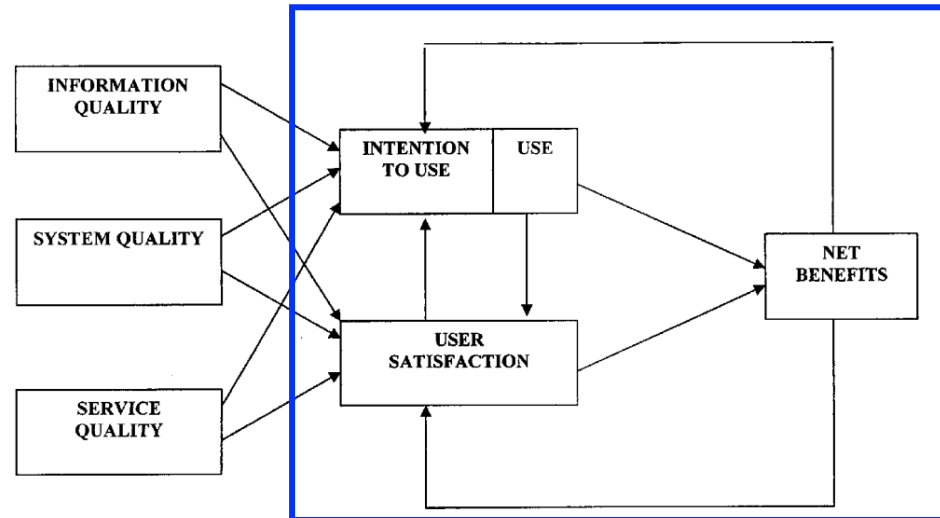


Figure 3. Updated D&M IS Success Model

# Literature Review – Adoption studies

Key factors for <b>Self-Service Technology</b> Adoption (Intention)	Key factors for <b>Mobile Food Apps</b> Adoption (Intention)
<ul style="list-style-type: none"><li>• Consumers' <b>Value Perceptions</b> toward Technology Use and Hedonic and Utilitarian Expectations (Xu et al., 2020)</li><li>• <b>Innovativeness, Performance Expectancy, Effort Expectancy and Social Influence</b> (Jeon, et al. 2020)</li><li>• <b>Effort Expectancy, Performance Expectancy, Facilitating Conditions, Social Influence, and Perceived Value</b> (El-Said, et al., 2020)</li><li>• <b>Perceived Quality, Cognitive and Affective States</b> (Ahn &amp; Seo, 2018)</li><li>• <b>Extrinsic Motivation, Previous Experience with SSTs, Customer Readiness</b> (Kim, J. S., &amp; Christodoulidou)</li><li>• <b>Technology Readiness, Perceived Usefulness, Perceived Ease of Use, Attitude toward Using SSTs</b> (Fisk et al., 2011).</li><li>• <b>...(Too many)</b></li></ul>	<ul style="list-style-type: none"><li>• <b>Mobile Website Quality</b> (i.e., service quality, system quality, and information quality), <b>Website Brand Equity</b> (i.e., brand image, perceived quality, brand association, and brand loyalty), <b>PEOU, PU, Digital Coupon Proneness</b> (an accelerator) (Akram et al. 2020)</li><li>• <b>Online Review, Online Rating, Online Tracking, Performance Expectancy, Hedonic Motivation, and Price Value</b> (Alalwan, 2020)</li><li>• <b>Product Quality, Perceived Price, Perceived Promotions, and eWOM</b> (Wang, 2019)</li><li>• <b>Convenience, Design, Trustworthiness, Price, Various Food Choices, Single-Person Households</b> (Cho et al., 2019)</li><li>• <b>...(Too many)</b></li></ul>

# Literature Review – Benefit studies

## Self-Service Technology Benefits

Akcam (2020)

- McDonalds' SSK provides their customers with greater **control, convenience and personalization** to our customers

Gao & Su (2018)

- **Reduced waiting cost, increased demand, and carried over benefits** to customers who do not use the tech.
- Some restaurants increased **employment levels**.
- Recommended when **customers have high wait-sensitivity**.

Hanks et al. (2016, P.1)

- “Customers who were solicited **in the presence of others were more likely to donate** than those solicited via SST.”

## Mobile Food Apps Benefits

Akcam (2020)

- Order **process improvements**
- Firms' better understanding of **customers' ordering profiles and better relationship** with them, etc.

Tanpure (2013)

- “**Convenience, Improved efficiency and Accuracy for restaurants by saving time, reducing human errors and real-time customer feedback.**”



# Literature Review – Social Anxiety vs. Technology

- **Social anxiety is positively associated with...**
  - the preferences to **online social interaction and problematic Internet use** (Stevens and Morris, 2007)
  - the preferences for **text-based communication** over phone conversations (Reid and Reid, 2007; Lundy, B. L., & Drouin, 2016; Gross et al., 2002).
  - **the risk of smartphone addiction** in young people. (Enez et al., 216)
  - **Problematic Internet and smartphone use levels** (Çuhadar, 2012; Elhai et al., 2018).
  - **Compulsive social media usage** (Apaolaza et al., 2019)
- **Prizant-Passal et al. (2016) – Meta Analysis: Social anxiety is ...**
  - correlated positively with **feelings of comfort online**,
  - **not correlated with total time spent** online, email use and IM,
  - correlated positively with **time spent on gaming**,
  - correlated positively with **problematic Internet use (e.g., addiction)**.

# Theoretical Background (1) – IS Continuance Model

- PU, Confirmation & Tech-Satisfaction → IS Continuance Intention

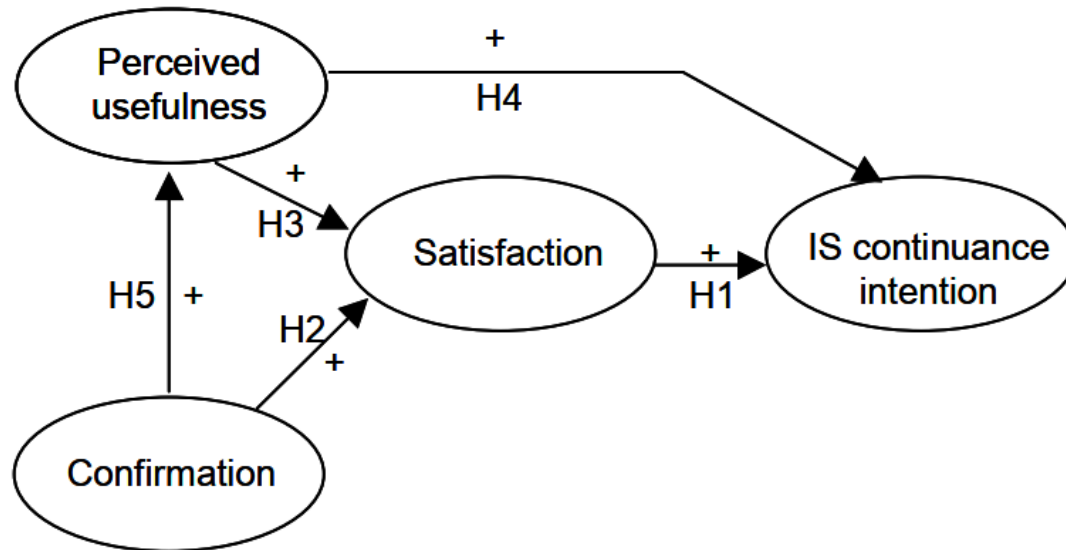


Figure 2. A Post-Acceptance Model of IS Continuance

# Theoretical Background (2) – IS Success Model

- Use & Tech-Satisfaction → Net Benefits (Individual & org. impact)

24 DeLONE AND McLEAN

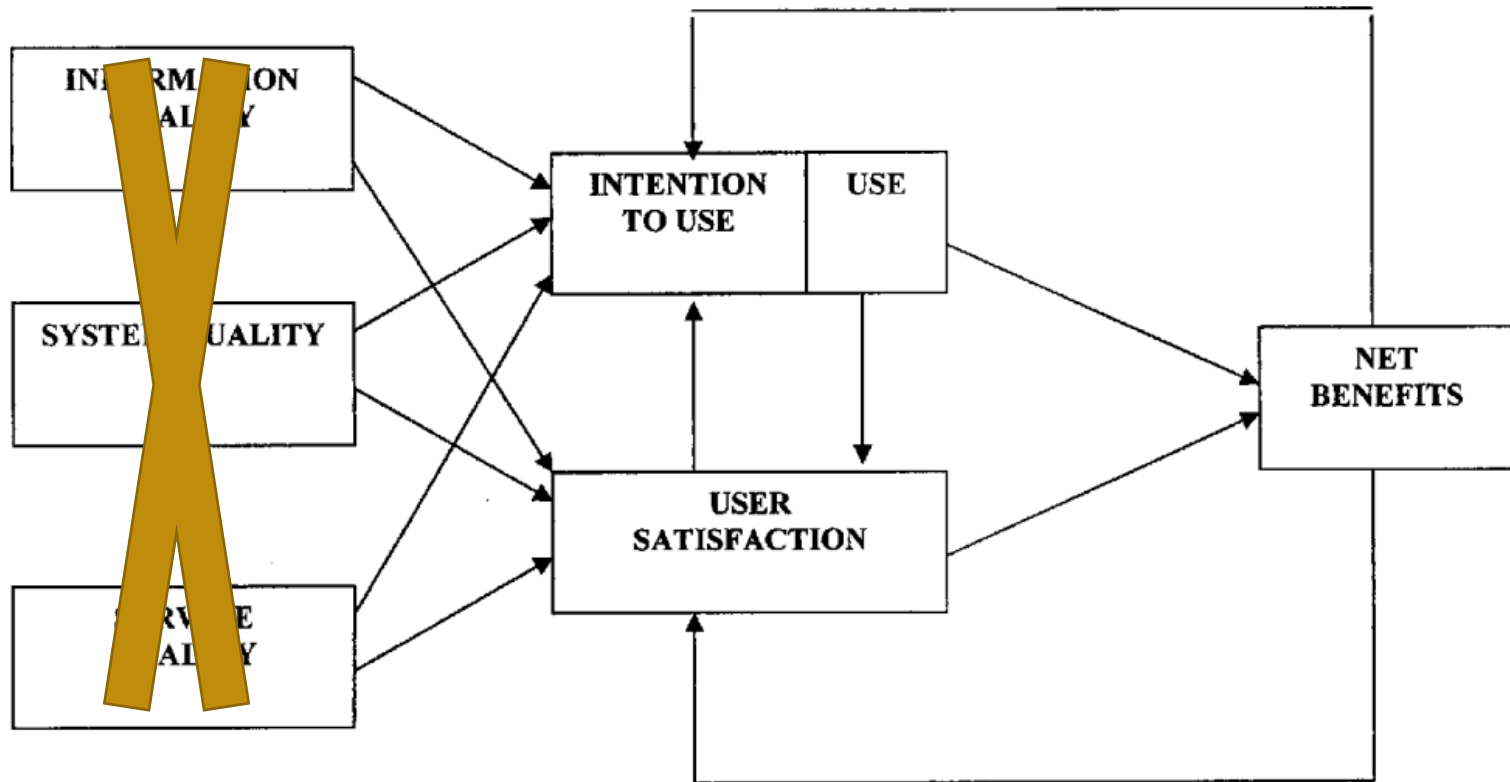


Figure 3. Updated D&M IS Success Model

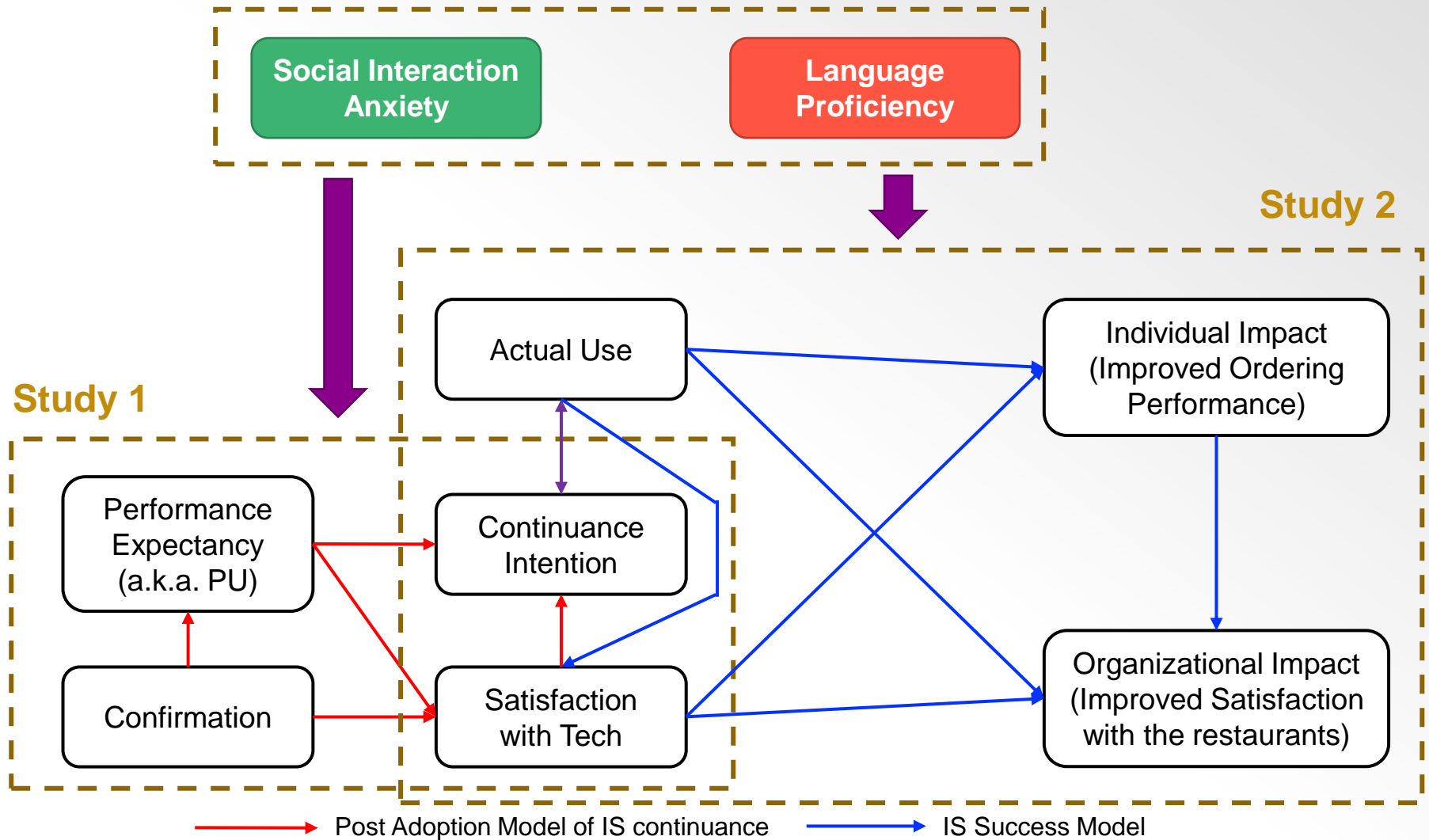
# Theoretical Background – Net Benefits

Collected for both My McD app & In-store SSKiosks

- **Net benefit measures** for individual use of human-less technologies

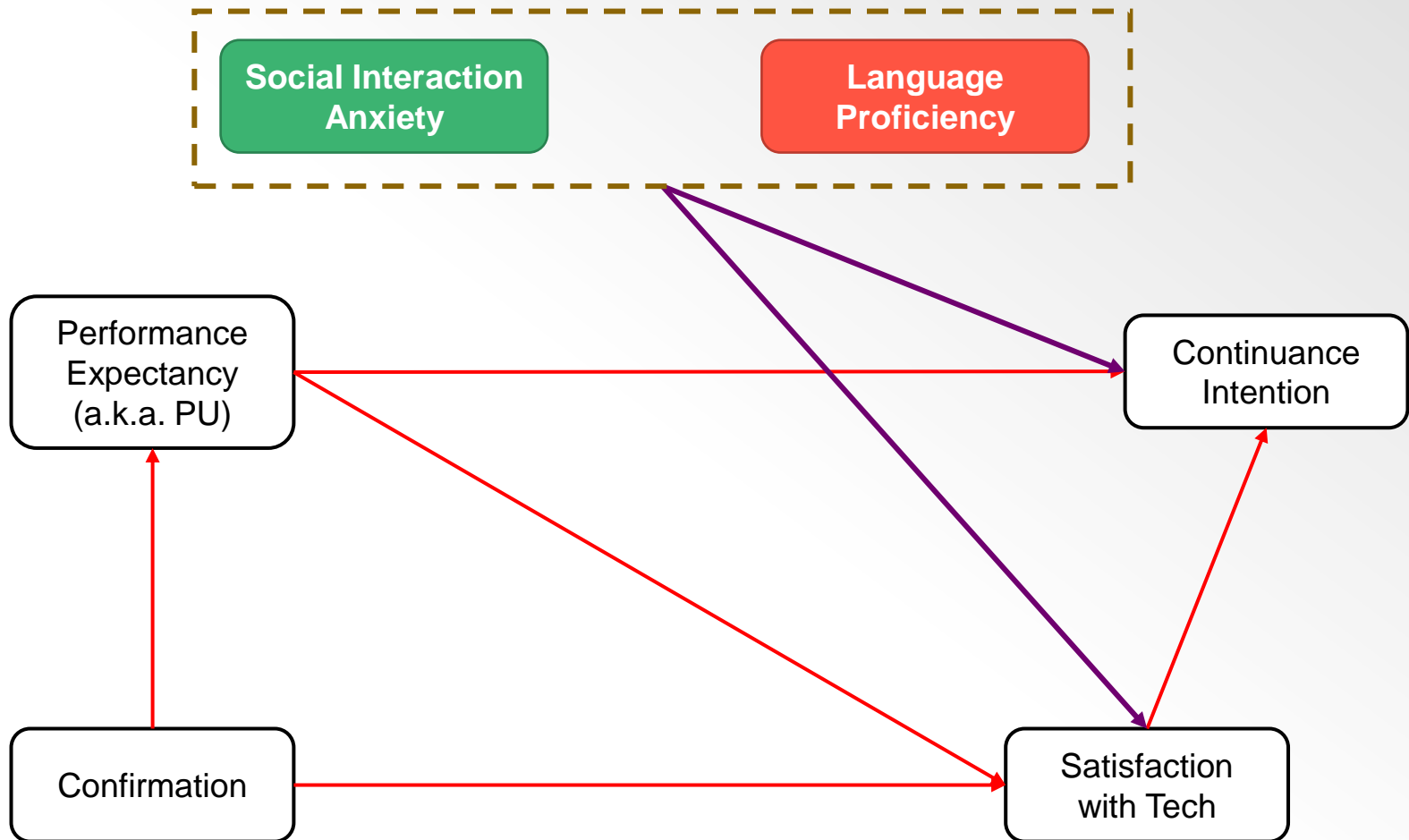
<p><b>Individual Impact - Improved Performance</b> (Delone and McLean 2003; Igbaria and Tan 1997)</p>	<p>Thanks to <b>MyMcD's App</b> (<b>Self-Service Kiosks of McDonald's Restaurants</b>) ...</p> <ol style="list-style-type: none"> <li>1) <b>The number of times I visits</b> McDonald's restaurants has been increased. (Effectiveness)</li> <li>2) My <b>average spending amount</b> at McDonald's restaurants has been increased. (Effectiveness)</li> <li>3) I get <b>better deals</b> when ordering food at McDonald's restaurants. (Effectiveness)</li> <li>4) <b>Time to order &amp; receive food</b> at McDonald's restaurants has been decreased. (Efficiency)</li> <li>5) <b>My efficiency of food ordering</b> at McDonald's restaurants has been improved. (Efficiency)</li> <li>6) <b>Overall, my performance</b> of food ordering at McDonald's restaurants has been improved. (Overall)</li> </ol>
<p><b>(Partial) Organizational Impact - Improved Satisfaction with the restaurant</b> (Hong, Thong, and Tam 2006; Delone and McLean 2003)</p>	<p>Thanks to <b>MyMcD's App</b> (<b>Self-Service Kiosks of McDonald's Restaurants</b>), I have become...</p> <ol style="list-style-type: none"> <li>1) Much more dissatisfied / Much more satisfied</li> <li>2) Much more displeased / Much more pleased</li> <li>3) Much more frustrated / Much more contented</li> <li>4) Much more terrified / Much more delighted</li> </ol> <p>... with McDonald's restaurants than before I used the MyMcD's App.</p>

# Conceptual Model (Brainstorming stage)

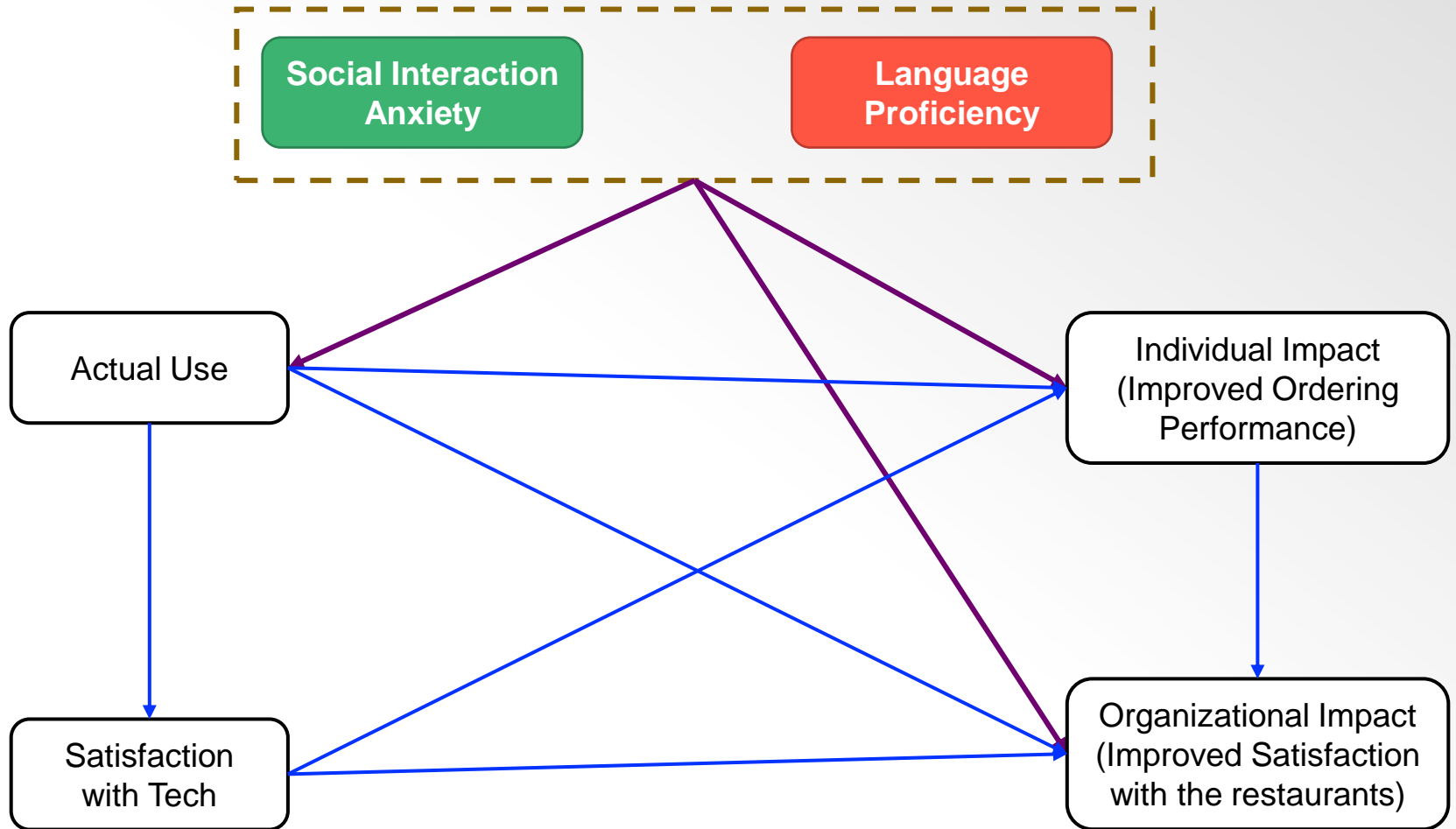




# Adoption / Continuance Model – Study 1



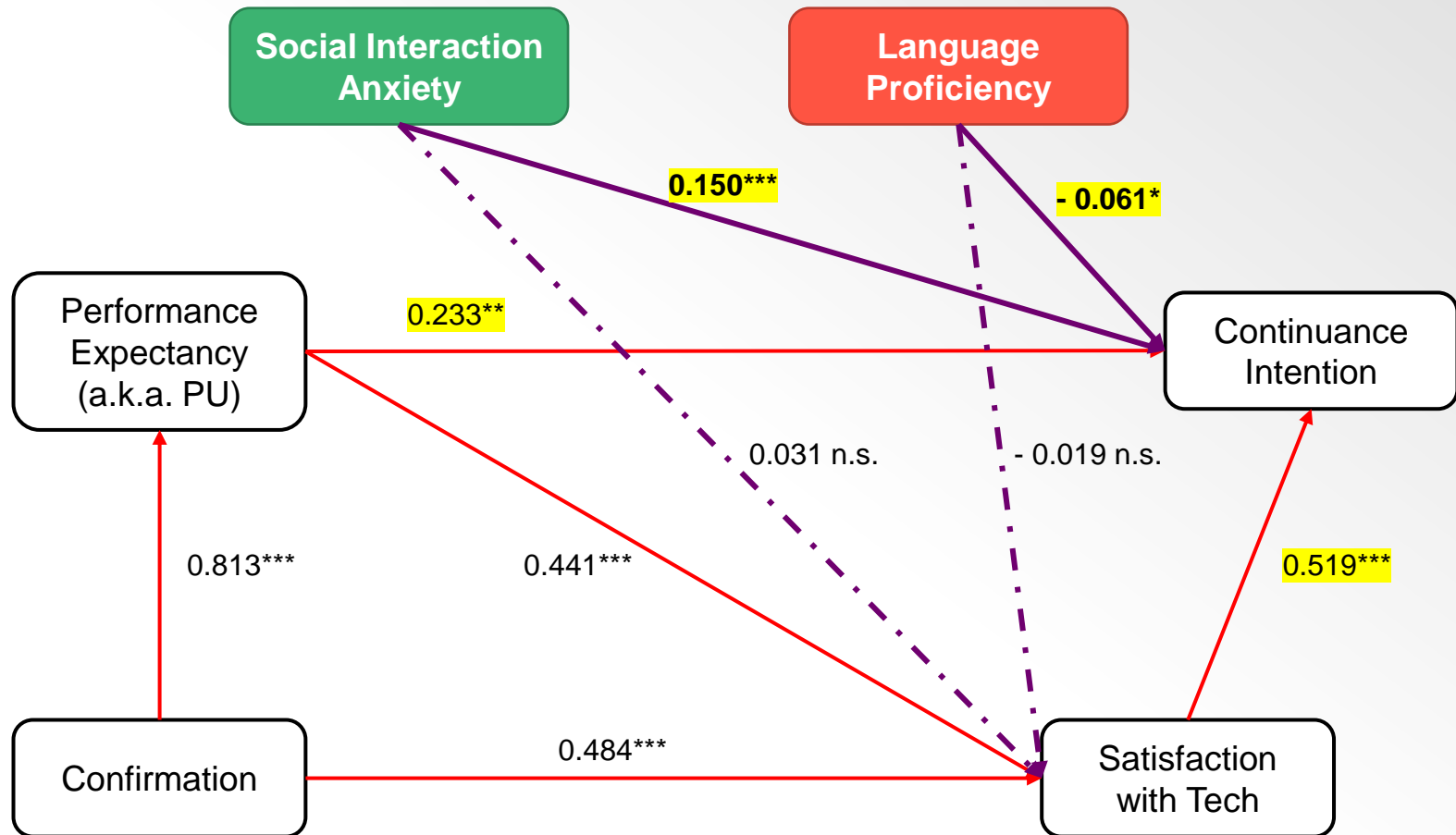
# Net Benefits Model – Study 2



# Research Method

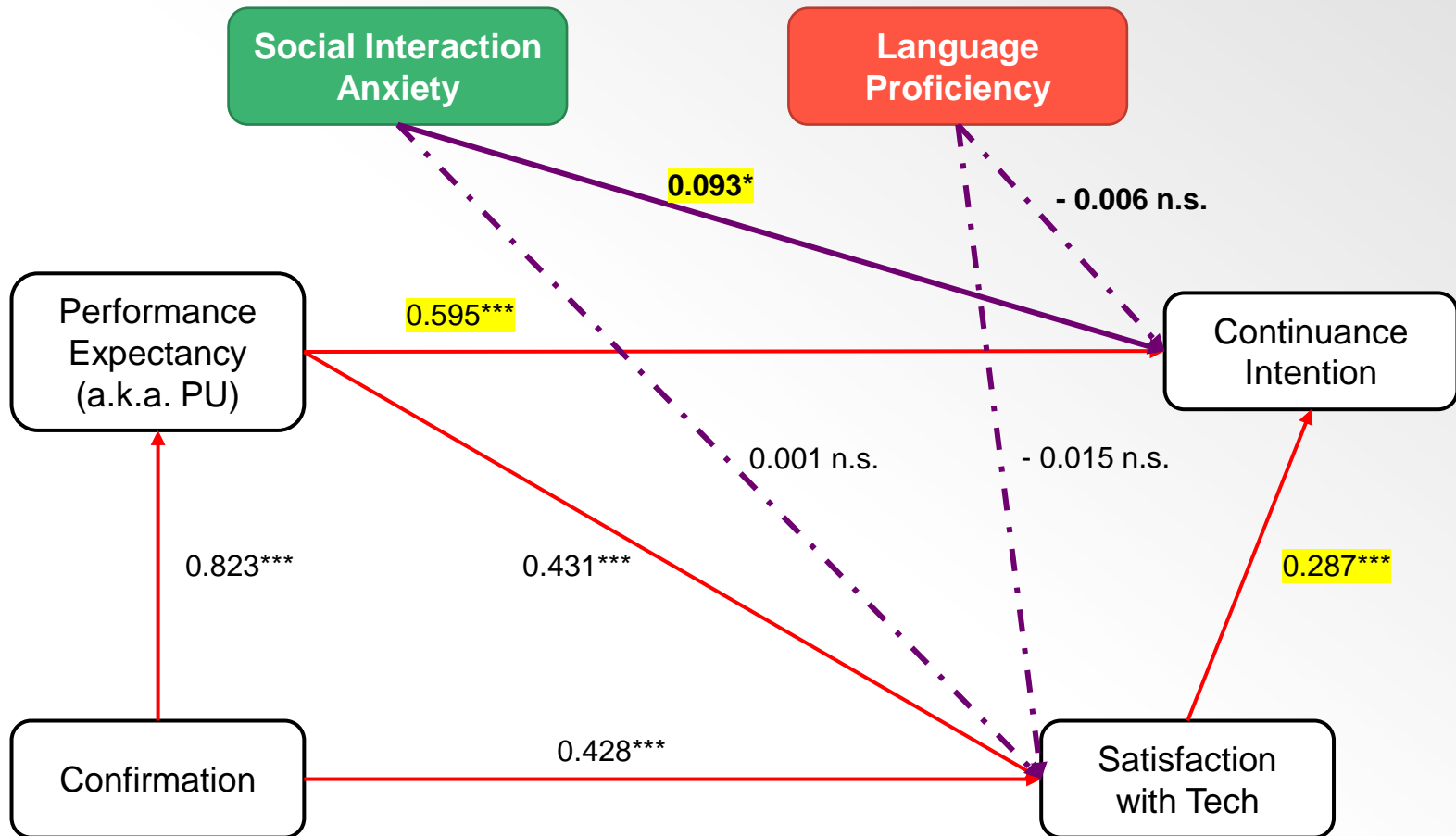
- Survey collected early 2020 (referred to the times before the pandemic lockdown) in the USA
- Screening questions: current users of the Macdonald's Mobile App and Self-service kiosks
- Sequence of questionnaire: Personality & Language proficiency variables → DV's of the model → IV's of the model
  
- 422 usable samples
- Analysis with SmartPLS (Still being analyzed)
- Measurement properties checked
- Tested all possible direct & moderating relationships
- Control variables: age group, gender, education, income, occupation (not reported)

# Results (1) – Continuance Model (SS Kiosks)



\*\*\* sig. at 0.001 / \*\* sig. at 0.01 / \* sig. at 0.05 / † sig. at 0.1

# Results (1) – Continuance Model (Mobile App)



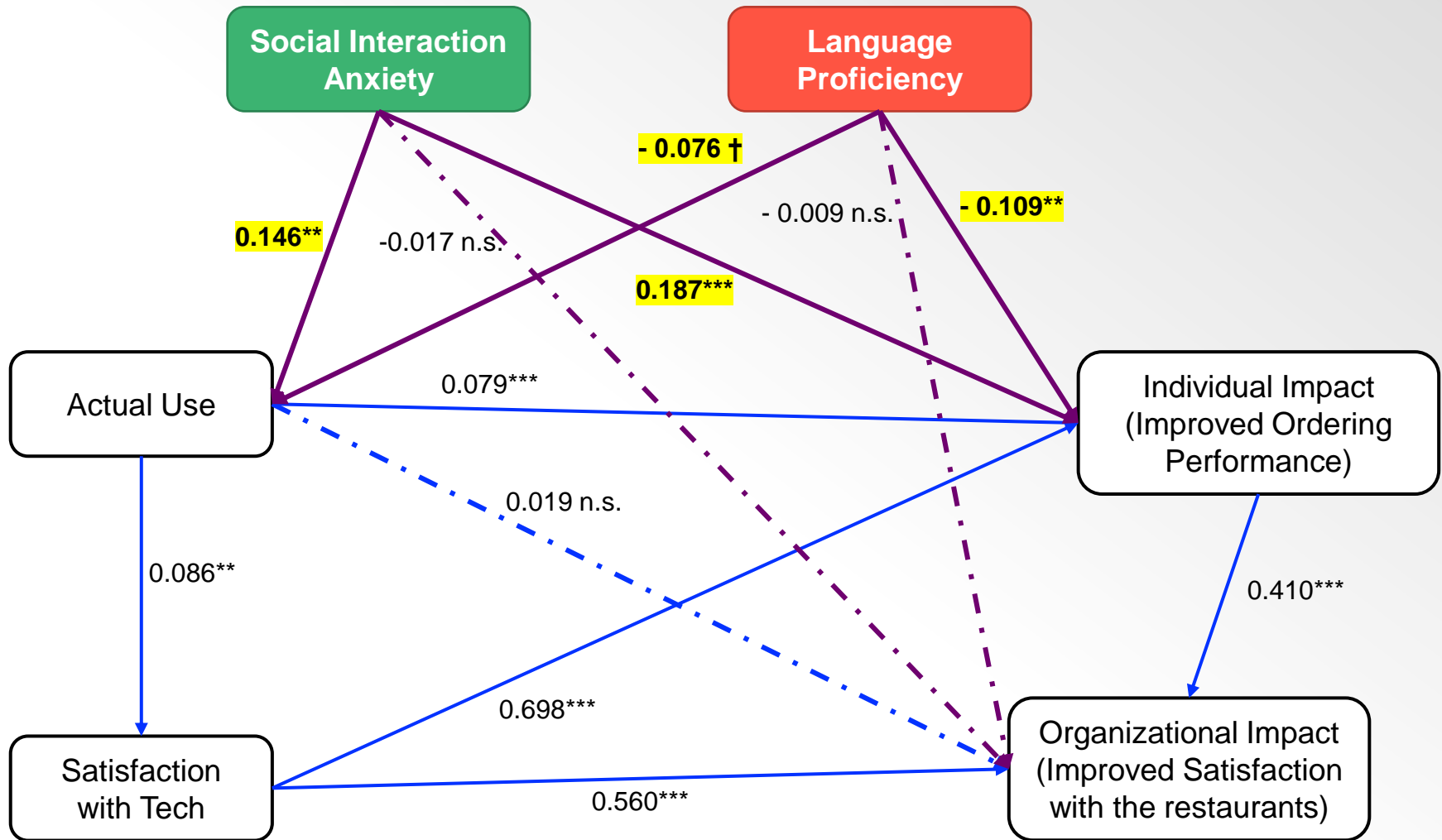
\*\*\* sig. at 0.001 / \*\* sig. at 0.01 / \* sig. at 0.05 / † sig. at 0.1



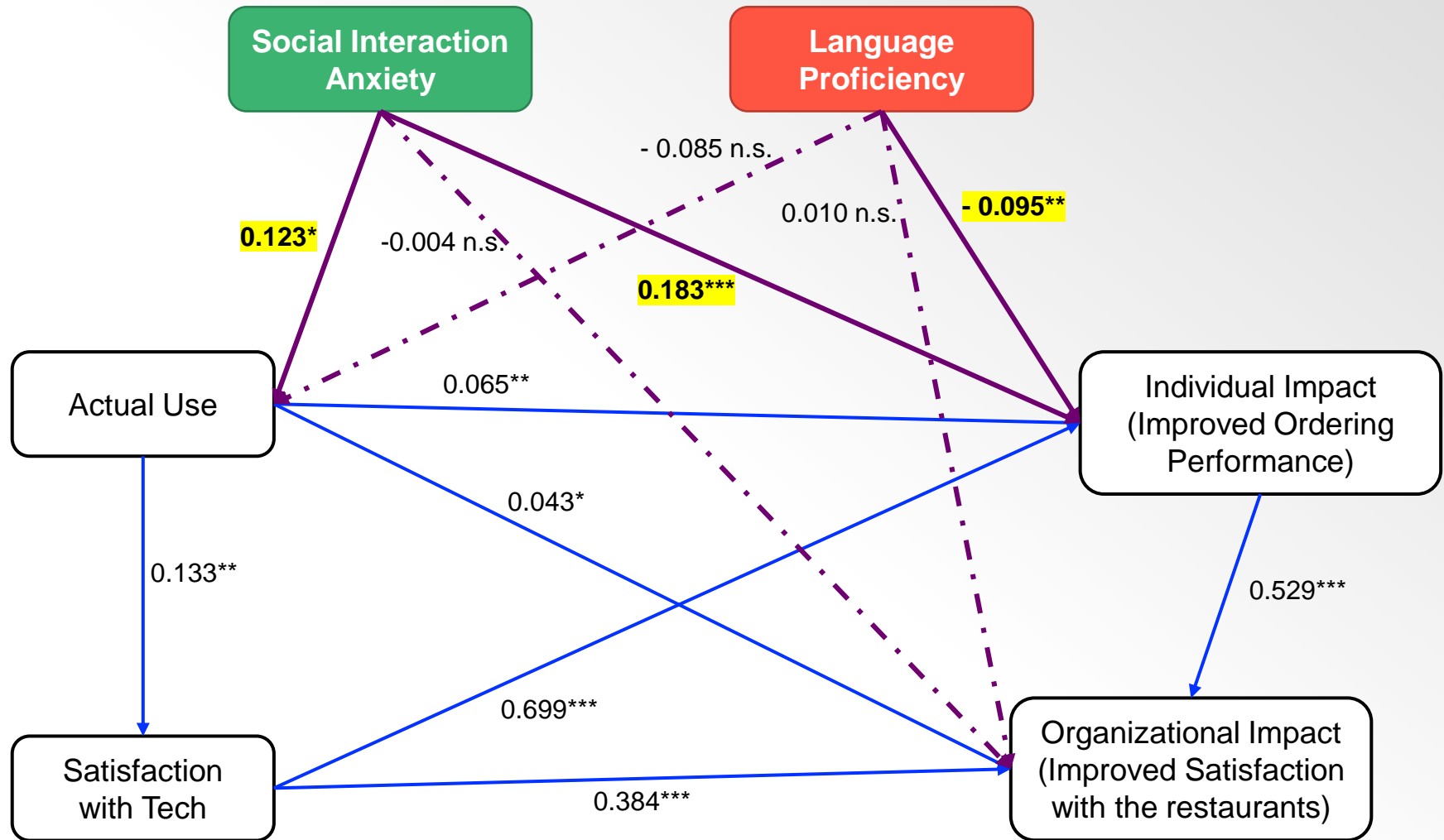
# Discussions of Results (1) (Continuance)

- **Social Interaction Anxiety**, even with the presence of users' performance expectancy and satisfaction with the human-less techs, does have **positive significant relationship with users' intention to continue use** both mobile apps and self-service kiosks.
- **Social Interaction Anxiety** has stronger impact on continuance intention in the case of **self-service kiosks** than in the case of mobile apps.
- **Language proficiency** has **negative relationship** with users' intention to continue use self-service kiosks.
- In the case of mobile apps, **performance expectancy** has stronger impact on user's continuance intention than satisfaction with the technology, while **in the case of self-service kiosks**, **user's satisfaction with the technology** has stronger impact on continuance intention than performance expectancy.

# Results (2) – Net Benefits Model (SS Kiosk)



# Results (2) – Net Benefits Model (Mobile App)



\*\*\* sig. at 0.001 / \*\* sig. at 0.01 / \* sig. at 0.05 / † sig. at 0.1

# Discussions of Results (Net Benefit)

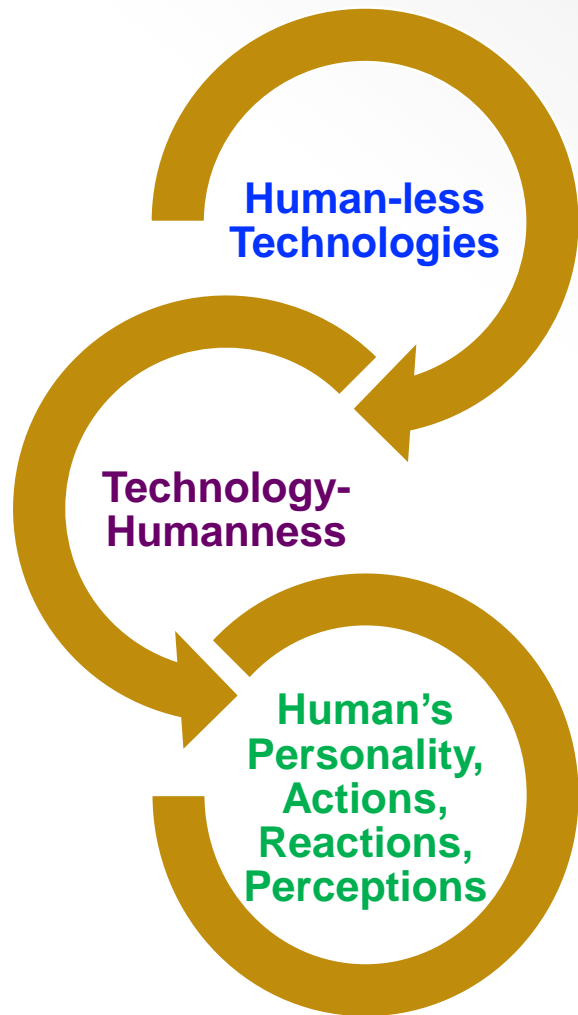
- The higher **social interaction anxiety** one has, the more they actually **use the human-less food ordering technologies** (mobile apps and self-service kiosks).
- The higher **social interaction anxiety** one has, the more likely that s/he feels that using the human-less food ordering technologies have **improved her/his food ordering performance** in a fast-food restaurants.
- The lower **language\* proficiency** one has, the more they **actually use the self-service kiosks**.
- The lower **language\* proficiency** one has, the more likely that **s/he feels that using the human-less food ordering technologies have improved her/his food ordering performance** in a fast-food restaurants.
- **Tech-satisfaction** has strong relationship with both aspects of net benefits.
- **Actual use** is positively associated with both aspects of net benefits in the case of mobile apps.

# Conclusions

- Empirical evidence about the 'use continuance' and 'net benefits' in the context of the human-less technologies of fast-food restaurants.
- Social Anxiety and Language Proficiency as important factors for actual use, satisfaction with techs, continuance intention, and individual benefits in the context of the human-less technologies of fast-food restaurants.
- Practical Implications to fast food restaurants (To be detailed)
- Accessible hospitality services for customers with linguistic/mental challenges.
- Social Anxiety → FF App/Kiosk Addiction?
- **Unused variables:** frequency of patronizations, habit of using the human-less technologies, introvert/extravert personality, proportion of ordering with different ordering methods,...



# Future Research



- **Fixed & HW:** Self-service kiosks, ATM, Smart speakers, **Service robots** (ICN Airport),...
- **Web, Mobile, & SW:** Online customer service, Mobile apps, **Online/mobile chatbots**, **VR agents...**

- **Technology humanness (a variable)**
- **Mori's (1970) uncanny valley theory**

- **Personality:** Technology readiness (anxiety), Innovativeness, Social anxiety, Language ability, Intro(Extro)version, **Big-five traits**,...
- **Actions:** (Continued) Use,...
- **Reaction:** Emotions, Recommendation, Resistance, Abandonment, **Personification**,...
- **Perceptions:** **Quality (Sys Q vs. Svc Q)**, Tech beliefs (e.g., PU), Perceived performance, Satisfaction, **Trust**,...



**THANK YOU!**

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# Appendix. Survey items

## Language Proficiency (1 item)

- 1) Please rate your speaking ability in English based on the following criteria (1 ~ 11)
- 1 (Zero) No ability whatsoever in the language
  - 2 (Novice – Low) Unable to function in the spoken language
  - 3 (Novice – Mid) Able to operate in only a very limited capacity
  - 4 (Novice – High) Able to satisfy immediate needs with learned utterances
  - 5 (Intermediate – Mid) Able to satisfy some survival need and some limited social demands
  - 6 (Intermediate – High) Able to satisfy most survival needs and limited social demands
  - 7 (Advanced) Able to satisfy routine social demands and limited work requirements
  - 8 (Advanced Plus) Able to satisfy most work requirements and show some ability to communicate on concrete topics
  - 9 (Superior) Able to speak the language with sufficient structural accuracy and vocabulary to participate effectively in
  - 10 (Distinguished) Able to speak with a great deal of fluency, grammatical accuracy, precision of vocabulary and
  - 11 (Native) Able to speak like an educated native speaker

Modified from ILR & ACTFL Skill Level Comparison Chart

(Kang and Lim 2004)

## Social Interaction Anxiety (7 items)

- 1) I have difficulty making eye-contact with others.
- 2) I become tense if I have to talk about myself or my feelings.
- 3) I feel tense if I am alone with just one other person.
- 4) I have difficulty talking with other people.
- 5) I worry about expressing myself in case I appear awkward.
- 6) I am nervous mixing with people I don't know well.
- 7) I feel I'll say something embarrassing when talking.

(Mattick and Clarke 1998)

# Appendix. Survey items

<p><b>Technology Anxiety (6~9 items)</b></p>	<p>1) I have difficulty understanding most technological matters.                  2) When given the opportunity to use a technology device, I fear I might damage it in some way.                  3) Technological terminology sounds like confusing jargon to me.                  4) I have avoided technology because it is unfamiliar to me.                  9) I hesitate to use technology for fear of making mistakes I cannot correct.</p>	<p>(Meuter et al. 2003; Thatcher and Perrewé 2002)</p>
<p><b>Patronization of the fast-food restaurant (1 item)</b></p>	<p>(Please answer this question referring to the period before the COVID-19 lockdown.)                  Please indicate the frequency that you eat (order) any food or drink items in any McDonald's restaurants per month:                  _____ times/month</p>	<p>Developed</p>
<p><b>Proportion of food-ordering method (1 item)</b></p>	<p>(Please answer this question referring to the period before the COVID-19 lockdown.)                  Please indicate the proportions of food ordering methods you use when you visit and eat in a McDonald's restaurant.                  All four proportions must add up to 100%.                  1) Human clerks _____ %                  2) Mobile Apps _____ %                  3) Self-service Kiosks _____ %                  4) Order made by others (E.g., ask your friends to order) _____ %</p>	<p>Developed</p>

# Appendix. Survey items

<b>Actual use</b> <b>(1 item)</b>	(Please answer this question referring to the period before the COVID-19 lockdown.) Please indicate the frequency that you use the My McD's App per month: _____ times/month	Developed
<b>Use continuance</b> <b>Intention</b> <b>(4 items)</b>	(Please answer this question referring to the period before the COVID-19 lockdown.) 1) My intentions are to continue using the My McD's App over other alternative means of food ordering methods. 2) All things considered; I expect to continue to use the My McD's App in the future. 3) I can see myself increasing my use of the My McD's App if possible. 4) It is likely that I will frequently use the My McD's App in the future.	(Bhattacharjee 2001)
<b>Individual Impact -</b> <b>Improved</b> <b>Performance</b> <b>(6 items)</b>	(Please answer this question referring to the period before the COVID-19 lockdown.) Thanks to the My McD's App ... 1) The number of times I visit McDonald's restaurants has been increased. (Effectiveness) 2) My average spending amount at McDonald's restaurants has been increased. (Effectiveness) 3) I get better deals when ordering food at McDonald's restaurants. (Effectiveness) 4) Time to order & receive food at McDonald's restaurants has been decreased. (Efficiency) 5) My efficiency of food ordering at McDonald's restaurants has been improved. (Efficiency) 6) Overall, my performance of food ordering at McDonald's restaurants has been improved. (Overall)	(Igbaria and Tan 1997) (Delone and McLean 2003)



# Appendix. Survey items

<p><b>Individual Impact - Improved Satisfaction with the restaurant (4 items)</b></p>	<p>(Please answer this question referring to the period before the COVID-19 lockdown.)          Thanks to the McDonalds' mobile app, I have become...          1) Much more dissatisfied / Much more satisfied          2) Much more displeased / Much more pleased          3) Much more frustrated / Much more contented          4) Much more terrified / Much more delighted          ... with McDonald's restaurants than before I used the My McD's App.</p>	<p>(Bhattacharjee 2001; Hong, Thong, and Tam 2006)          (Delone and McLean 2003)</p>
<p><b>Satisfaction with Technology (4 items)</b></p>	<p>(Please answer this question referring to the period before the COVID-19 lockdown.)          How would you describe your overall experience of using the My McD's App?          1) Very dissatisfied / Very satisfied.          2) Very displeased / Very pleased.          3) Very frustrated / Very contented.          4) Absolutely terrible / Absolutely delighted.</p>	<p>(Bhattacharjee 2001; Hong et al. 2006)</p>
<p><b>Performance Expectancy (4 items) (used as PU in expectation-confirmation model - ECM)</b></p>	<p>(Please answer this question referring to the period before the COVID-19 lockdown.)          1) I find the My McD's App useful when ordering food.          2) Using the My McD's App enables me to accomplish my food ordering process more quickly.          3) Using the My McD's App increases my efficiency in the food ordering process.          4) If I use the My McD's App, I will increase my chances of getting better deals for the price of my food.</p>	<p>(Venkatesh, Thong, and Xu 2012)</p>

# Appendix. Survey items

## Confirmation (3 items)

(Please answer this question referring to the period before the COVID-19 lockdown.)

- 1) My experience with using the My McD's App was better than what I expected.
- 2) The service level provided by the My McD's App was better than what I expected.
- 3) Overall, most of my expectations about using the My McD's App were confirmed.

(Bhattacharjee, 2001; Hong et al., 2006)

## Habit (5 items)

(Please answer this question referring to the period before the COVID-19 lockdown.)

- 1) The use of the My McD's App has become a habit for me
- 2) I am addicted to using the My McD's App.
- 3) I must use the My McD's App.
- 4) I do not think twice before using the My McD's App.
- 5) Using the My McD's App has become natural to me.

(Limayem and Hirt 2003)