Using Agent-based Modeling to Explore the "Myth" of Media Multitasking

Abstract

Media multitasking appears to have become the norm in our Permanent Online, Permanent Connected society(POPC,Vorderer et al. [2017]).This research project aims to adopt a balanced perspective, considering media multitasking as a dynamic choice involving users' trade-offs. It seeks to establish connections between the multimedia environment and the users' individual attributes. An Agent-Based Model (ABM) will be designed to observe such dynamic choices and explore the factors influencing these decisions. The application of ABM as an emerging research technique in the field of communication studies allows us to view media tasks as active agents, breaking away from the conventional viewpoint of users generating media multitasking behaviors.

1 Introduction

In the new multimedia environment, audience's media use behaviour are becoming more complicated. It is worth noting that media saturation and convergent technologies have made media multitasking increasingly prominent in recent years.[Wang and Tchernev, 2012]Media multitasking is commonly defined as engaging in two or more media activities with a specific timeframe. Existing research can generally be divided into two categories. Media effect research consistently shows negative consequences of media multitasking in empirical ways while media choice research depicts its increasing prevalence.[Wang et al., 2015] For instance, media multitasking is widely known to be detrimental to cognitive performance[Armstrong and Chung, 2000], cognitive function[Ophir et al., 2009], and even can be life-threatening[McCartt et al., 2006]. Thus contradicitons between effect and choice are considered as "myth" of media multitasking. In other words, perhaps people are simply unaware of its actual inefficiencies or they are required to multitasking due to frenzied work load and time stress.[Rosen, 2008] It's fair enough to conceive media multitasking as balancing choices rather than inherently distraction.

1.1 dynamic motivated choice perspective

Dynamic motivated choice perspective is widely employed to explore this question and incorporates many relevant factors, such as the type of media technology, geographical information of users, the type of interaction between technology and people, etc. Wiradhany et al. [2021]introduces the exploitation-exploration model of media multitasking(EEMMM), using task engagement to develop the model and showing why people media multitask spontaneously. From U&G theoretical opinion, Wang and Tchernev [2012] provides evidence of the reciprocal dynamics of media multitasking, personal needs, and gratification using time-series data.

1.2 multiple factors to be considered

After reviewing existing research, multiple factors are considered and involved in the model, as Table 1 shows.

This research tend to draw the perspective of dynamic choice and consider multiple factors to observe the general patterns of emergence of media multitasking, in other words, equilibrium state of multitasking and boundary conditions under different circumstances.

1.3 Specific aims

In conducting this study, the following specific aims will be accomplished.

- **specific aim1**: How individual engaging in multimedia environment and balancing their media multitasking choice?
- **specific aim2**: How media factors, i.e., shared modality, affects the choice or combinations? Similarly, what about the audience's factor?
- **specific aim3**: What is the boundary condition for the equilibrium?

2 Method and proposed technical work

In various branches of social sciences, agent-based models(ABMs) have long been been applied to enhance researchers' understanding of complex systems and process. However, the approach is rarely used in communication science research[Waldherr and Wettstein, 2019]. Waldherr and Wettstein [2019] see integrating micro and macro perspectives on media effect as one of the most prominent venues for ABM in communication science. However, the majority of existing research regard the agent as people to deconstruct societal phenomena and identify individual process.[Epstein, 2012] This research try to see the media task as agent to simulate the multimedia and high-choice environment modern users facing today. Additional argument will be attached to explain why such choice works.

- Define Agents and Attributes

	Type	Factors	Reference
media	technology and interaction based	affordance	Zhou 2020
		information flow	Baumgartner and Wiradhany 2022
		shared modality	
		task switching	
		instant gratification	
		behavioral response requirement	
audience	socio-geographic	gender	Alghamdi et al. 2020
		age	Carrier et al. 2009
	individual-level	personality traits	Wang and Tchernev 2012
		needs	
		social capital	Huber et al. 2019

Table 1: Factors and References

  - Create agents representing individuals, each having attributes such as social capital, age, gender, and personality traits.
  - Define agent attributes with appropriate ranges or categories (e.g., low, medium, high) for each characteristic.
- Define Tasks and Their Attributes
  - Create tasks as agents, representing different media-related tasks (e.g., visual, auditory, information flow, low behavioral requirement tasks).
  - Assign specific attributes to each task, defining their characteristics and complexity.
- Environment and Interaction Rules
  - Design the multimedia environment in which the agents operate.
  - Specify the rules for agents' interactions with tasks and each other (e.g., task selection, task switching, communication).
- Task and Agent Interaction
  - Implement the logic for agents to interact with tasks based on their attributes and preferences. Define how agents' attributes influence their task preferences and switching behaviors.
- Task Combination and Stability
  - Define how agents combine multiple tasks and how the combination affects their performance and well-being.
  - Specify conditions for achieving stability in the model, such as reaching an equilibrium state or balancing media multitasking behavior.
- Model Calibration and Validation
  - Determine appropriate parameters and initial conditions for model to reflect real-world scenarios.
  - Validate model by comparing simulation outcomes with empirical data or existing research on media multitasking behaviors.(optional)
- Run Simulations and Analyze Results
  - Run multiple simulations with different initial conditions and parameter settings to observe different outcomes.
  - Analyze the results to understand how different agent attributes and interaction rules influence media multitasking behavior and stability
- Model Refinement and Sensitivity Analysis
  - Refine the model based on insights gained from the analysis.
  - Perform sensitivity analysis to test the robustness of the model against changes in parameter values.

3 Expected Results

The expected outcome can be 3 parts: media multitasking patterns, impact of attributes, stability and equilibrium. Specific categories will be determined by model results.

4 Softaware

Python or Netlogo will be employed to do the technical work. Some popular libraries and frameworks in Python that are commonly used for ABM, i.e., Mesa, PyABM, etc.

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