Understanding social media echo chamber, socialbots and trust

Theory of Planned Behavior perspectives

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PACIFIC TELECOMMUNICATIONS COUNCIL

PTC'23

15-18 JANUARY 2023 | HONOLULU, HAWAII

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Social media echo chamber & socialbots

- Social media's echo chamber effects selectively exposed users to like-minded viewpoints (Dubois & Blank, 2018)
  - ✓ Algorithms enhance filter bubble, form stratospheres, and keep users from alternative viewpoints; sending targeted messages to selected social groups (Cota et al., 2019) & resulting in polarization (Cinelli et al., 2021)
  - ✓ Partisan social media echo chamber effects exacerbate users' political polarization and fragmentation (Bright, 2018; Torres-Lugo et al., 2022)
- Disguised socialbots
  - Definitions: Fake accounts that mimic human online behaviors with ill agenda, disseminate disinformation to undermine elections and democracy (Ferrara et al., 2016).
  - Q: Understand echo chamber in the context of malicious socialbots

Research purposes

- Taiwan has faced bot-driven disinformation campaigns during elections and COVID-19 outbreaks (Lin, 2022)

- To fill the research gap, this web survey study adapts **variables of Theory of Planned Behavior (TPB) model** (i.e., **socialbot attitude**, **bot control** and **privacy concern**) to investigate the complex associations with **social media's echo chamber and trust**, as well as their impacts on **social media users' interaction intent with socialbots**.

Echo chamber & social media algorithm

- Eco chamber definition: A “bounded, enclosed media space,” forms a frame ideology and feedback loops for people “listen to, read, and watch media outlets” (Jamieson & Cappella, 2008, p.76)
  - People’s tendency to prefer congenial information and disregard uncongenial information (Buder et al., 2021)
  - People selectively exposed themselves to homogenous perspectives and interacted primarily with content similar to personal cognitive preferences (Garimella et al., 2018)
  - With goal-oriented search engines, Internet use facilitates selective exposure and likely enhances online echo chamber

Echo chamber & social media algorithm studies

- Social media algorithms form filtering bubbles to refrain users from reaching alternative perspectives (Hong & Kim, 2016)
  - Magnifies echo chamber impacts on divided communities and fragmented society (Dubois & Blank, 2018)
  - Mutually validating worldviews and isolating from threatening out-groups lead to ideological polarization (Buder et al., 2021; Baumgaertner, 2014)
  - Reinforce and solidify political beliefs (Justwan et al, 2018), especially influential for political swingers with weak partisan preferences (Rudolph, 2011)
- During the elections and pandemic, social media echo chamber
  - Strengthens people's confirmation bias (Jiang et al., 2021)
  - Increases vulnerability to online misinformation manipulation

Echo chamber, socialbots & social media algorithm

- Regarded as risks, disguised socialbots used to propagate political disinformation and health misinformation brings threats to compromise election results, endanger democracy (Lin, 2021; Lin, et al., 2022; Shao et al., 2017) and sabotage public health (Faris et al., 2020).
- Bail et al.'s (2018): People exposing to twitter bots' messages with opposite perspectives strengthened their pre-existing perspectives
- Social media users are vulnerable as visible targets for socialbots as they reinforce online falsehood and manipulate user attitudes, opinions and behaviors (Mihr, 2017, p.21).
- Past research has not examined the complex relationships between the social media users' susceptibility to echo chambers with their planned behaviors towards disguised socialbots (TPB variables in this study).

Theoretical foundation: TPB

- Theory of Planned Behavior Theory (TPB) focuses on understanding human behaviors led by behavioral beliefs about projected outcomes (Ajzen, 2002) (social norms & control)
  - Extensively applied to various disciplines (e.g., Health research; new media & technology studies)
- It is crucial to examine how social media users' perceptions towards malicious socialbots and their negative outcomes will affect their behavior intention
- Extended TPB has been applied to examine disguised socialbots' associations among disinformation interaction, TPB variables and disinformation threat (Lin, 2022)

TPB variables in this study

- **Attitude towards socialbots** : Social media user attitudes towards socialbots as a challenge to communities and public debates, a risk to organizations and their images, and ethical concerns for scholars and practitioners
- **Perceived bot control** as behavioral control: people's views about their ability to create and affect happenings in their lives (self-efficacy) (Bandura, 1982)
  - Terry & O'Leary (1995): include "Perceived self-efficacy" (i.e., belief in one's ability to perform a behavior) & "perceived controllability" (i.e., belief that a performance is entirely up to the individual)
- **Privacy concern** as subjective norm: individuals' awareness about their private data and ability to limit sharing of personal information (Wei et al., 2010)
  - Socialbots automatically collecting users' personal information (Li et al., 2020); expect high levels of confidentiality from socialbots interactions(Graeff, 2013); people felt skeptical about social media trustworthiness (Wei et al., 2010)

Trust & intention to interact with socialbots

- William (2012): multi-dimensional social media users trust
  - Content → trust in the information
  - Messenger/source → trust in who delivered the information
  - Content creator → trust in media outlets or social media companies
- Individual media attention is influenced by media trust; and socialbot trust is likely to influence socialbot interaction intention (Williams, 2012)
- If socialbots facilitate communication, provide credible information and perform social presence activities, users' interaction intention increases (Grimme et al., 2017; Meske & Amojo, 2018)
- When socialbot activities intentionally cause harm, they result in falsehoods, spamming, deception, likely reducing trust (Shi, et al., 2020)
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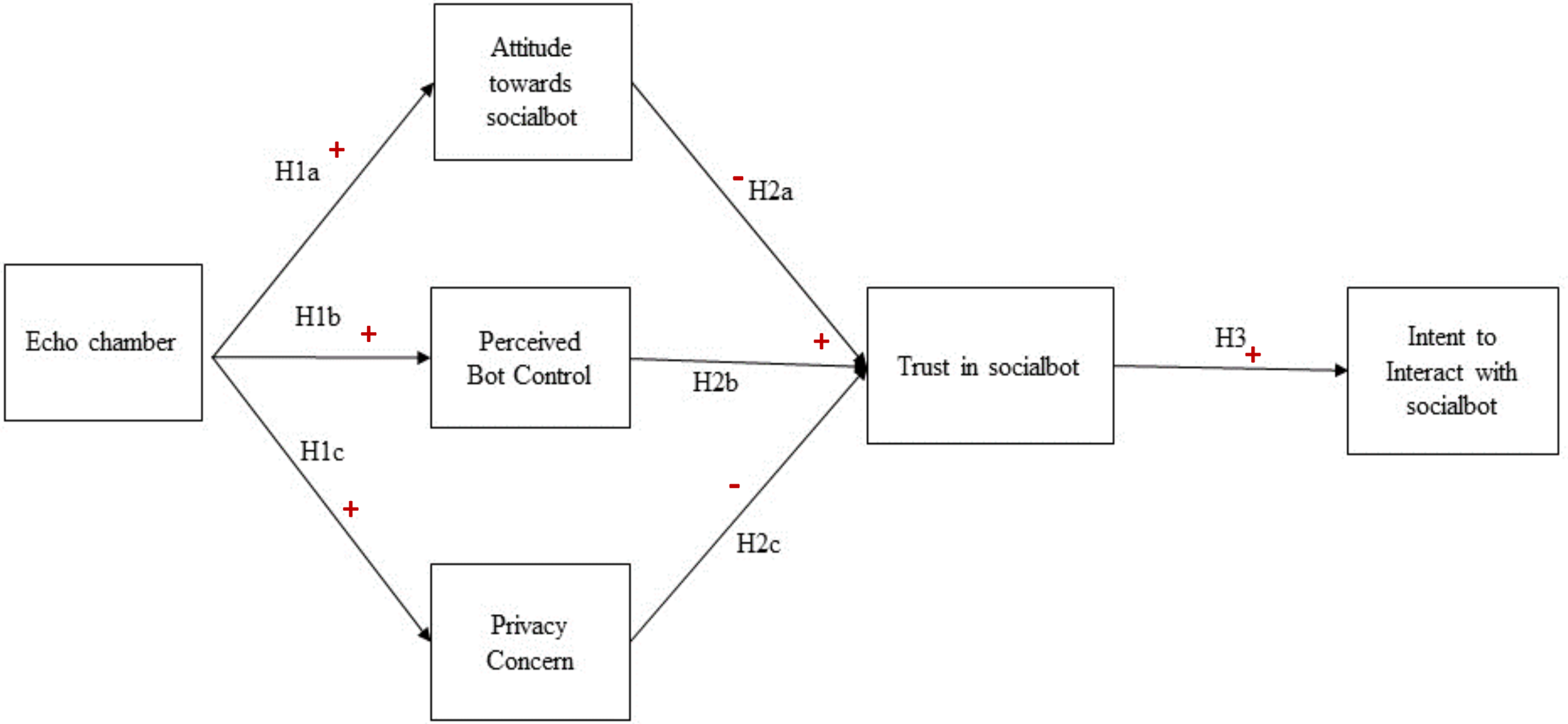
Research purposes & hypotheses

- Research aims
  - Taiwanese socialbot users' **perceived echo chamber** and its relationship with **TPB variables (attitude towards socialbot, perceived bot control** and **privacy concern**) as well as their associations with **socialbot trust** affecting **intention to interact with socialbot**
- Hypotheses

H1a	:	**Echo chamber** is positively associated with **attitude towards socialbot**.
H1b	:	**Echo chamber** is positively associated with **perceived bot control**.
H1c	:	**Echo chamber** is positively associated with **privacy concern**.
H2a	:	**Attitude towards socialbot** is negatively associated with **trust in socialbot**.
H2b	:	**Perceived bot control** is positively associated with **trust in socialbot**.
H2c	:	**Privacy concern** is negatively associated with **trust in socialbot**.
H3	:	**Trust in socialbot** is positively associated with **intent to interact with socialbot**.

Research model



Research site: Taiwan

- 2023 Social media penetration rate: 90% of the population actively using one or more platforms (OOSGA, 2023)
- V-Dem 2021 report: Since 2012, Taiwan has ranked No. 1 as the most severely attacked target by foreign disinformation campaigns for 9 years
- International media reports: Political disinformation and cyberattacks launched by foreign governments occurred frequently during Taiwanese elections (CNA, 2019).
- When COVID-19 first occurred in Taiwan, media reported that foreign Internet armies and socialbots disseminated coronavirus misinformation to stir public panic (Yuan, 2020).

Research Method

- Data Collection : Web survey in August 2021

- Filtering criteria of Cyberpanel
  - Taiwanese social media above 20 years old with prior experiences of socialbots
  - Fit 2021 Taiwanese social media user profile in demographic quotas (i.e., gender, age and education attainments) (IXresearch, 2020)

Final sample:
750 respondents

Data analysis:
Structural Equation Modelling

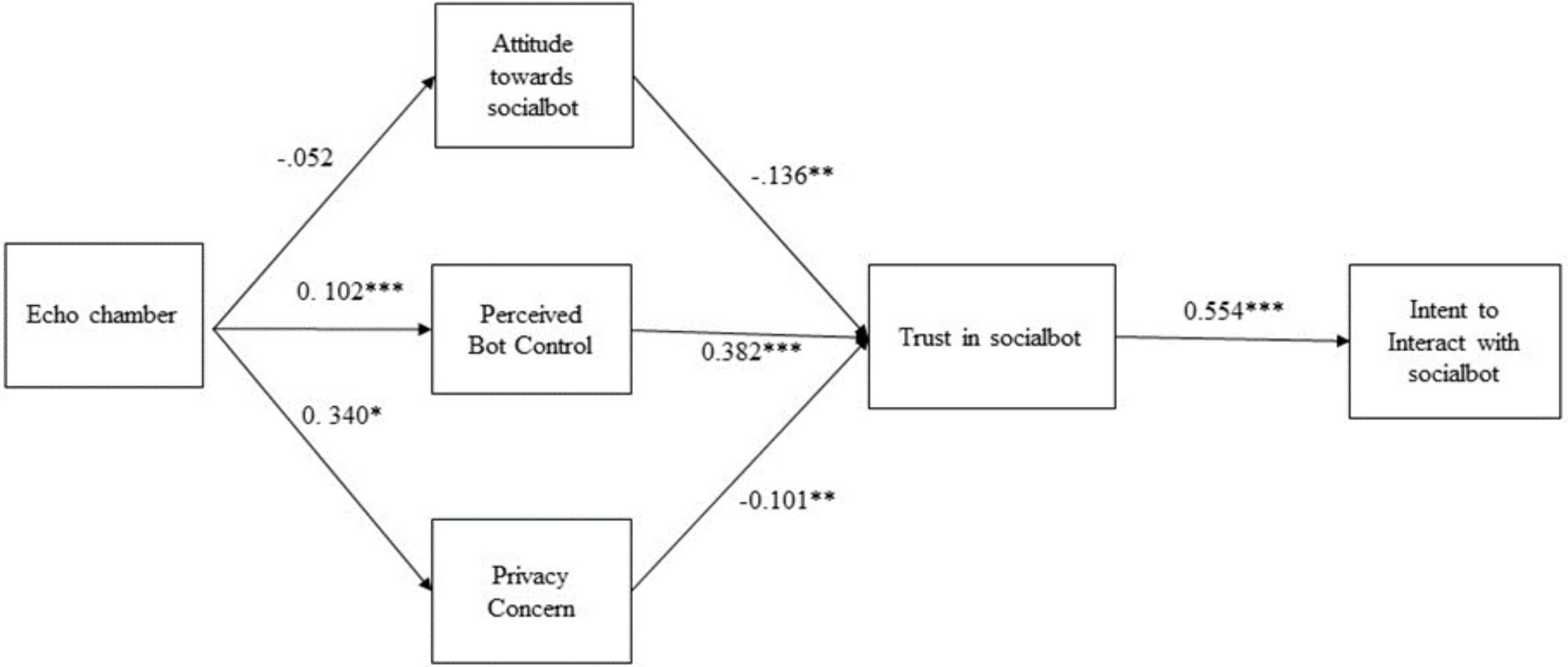
Measurement

- **Echo Chamber (α = 0.84, M = 3.16, SD =0.82)** : Adapted from Dubois & Blank (2018)'s measurement (Aspects of echo chamber: disagree, different, confirm, offline, change)
- **Attitude towards socialbots (α = 0.63, M = 2.99, SD =0.80)**: Adapted from Wiesenberg & Tench (2020)'s five-item measurement
- **Perceived Bot Control (α = 0.73, M = 4.52, SD =1.21)** : -Adapted from Schmuck & von Sikorski (2020) four-item measurement
- **Privacy Concern (α = 0.94, M = 5.10, SD =1.25)** : Wei et al. (2010)'s four-item measurement
- **Trust in Socialbots (α = 0.94, M = 5.88, SD =1.71)** : Adapted from Williams (2012) six-item measurement of media trust
- **Intent to interact with socialbot (*a* = 0.61, M = 3.23, SD =0.92)** : Edward et al. (2014)'s three-item measurement

Table 1. Respondents' demographic profile

Sample characteristics (N =750).		Frequency	Percentage(%)
Gender	Male	372	49.6
	Female	378	50.4
Age	20-29	169	22.5
	30-39	192	25.6
	40-49	196	26.1
	50-59	154	20.5
	60 and older	39	5.3
Education	Elementary school	8	1.07
	Junior high school	16	2.13
	Senior high school/vocational high school	128	17.07
	Associate degree	107	14.27
	Bachelor's Degree	406	54.13
	Master's degree and above above	85	11.33
Individual Monthly income	Dependent/No income	36	4.8
	Unstable income	34	4.5
	NTD20000 and below	53	7.1
	NTD20001-40000	248	33.1
	NTD40001-60000	174	23.2
	NTD60001-80001	88	11.7
	NTD80001-100000	50	6.7
	NTD100001-150000	42	5.6
	NTD150001-200000	11	1.5
	NTD200,001 and above	14	1.9

Results



X2/df = 3.99, CFI = 0.932, TLI = 0. 924, RMSEA =0.063 (90% CI= .060 .067), SRMR =0.085

p <.05, ** p <.01, *** p <.001; n.s. = non-significant* *(Good model fit)***

Results

Table 2. Summary of hypothesis testing

	Hypothesis	Path value	Decision
H1a	Echo Chamber → Attitude towards socialbots	n.s.	Rejected
H1b	Echo Chamber → Perceived Bot Control	0.102***	Supported
H1c	Echo Chamber → Privacy concern	0.340*	Supported
H2a	Attitude towards socialbots → Trust in socialbots	-0.136*	Supported
H2b	Perceived Bot Control → Trust in socialbots	0.382***	Supported
H2c	Privacy Concern → Trust in socialbots	-0.101**	Supported
H3	Trust in socialbots → Intent to interact	0.554***	Supported

Notes: *p <.05, ** p <.01, *** p <.001, n.s. = non-significant. Results were controlled for age, gender, ethnicity, education and income

Results

- Echo chamber on social media
  - No influence on **attitude towards socialbots** (b = .052, n.s)
  - Significantly associated with **perceived bot control** (b = .102, p <.001)
  - Moderately related to **privacy concern** (b = .340, p <.05)
- Perceived bot control
  - Positively associated with **socialbot trust** (b = .382, p <.001)
  - Negatively related to
    - ✓ **Attitude toward socialbot** (b = .136, p <.01)
    - ✓ **Privacy concern** (b = -.101, p <.01)
- Trust in socialbot predicts interaction intent (b =.554, p <.001)

Discussions

- **Echo chamber effects** are exacerbated by echoing thoughts in stratosphere and widening the gaps among outgroups (Cinelli et al., 2021; Dubois & Blank, 2018)
  - Social media algorithms accelerates echo chamber, resulting in political polarization and social antagonism
  - Socialbots in computational campaigns worsens social media's echo chamber effects
- Research gap: Past studies have not yet examined how **social media users' susceptibility to echo chamber** affect their **perceived planned behaviors towards disguised socialbots**
  - This study is one of the first quantitative research to investigate perceived echo chamber effects on users' perceptions of socialbots and further look into the relationships of TPB variables with socialbot trust and bot interaction intention

Discussions: Social media echo chamber

- **Echo chamber** here refers to **the extent to which socialbot users find themselves in an echo chamber by checking various ways of seeking information on social media** (reflecting media diversity), including...
  - Reading contents that users **disagree** with and **different** from their perspectives
  - **Confirming** individual beliefs
  - Verifying information with **offline media**
  - **Changing personal viewpoints** after thinking
- **Social media echo chamber** has no effect on **attitudes towards socialbot** (**tested by individual ethical challenges (micro), threat for organizations (meso) and societies and public debates (macro)**)
  - **Perceived echo chamber** does not have a direct relationship with **attitudes towards sociabots** due to their hardly detected and novelty characteristics

Discussion & Conclusion: : Social media echo chamber

- **Social media echo chamber** has a strong positive association with **perceived bot control** and a **weak relation to privacy concern**
- Perceived bot control encompasses self-controllability to avoid socialbots' manipulation (Schmuck & von Sikorski, 2020) and self-efficacy to bot detection (Yan et al., 2020)
- **Social media users with highly perceived echo chamber** tend to have **good control over protecting themselves from socialbot harm and detecting bots**
- Sociabot users' **privacy concerns** (Wei et al., 2010) are related to...
  - (1) Information misuse or no prior consent; (2) Data stolen or information leaking; (3) Personal information used for political propaganda
- People who can mitigate **social media echo chamber** are likely to feel concerned about socialbots' privacy concerns

Discussion: TPB variables & trust in socialbots

- In this study, **trust in socialbot** contains users' benign beliefs in 1)social media contents, 2) individual designers and 3) companies/platforms (Williams, 2012)
- **Socialbot trust** positively predicts users' **interaction intention** significantly
  - Socialbot users are likely to interact if they trust in bots' contents, developers and ways of using personal information obtained by bots
- **Attitude toward socialbot**, **perceived bot control**, and **privacy concern** (TPB variables): Predictors for interacting with socialbots and threat (Lin, 2022)
  - The study finds:
    - Owing to skepticism embedded in **socialbot attitude** and **privacy concern**, both are **negatively** associated with socialbot trust
    - **Perceived bot control (strong predictor)** is **positively** associated with trust in socialbots

Contributions

- Disguised socialbots cause the contemporary threat to political disinformation, election intervention, and opinion manipulation in democratic societies
- Research contribution
  - Theoretically : contributes to extend the TPB theory to the context of socialbot and echo chamber
    - Identifies social media echo chamber as a predictor for TPB variables (i.e., perceived bot control and privacy concern)
  - Practically : highlights the significance of promoting digital literacy about disguised socialbots
    - Improving social media users' bot control and raising their privacy concerns so as to mitigating social media echo chamber and reducing trust in malevolent socialbots
- Digital literacy campaigns can be developed to raise awareness of malignant socialbots
  - Training social media users to detect and differentiate malignant bots as well as to prevent themselves from opinion manipulation and personal data leakage

Mahalo!

Q & A

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