Investigating the Impact of Feedback Intervention and Social Facilitation on Users'
Satisfaction, Productivity and Mindfulness

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ABSTRACT

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Rakesh Bishnoi

Among many productions and lifestyle technological products, scheduling applications are emerging as a viable solution. Existing research has studied productivity with meagre attention to continuance intention to use the technology. The current study attempts to examine users' continuance intention in the context of scheduling mobile application by integrating expectation confirmation theory with feedback intervention theory and social facilitation theory. Specifically, this study will extend the expectation confirmation model (ECM) by adding feedback interventions and social facilitation as antecedents to ECM to examine continuance intention based on variables of scheduling applications. A one week long longitudinal experiment with 55 participants was conducted assigning them different scheduling tasks of a mobile application followed by a post study questionnaire. Structural Equation Modeling (SEM) was employed to validate the proposed research model and test the hypotheses. We found a significant influence of perceived usefulness and satisfaction on users' continuance intention leading to positive effect on productivity with use of application. However, no significant relationship was found between perceived usefulness and satisfaction. Furthermore, the study found a strong effect of confirmation on satisfaction and a positive influence of satisfaction on mindfulness. This study will contribute to expanding our understanding of the factors that influence users' continuance intention of using scheduling mobile applications and their impact on productivity and mindfulness.

Keywords: *Scheduling application, expectation confirmation model, continuance intention, feedback intervention theory, social facilitation theory, productivity, mindfulness.*

Acknowledgments

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Chapter 1

Introduction

In the 1990s, the technology-industry boom introduced the concept of 'Internet time,' emphasizing the rapid emergence of technologies and tech companies in the digital age, a notion still accurate in 2023 (Rosenberg, 2008). This digital era has also significantly impacted individuals' time management and overall well-being, with a decline in attention spans by 33% since 2008 (Microsoft Canada, 2015). While organizations optimize processes with agile methodologies like JIRA (Sarkan et al., 2011), few prioritize personal optimization. To address such challenges, leveraging technology itself through task and scheduling applications is proposed. The demand for such applications is evident, with productivity-focused mobile apps reaching 7.6 billion downloads and $5 billion in revenue by 2022 (Statista Market Forecast, 2022). Silicon Valley's digital calendar designers emphasize the ideals of efficient time management in scheduling applications (Wajcman, 2019).

Despite numerous productivity apps (Issahaku et al. 2018), user retention remains a challenge, prompting research on continuance intention and related variables. To incentivize user engagement, establishing an uninterrupted feedback loop from productivity applications is suggested. This research plans to incorporate feedback interventions, using scheduling applications as a control variable, to assess their impact on user perception, satisfaction, and mindfulness. Mindfulness, explained by Langer (1989) as a state of lively awareness and alertness, is crucial for wise decision-making and long term of benefits (Shapiro et al., 2006). While existing studies on information systems focus on organizational levels (Goswami et al. 2009; Swanson and Ramiller 2004; Fichman 2004), applying mindfulness to individuals' technology acceptance is underexplored (Sun, 2011). This research aims to explore mindfulness in the context of technology, specifically focusing on how scheduling applications contribute to users' decision-making at the individual level.

Additionally, Huang (2019) highlighted that external factors, such as social influence, significantly impact the continuance intention related to desktop usage.

Although significant developments are being made as individual subjects of productivity (Uruena, 2018), mindfulness in IT (Wu et al., 2022) and social facilitation (Rafaeli and Noy, 2002), we still lack research of potential convergence of these variables and their impact on continuance intention in order to enhance productivity and mindfulness in mobile applications. Aiello et al. (1995) 's research proved that the social facilitation effect resulted in participants' enhanced output. As a result, we will be introducing social facilitation variable to test user's behavior on task management and how collaboration and presence of others affects user's perception of using these technologies. The central aim of this research is to expand the expectation confirmation model (ECM) within the productivity context. This involves incorporating feedback interventions and social facilitation as additional antecedents and investigating their impact on the resulting outcomes of productivity and mindfulness. We have designed a longitudinal experiment in which participants are asked to use a productivity app for one week. This study can be used to inform the design of the productivity applications to improve their continuance use.

Chapter 2
Literature Review

2.1 Expectation confirmation theory and ECM

The original ECM model used in this study comes from expectation confirmation theory (ECT **Appendix A**). Oliver (1980) first created ECT which originally consisted of constructs: pre-purchase expectation, perceived performance, confirmation, satisfaction, and user's repurchase intention in the context of marketing. It asserts that expectations, along with perceived expectations, leads to post-purchase satisfaction. Furthermore, this effect can be deduced by positive or negative dissonance among expectation and performance (Oliver, 1980). ECT was then used in numerous studies for a variety of purposes and was further adapted and extended into expectation confirmation model (ECM) by Bhattacharjee (2001b) with a view to predict IS continuance usage rather than

focusing on initial adoption as seen in ECT. Bhattacharjee's model includes three variables: perceived usefulness, confirmation of expectations, and satisfaction to describe and predict IS continuance usage and it uniquely states prominence on post-purchase expectation. As seen in figure 1, to determine the IS continuance intentions, the two primary variables are confirmation and perceived usefulness, which is determined by the user's initial expectations.
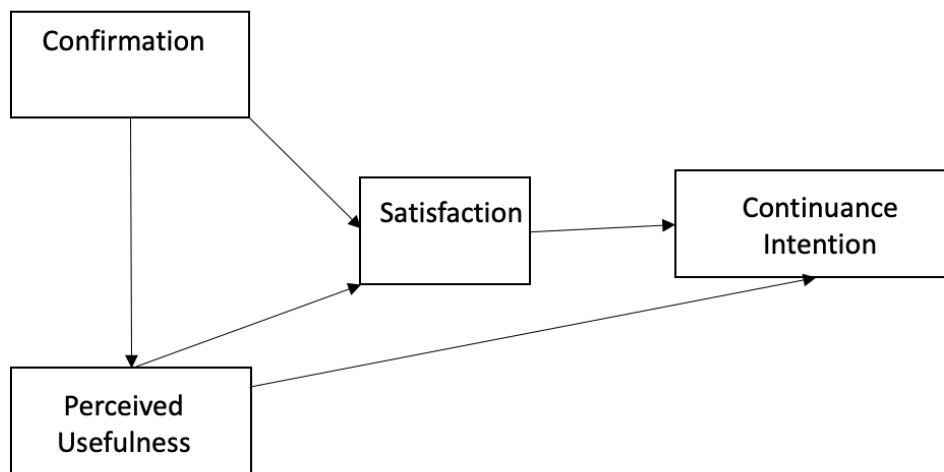
Figure 1. Post-acceptance model from Bhattacherjee (2001b)

ECM draws upon principles from IS, psychology and behavior to explain expectations formed by users, their use of services or products, and ensuing their satisfaction. A wide range of research has adopted ECM to describe continuance expectation in different technology topics by proposing several models to study online information on mobile applications or websites (see Table 1). Table 1 presents a compilation of studies within the realm of Information Systems (IS) that employ technology analogous to the one utilized in this research. The table describes the respective research contexts, theoretical frameworks (which align with those employed in this study), and outcomes of these investigations. By examining this table, one can discern the progression and contributions of prior research, thereby guiding the direction and relevance of the present study. Taking that into consideration, we looked at different kinds of research being carried out to elucidate the user's behaviour with the help of ECM and extended with the help of other theories in relation to mobile applications and online websites. Beginning with subject of technology for this research, mobile applications, Malik and

Rao (2019) introduced an extended model of ECM coupled with TAM to study continued usage of on-demand ride hailing services. Their results supported the integrated model of ECM and TAM to predict user's post adoption behaviour of ride hailing mobile application. Long and Suomi (2022) investigated motivation behind users' continuation of usage of theme park mobile applications by introducing ECT along with IS success model and perceived value. Rahi et al. (2022) studied another extended ECM by introducing an addition of flow theory and brand awareness in mobile applications for e-commerce. Their result suggests that satisfaction and expectation-confirmation are the most crucial elements in deducing user intentions of continuing using m-shopping applications. Tam et al. (2020) established with their research that satisfaction, habit, performance and effort expectancy are the most important determinants to predict continuous intention of usage of mobile application. To do so, they used ECM and the extended theory of acceptance and use of technology (UTAUT2). Looking at research done on online websites and users' IS continuous intention of usage, Lin et al. (2005) studied factors affecting continued use of internet websites by including the variable 'playfulness' into the expectation confirmation theory (ECT). They went on to establish that perceived playfulness, confirmation to satisfaction and perceived usefulness, all contributed to the users' intention of continuing using a website. Shiau et al. (2011) investigated an extended model of ECM with flow theory to measure continued usage of online blogs among major platforms. Lee (2010) explored similar applications by explaining and predicting users' intentions to continue using e-learning platforms using respondents from university in Taiwan. Liao et al. (2007) predicted the effects of external points such as confirmation of expectation, search effort, and alternative attractiveness are predictors regret, which in turn influences repurchase intention and satisfaction.

Table 1 Some research in ECM and mobile apps

Authors	Research Context	Theory/Model	Technology Used	Sample and Method	Findings
Malik and Rao (2019)	Continued usage of on-demand ride services	ECM and TAM	Ride hailing mobile applications	1552 customers from various cab services in India, CFA	Results support the integrated model of TAM and ECM for predicting post adoption behavior of ride hailing apps
Long and Suomi (2022)	Motivation behind users continuing to use theme park apps	ECT, IS Success model and perceived value	Theme park mobile applications	Data to be collected from online survey platform in China	Expanding literature and understand individual differences in theme parks
Rahi et al. (2022)	Consumer behaviour towards mobile shopping applications	ECM, flow theory and brand awareness	Mobile shopping applications	401 participants working in education sector, SEM	Satisfaction and expectation-confirmation are the most essential elements in determining user intentions to continue using m-shopping apps
Tam et al. (2020)	Factors underlying the continuance intention of mobile applications usage	ECM and the extended theory of acceptance and use of technology (UTAUT2)	Mobile applications	304 questionnaires collected via email, SEM	The most important determinants of continuance intention of m-apps are satisfaction, habit, performance expectancy and effort expectancy
Lin et al. (2005)	Continued use of websites by including 'playfulness'	Extending the expection confirmation theory	Internet websites	300 undergraduate student with major in management, Confirmatory factor analysis (CFA)	Perceived playfulness, confirmation to satisfaction, and perceived usefulness all contributed significantly to the users' intent to reuse a web site.
Shiau et al. (2011)	Flow' experience and continuance usage of online blogs	Extending the expectation confirmation model with flow theory	Blogs websites	303 online bloggers on major platforms, Structural equation modeling (SEM)	Primary ECM variables and flow positively influences bloggers' continued intention of using blogs
Lee (2010)	Explaining and predicting users' intentions to continue using e-learning platforms	ECM, TAM and the theory of planned behavior (TPB)	E-commerce websites	123 respondents from university in Taiwan using e-learning websites	Satisfaction has the most significant effect on users' continuance intention
Liao et al. (2017)	Effect of external points on repurchase behaviors and influence on satisfaction and regret	ECT and regret theory	E-commerce websites	268 online store customers, Partial least squares analysis	Confirmation of expectation, search effort, and alternative attractiveness are predictors of regret, which in turn influences satisfaction and repurchase intention
Riley et al. (2011)	How health behavior theories are applied to mobile applications	Dynamic feedback system theories	Health behavior interventions with mobile applications	Theoretical review of interactivity of mobile health behavior interventions	Current theories appear inadequate to inform mobile intervention development
Camilleri and Kozak (2022)	Reaction towards online content attractiveness through social media platforms and applications	TRA, TAM, TPM, and Social Facilitation	Social media platforms and mobile applications	923 Facebook users and member of travel and tourism groups, Partial least squares (PLS)	They found that Facebook users were attracted to groups which featured aesthetically appealing content and the ones that facilitated their engagement

2.2 Productivity and Mindfulness

Productivity as achieved through the use of digital products can be referred as the measurable effectiveness and efficiency gained by individuals in or entities in accomplishing tasks facilitated by integration of technology. This concept has gained notable attention with the wake of mobile technology in numerous aspects of daily life, the design and utilization of mobile devices have progressed, creating new prospects and augmenting value and productivity (Stewart & Pavlou, 2002). Mobile app stores have more than 4.9b billion application downloads on app stores by 2022 under the category 'Lifestyle' generating a total revenue of US $6bn (Productivity - Worldwide | Statista Market Forecast, 2022). Existing research examining smartphone usage and its impact on productivity have employed diverse theoretical frameworks. The implementation of mobile applications has revolutionized workforces in numerous sectors, for instance road transport in Nigeria (Obisi et al., 2017). Their study found a significant relationship between road transport management and mobile applications. Miranda and Vergaray (2021) investigated the literature of impact on work productivity by employing gamified mobile applications and suggested way to new research on the topic due to paucity of studies on the subject. Abhari and Vaghefi (2022) explored screen time and productivity, leveraging the goal-setting theory as their theoretical foundation and established that engaging in self-monitoring improves user productivity and contributes to a general feeling of satisfaction with accomplishments. Concurrently, mindfulness-based mobile applications (MBMAs) as well have gained substantial attention among smartphone user cohort. Mindfulness has been conceptualized as an encompassing self-regularity capacity, an accepted skill and a meta-cognitive skill (Sliwinski et al., 2015). Recent research has studied the efficacy of mindfulness application in minimizing stress, symptoms of anxiety and depression (Huberty et al., 2019) and improving mental health. Furthermore, Sarker et al. (2012) delved into use of mobile technologies to mitigate the impact of work-life balance and emphasized the significance of selecting fitting strategy to augment productivity. Consequently, exploring users' determinants of continuance intention to use such applications is imperative for amplifying both productivity and mindfulness.

2.3 Feedback intervention

Feedback in theories of communication is generally limited to the conduct as a reaction to a message (Frandsen & Millis, 1993). This ambiguous concept was later made coherent by Kluger and Denisi (1996)'s Feedback Intervention Theory (FIT). They posit that FIT aims to understand the mechanisms and dynamics of feedback processes in organizational and performance contexts. FIT imparts insights into how feedback, when appropriately structured, can affect the behavior, motivation and performance of both individuals and groups. Furthermore, they implied that in some situations, feedback interventions can result in "large and positive effect on performance". McCalley, L.T. (2006) in their applied product research pointed out that FIT provides an explanation for the role of goals and feedback which allows "generalizability to other applications". Moreover, Brohman et al. (2020) discussed impacts of various forms of provider feedback on both healthcare providers' actions and patients' adaptability, particularly concerning individuals with chronic diseases. The study categorized feedback into three primary types:

(1) Outcome feedback, which entails receiving information about one's performance results' state, (2) Corrective feedback which furnishes details about the procedure that caused the difference and/or the methods for minimizing it, (3) Personal feedback, characterized by information that conveys concern, seems well-intentioned, is sensitive to the demands of the individual's emotions and brain, and demonstrates a route to progress (Fong et al. 2018). Ozyurk et al. (2012) established in their study that providing individuals with information regarding the anticipated outcome significantly influences subsequent performance outcomes. As outlined in Table 1, Riley et al. (2011) investigated how health behaviour theories are applied to mobile applications and found that existing theories seem insignificant to inform mobile intervention development.

As a result, this research aims to also investigate productivity enhancement with the help of the scheduling application. The employed mobile application will offer participants with outcome feedback on their tasks and offer pertinent suggestions, enabling users to contemplate and implement helpful adjustments.

2.4 Social facilitation theory

Theory of social psychology has the age-old construct of social facilitation, which was originally understood as people's tendency to execute simple as well as well-learned tasks better in presence of others (Rafaeli and Noy, 2002). As first devised by Zajonc (1965), the fundamental premise of social facilitation theory suggests that the mere presence of others can enhance or inhibit an individual's performance, depending on the nature of the task. Furthermore, as concluded by Geen and Gange (1977), the drive theory remains the most relevant explanation of "both increments and decrements in performance in terms of a single set of constructs". The concept of home team advantage in sports serves as an illustration of the relationship between social facilitation and pressure (Baumeister, 1984). In this context, when a team competes in front of their home crowd during regular matches, it tends to enjoy an additional advantage. However, the dynamics change when it comes to critical matches, leading to adverse effects on performance. Abeele et al.'s (2007) research experiment established the similarity between social presence and connectedness and consequently with emotional presence. Drawing on these findings, this study will employ the social facilitation variable as an additional variable in setting of scheduling application. As outlined in Table 1, Camilleri and Kozak (2022) studied reaction towards online content on social media platforms and applications and found that individuals on Facebook were drawn to groups that showcased visually appealing content and those are the ones that facilitated active engagement.

We can deduce that there are numerous different topics and methods to approach the research of mobile applications utilizing diverse theories. Nevertheless, there does not seem to be (or is very limited) significant historical research on the topic of mobile applications combining ECM and FIT and/or Social Facilitation models to study users' continuance intention in context of scheduling mobile applications. By combining these three well known theories, into a single theoretical model, we hope to contribute to the field of information systems. The model used in this study is described in the next chapter.

Chapter 3
Research Model and Hypothesis

This study intends to fill the existing gap for lack of research in determining variables affecting continuance intention (Funilkul and Vanijja, 2018 and Fadzil, 2018) in scheduling mobile application and how they impact productivity and mindfulness as the nascent outcomes of ECM. This way, we will modify and extend the ECM framework by building on context-based factors specifically by testing user's perceived usefulness with the help of a digital scheduling mobile application. Moreover, this study will incorporate feedback intervention literature and social facilitation theory as the antecedents to ECM's perceived usefulness construct. To answer the proposed research, below model was developed as shown in figure 1.
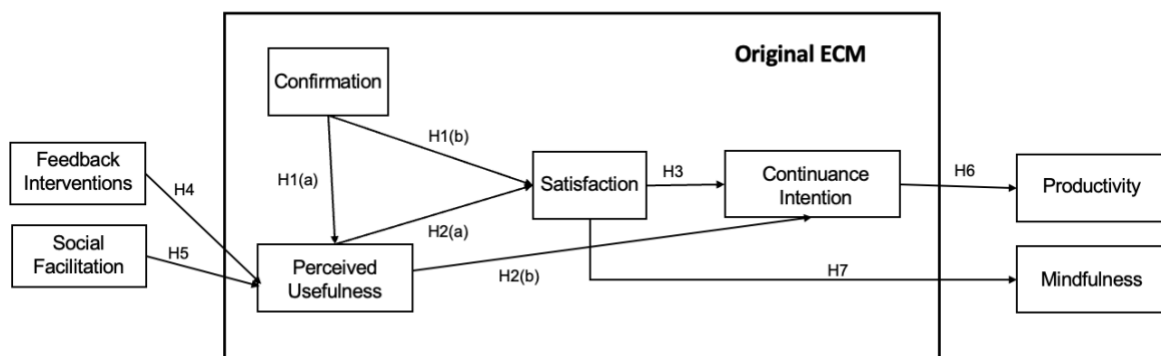
Figure 2. Proposed-Research Model

3.1 Original ECM hypothesis

Bhattacherjee (2001) posits in ECM that confirmation is a cognitive belief and states the extent to which user's expectation reached post the initial use of the technology. If the expectation of users is confirmed with the use of application, this in return will augment their perceived usefulness (post-consumption expectations) for the application (Sarkar and Khare, 2018) increasing satisfaction and hence will positively affect their future IS continuance intention. Studies have demonstrated that customers' initial expectations of

an app play a significant role in shaping their post-adoption satisfaction. Moreover, users compare their initial expectations to their actual experiences with the app, as a result, when their expectations are met or exceeded, users tend to be more satisfied. Ambalov (2018) in its meta-study of 51 primary studies on IT continuance confirmed the relationship between perceived usefulness, confirmation, and satisfaction. Moreover, Barnes and Böhringer (2011) attested to the original ECM model by proving that twitter user's continuance behavior is strongly determined by their perception of value of usage and satisfaction from using the social media. Regarding this research, confirmation can be explained as the awareness of the assistance from the use of scheduling application. However, if the desired expectations are not met, it will on the contrary reduce their perceived usefulness. Accordingly, we propose the first set of hypotheses:

H1(a): H1: Confirmation of expectation has positive impact on user's perceived usefulness with scheduling applications

H1 (b): Confirmation of expectation has positive impact on with users' satisfaction with scheduling applications

H2 (a): Perceived usefulness has positive impact on satisfaction with scheduling application

H2 (b): Perceived usefulness is positively associated with scheduling mobile application's continuance intention usage

H3: Satisfaction has a positive impact on IS continuance intention with scheduling application

3.2 Feedback interventions (FIs)

Feedback intervention theory was first defined as "actions taken by (an) external change agent(s) to provide information in regarding aspects of one's task performance" (Kluger and DeNisi, 1996). FIT also posits that the only way feedback can be effective is when attention is focused on task learning rather than to meta-task process (King, 2016). Gu et al. (2022) studied it's significance of within the realm of Human-Computer Interaction (HCI) in the context of designers involved in designing digital products. In context to this study, FIT is used to provide user's feedback based on outcome of their digital task scheduling. As a result, feedback interventions acting as an antecedent to ECM will provide extra value addition to its users and increase perceived usefulness of scheduling mobile application. Therefore, we propose:

H4: Outcome feedback will have positive impact on user's perceived usefulness with scheduling application

3.3 Social Facilitation

In experimental social psychology, social facilitation is one of the most fundamental phenomena (Sanders, 1980) and is an illustration of the most basic kind of social influence. In context of this study, social facilitation will facilitate user's using a mobile application with an increased tendency to perform their scheduled tasks in presence of their task collaborators. As a result, people will perceive more usefulness when they are aware of other's presence exposure of their activities in the application and which in return will establish encouragement. Hence, we posit that:

H5: Social facilitation will have positive impact on user's perceived usefulness with scheduling application

Mobile applications have been proven to be transformative in various industries and fields ranging from clinical practice where it has provided assistance in task and time management (C. L. Ventola, 2014), an application for production scheduling (Mourtzis et al. 2016). This study has scheduling application as the control variable where the end-product of using such products is to increase productivity (H6). Tsafou et al. 2016, found in their cross-sectional study that the effect of mindfulness on physical activity is mediated by satisfaction. Moreover, Gupta and Verma (2019) in their study on mindfulness and satisfaction posited a positive increase in the treatment group as a result of mindful practices. In context of this study, satisfaction being one of the proven constructs of ECM, will yield a positive effect on user's mindfulness. Hence, we posit that:

H6: Continuance intention will have positive impact on user's productivity with scheduling application

H7: Satisfaction will have positive impact on user's mindfulness with scheduling application

Chapter 4

Research Methodology

4.1 Research Context

In this study, we worked with a newly developed mindfulness and productivity management mobile application. It is a Canada based lifestyle management application that focuses on providing its users a tool to schedule various day-to-day tasks, provide feedback to make positive changes to their schedule helping them achieve their goals in an optimized manner and also lets the users collaborate with their peers on tasks of their choice among many other features. For the context of this study, we tested participants on the latter two features keeping scheduling tasks as our control condition for a span of one week. There are one control and two treatment groups using the application to perform their tasks. The three groups were divided based on the following features - Group 1: Calendar/scheduling (control group: feature 1), Group 2: Calendar + Feedback interventions (features 1 and 2), Group 3: Calendar + social facilitation (features 1 and 3). The features' screenshots as taken from the mobile applications are shown in figure 3. In the study, participants assigned to the control group engaged with the applications over a span of one week, primarily utilizing the calendar feature to input their weekly agendas and establish task reminders. This facilitated continuous monitoring of their schedules, encompassing activities such as scheduling workouts and leisure pursuits. Moreover, participants in Group 2, in addition to the calendar functionality, interacted with a feedback mechanism integrated within the application. This feedback, algorithmically derived from their scheduled activities and their subsequent engagement levels, aimed to enhance participants' comprehension of task prioritization and time management. For instance, during the initial application phase, if a participant aspired to allocate 45 minutes daily for physical exercise but failed to meet this target based on their calendar entries, the feedback mechanism would highlight this discrepancy and propose actionable recommendations to realign with the intended goal. Lastly, members of Group 3 combined the calendar feature with a social facilitation element, promoting collaboration with friends and family on selected tasks. This collaborative dynamic aimed

to improve participants' commitment and focus by involving relevant stakeholders in their task execution, such as a student coordinating study sessions with peers and generating mutual reminders.
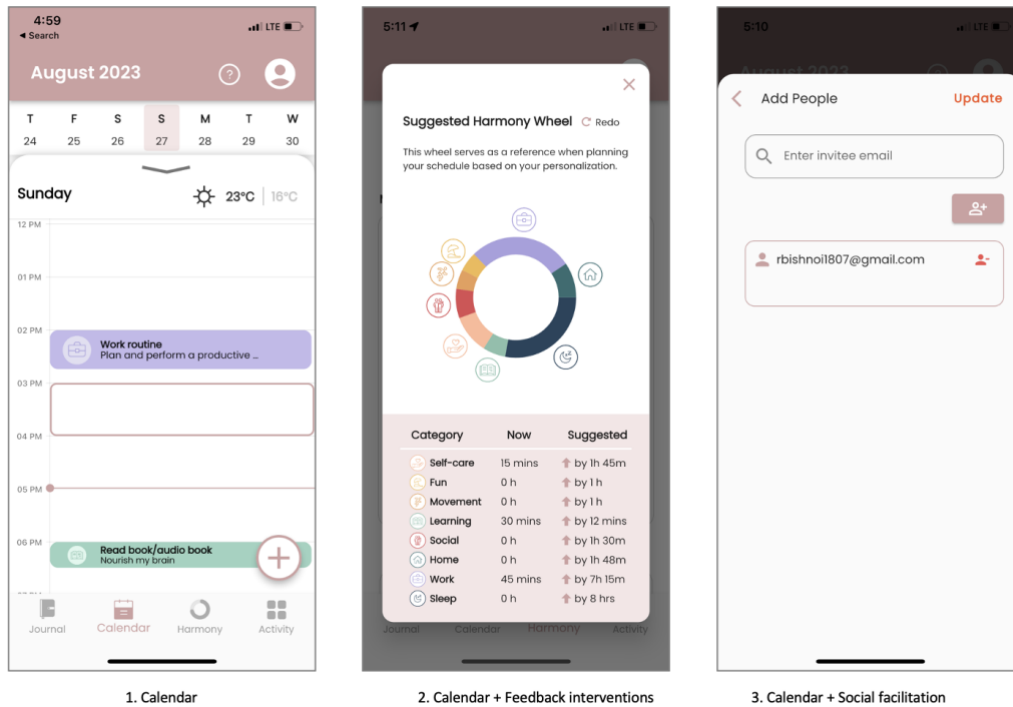
Figure 3. Assigned Tasks

4.2 Measurement

Three online questionnaire surveys were administered to accumulate from participants through survey platform Qualtrics which was shared via participants' email. The survey's measuring items were adopted according to context of this study and were taken from previously validated instruments and literature. The items for constructs from original ECM model perceived usefulness (3 items), confirmation (3 items) and satisfaction (3 items) were adapted from Bhattacherjee's (2001). Whereas continuance intentions (2 items) were adapted from latter research from Bhattacharjee and Lin (2015). The items for feedback interventions (3 items) were adopted from King et al. (2009), whereas the items for social facilitation (3 items) were adopted from Rafaeli and Roy (2002) based on the context of this study. Lastly, items for mindfulness (4 items) were adapted and changed to fit the context from Baer et al. (2004). The three items developed for

productivity captures both user efficiency and effectiveness in carrying out their everyday work.

All items in survey responses from participants will be measured on a seven-point Likert scale, ranging from strongly disagree (1) to strongly agree (7). Table 2 displays the items used in this study and their sources.

Table 2 Survey Items

Code	Item	Source
PU1	Scheduling applications like Cedulify improves my performance in managing my tasks and activities	Bhattacharjee (2001)
PU2	Scheduling applications like Cedulify increases my productivity (such as time management)	Bhattacharjee (2001)
PU3	Overall, Scheduling application like Cedulify is useful in managing goals related to mindfulness and productivity	Bhattacharjee (2001)
CNF1	My experience of using scheduling applications (Cedulify) is better than what I expected	Bhattacharjee (2001)
CNF2	The service provided by scheduling application (Cedulify) is better than what I expected	Bhattacharjee (2001)
CNF3	Overall, most of my expectations from using scheduling application (Cedulify) have been fulfilled	Bhattacharjee (2001)
STS1	I am pleased with the overall use of the scheduling application Cedulify	Bhattacharjee (2001)
STS2	I feel satisfied about my overall experience of using the scheduling application Cedulify	Bhattacharjee (2001)
STS3	STS 3Q16_1 Overall, I am satisfied with scheduling application Cedulify	Bhattacharjee (2001)
CUI1	I intend to continue using Cedulify rather than discontinue its use	Bhattacharjee and Lin (2015)
CUI2	I intend to continue using Cedulify than use any alternative means	Bhattacharjee and Lin (2015)

FI1	I think feedback from Cedulify provides clear direction on how to improve my personal goals	King et al. (2009)
FI2	Feedback from Cedulify can be valuable form of productivity advice	King et al. (2009)
FI3	I carefully read feedback provided by Cedulify	King et al. (2009)
SF1	Presence of a collaborator on the scheduled task on Cedulify helped me in achieving the task	Rafaeli and Roy (2002)
SF2	I felt a pressure to complete a scheduled task on Cedulify in the presence of a collaborator	Rafaeli and Roy (2002)
SF3	I feel presence of other people on scheduled tasks on Cedulify affects my behaviour towards completing it	Rafaeli and Roy (2002)
PRD1	Using this app helped me become more productive in performing my everyday tasks	
PRD2	Using this app helped me complete my everyday job more quickly	
PRD3	Using this app helped me perform my everyday job more effectively	
MDF1	I find it easy to create new and effective ways of using Cedulify	Baer et al. (2004)
MDF2	I am often open to learning new ways of using Cedulify	Baer et al. (2004)
MDF3	I like to figure out different ways of using Cedulify	Baer et al. (2004)
MDF4	I get involved when using Cedulify	Baer et al. (2004)

Note: PU: Perceived usefulness; CNF: Confirmation; STS: Satisfaction; CUI: continuance intention; FI: Feedback Interventions; SF: Social Facilitations; PRD: Productivity; MDF: Mindfulness

4.3 Data Collection

A North American public university's internal student portal was used to recruit part-time/full-time students and working professional participants. A university ethics approval certificate was obtained in order to hire human subjects for the cause of this experiment. To encourage participation, each participant received a $50 gift card upon

completion of the experiment. This approach was considered to ensure a tangible benefit for their participation while circumventing any undue influence on their responses. After expressing interest and providing their information, participants were asked to complete a pilot survey to obtain their consent and confirm their availability for the upcoming one-week study. A total of 83 individuals completed this initial questionnaire. On Day 0 of the experiment, a pre-study questionnaire aimed at gathering demographic information was administered, with 73 participants responding. Following this, a mid-experiment questionnaire was conducted on Day 3 to capture self-reported participation data, resulting in the discontinuation of 6 participants. Subsequently, a post-study questionnaire was administered on Day 7, encompassing items related to all constructs in the model, and it was completed by 67 participants. During the data cleaning phase, 12 responses were further discarded due to inconsistent use of application during the 7-day period, resulting in a final dataset comprising responses from 55 participants 2

The demographic profile of these participants is listed in table 3. Men (60%) and women (40%) were well-presented in the sample, the majority of responders (56%) were between age 25-34 years old, and 75% of participants holds master's degree. Furthermore, the sample included people from various ethnicities with the majority being South Asians (45%) followed by Europeans (15%). As compared to the average Canadian population, our sample is more representative of minority communities in Canada, one of the reasons being high number of international students in graduate program of universities. Moreover, a random assignment of participants was executed among the three groups as demonstrated with groupwise demographic data in table 3.

Table 3. Respondents' Profile

Distribution (n = 55)						
Age		Overall		Group 1	Group 2	Group 3
	18-24	22	40%	35%	20%	57%
	25-34	31	56%	59%	80%	39%
	35-44	1	2%	6%		4%
	45-54	1	2%			
	>54	0	0%			
Gender						
	Male	33	60%	53%	53%	70%
	Female	22	40%	47%	47%	30%
Education						
	High school degree or equivalent	1	2%	6%		
	Bachelor Degree	12	22%	35%		26%
	Master's degree (e.g., MSc or Med)	41	75%	53%	100%	74%
	Doctorate (e.g., PhD)	1	2%	6%		
Ethnicity						
	South Asian	25	45%	24%	47%	61%
	European	8	15%	35%	7%	4%
	Middle eastern	6	11%	12%	13%	9%
	Hispanic or Latin	4	7%	6%	13%	4%
	South East Asian	6	11%	12%	13%	9%
	Other	4	7%	6%	7%	9%
	East Asian	1	2%			4%
	Prefer not to answer	1	2%	6%		

Chapter 5

Data Analysis and Results

To analyze the collected data, Structural Equation Modeling (SEM) was used to examine the relationships presented in the proposed research model and the analysis was conducted with variance-based software Smart PLS version 4. As advocated by Anderson and Gerbing (1988), a two-step approach was then followed. First, to analyze the fitness and construct validity of the proposed measurement model, assessment of reliability, convergent validity, and discriminant validity. Following which, the structural model was examined to test the strength and hypothesized relationships as proposed in the research model. SEM was particularly used in data analysis of this research due to its capability to assess multiple components of a model simultaneously (Awang, 2015).

5.1 Evaluation of the measurement model

The collected data was examined by Cronbach's α to assess reliability and internal consistency of the model. It compares the amount of shared variance or covariance within the items of the construct making up an instrument amounting to overall variance. The mean, standard deviation and Cronbach's α of all constructs is shown in table 4. The analysis shows the reliabilities of the six dimensions to be above the 0.7 criteria suggested in the literature (Nunnally, 1978). A collection of indicators designed to assess a single construct is known as convergent validity (Kline, 2015). As recommended by Fornell and Larcker (1981), convergent validity can be proven by following criteria: a) the item's factor loading (λ) are significant and above 0.5 (Hair et al., 2010, Awang, 2015), or as suggested by some literature to be above 0.7 (Chin 1998; Hair et al. 2010), b) the average variance extracted (AVE) is greater than 0.5 (Awang, 2015), c) composite reliability (CR) of each construct is above 0.7 (Byrne, 2013; Awang, 2015). As indicated in table 4, composite reliability (CR) and cronbach's α for all constructs were found to be higher than the threshold value of 0.7, advocating a satisfactory reliability. The average variance extracted (AVE) was found to be above 0.5 as well as all the factor loadings were above 0.7 (Chin 1998; Hair et al. 2010

Table 4. Construct reliability

Construct (Mean, SD, R^2)	Item Code	Factor Loading	Cronbach's α (>0.7)	AVE (>0.5)	CR (0.7)
Perceived Usefulness (5.6, 0.95, 0.088)	PU1	0.753	0.802	0.721	0.885
	PU2	0.906			
	PU3	0.881			
Confirmation (5.93, 1.12)	CNF1	0.931	0.902	0.836	0.939
	CNF2	0.930			
	CNF3	0.881			
Satisfaction (6.01, 1.22, 0.851)	STS1	0.965	0.955	0.917	0.971
	STS2	0.961			
	STS3	0.947			
Continuance Intention (4.83, 1.80, 0.445)	CUI1	0.970	0.933	0.937	0.968
	CUI2	0.966			
Mindfulness (5.38, 1.30, 0.469)	MND1	0.843	0.900	0.768	0.930
	MND2	0.862			
	MND3	0.997			
	MND4	0.912			
Productivity (4.86, 1.55, 0.633)	PRD1	0.934	0.938	0.890	0.960
	PRD2	0.949			
	PRD3	0.947			

Discriminant validity pertains to the degree to which a construct is distinct from other constructs (McKnight et al., 2002; Hair et al., 2010). To demonstrate discriminant validity, express that the square root of the Average Variance Extracted (AVE), represented by bold diagonal values for each construct, is higher than its corresponding correlations coefficients (Fornell and Larcker, 1981 & Byrne, 2013). Therefore, we establish that there is sufficient discriminant validity among all the variables. Although, the discriminant validity for confirmation-satisfaction is not met, hence, the relation of confirmation impacting satisfaction should be interpreted with caution. However, as established by the literature of ECM, it is very likely that confirmation is a strong predictor of satisfaction (Bhattacherjee, 2001).

Table 5. Results of discriminative validity of the measurement model

	CNF	CUI	MDF	PRD	PU	STS
CNF	**0.914**					
CUI	0.614	**0.968**				
MDF	0.738	0.746	**0.877**			
PRD	0.559	0.796	0.689	**0.943**		
PU	0.296	0.456	0.534	0.634	**0.849**	
STS	0.922	0.598	0.685	0.546	0.291	**0.958**

5.2 Evaluation of the structural model

SmartPLS's bootstrapping analysis was performed which allows testing statistical significance of model's sub-constructs' path coefficients and weights (Chin et al., 2008). As PLS does not produce overall goodness-of-fit indices, the primary method for assessing the explanatory power of the model is through R^2 (Wasko and Faraj, 2005; Nair et al., 2015). Moreover, another method is provided by Tenehaus et al. (2005) to examine the model fit called goodness of fit (GoF) index. It uses the geometric mean of the average communality and the mean of R^2 for endogenous constructs ($GoF = \sqrt{AVE * R^2}$). The cut off value reported for evaluating GoF: GoFsmall = 0.1; GoFmedium = 0.25; GoFlarge. = 0.36 (Hoffman and Birnbirch, 2012). For the current study's model, using data from Table 4, a GoF of 0.65 was measured, which indicates a very good model fit.
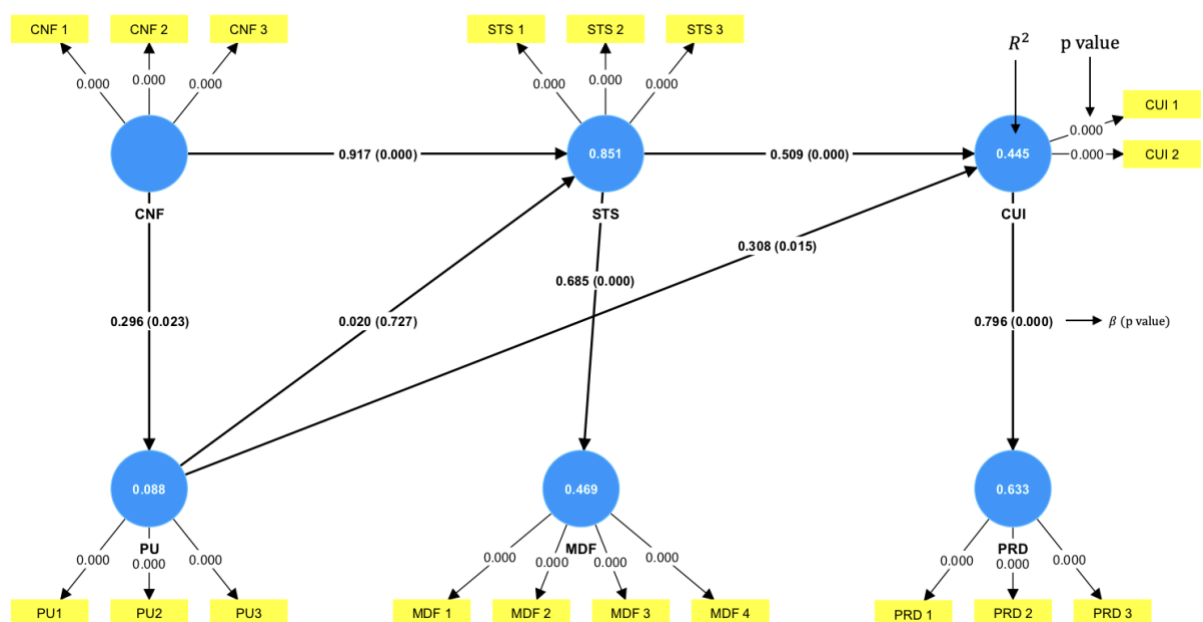
Figure 4: Structural model

5.3 Structural hypotheses testing

The hypotheses tests of this study show interesting results as shown in figure 4 and also listed in table 6.

Table 6. Hypotheses results summary

	Path	β Value	p-level	Support
H1a	CNF-PU	0.296	*	Yes
H1b	CNF-STS	0.917	***	Yes
H2a	PU-STS	0.020	0.727	No
H2b	PU-CUI	0.308	*	Yes
H3	STS-CUI	0.509	****	Yes
H4	FI-PU	0.718	*	Yes
H5	SF-PU	0.407	**	Yes
H6	CUI-PRD	0.796	***	Yes
H7	STS-MND	0.685	***	Yes

*Note: *: p < 0.1; **: p < 0.01; ***: p < 0.001*

The results shows that confirmation has a positive association with perceived usefulness (β=0.296, p<=0.1) and confirmation has a positive influence on satisfaction (β=0.917. p<0.001) which supports H1a and H1b respectively. Perceived usefulness has a positive influence on continuance usage intention (β=0.308, p<0.1) supporting H2b. However, perceived usefulness is found to be statistically insignificant in explaining its effect on satisfaction (β=0.020, p > 0.1). Moreover, there was a positive association of satisfaction with continuance usage intention (β=0.509, p<0.001) and satisfaction (β=0.685, p<0.001), supporting H3 and H7. Lastly, continuance usage intention has a positive influence on productivity supporting H7. The p values and path coefficients are shown in figure 4.

5.4 Regression Analysis

To test hypothesis H4 and H5, regression analysis was run using SPSS version 29. First, with the help of regression standardized residuals, a normal probability plot (p-p) was

obtained to assess the normality assumption of the residuals in a linear regression model. Figure 5a and 5b shows the p-p plot of FI and SF groups against the dependent variable perceived usefulness. The position of the points close to the 45-degree line suggests that the assumed distribution provides a reasonable representation of the data (Taylor and Francis, 1995).
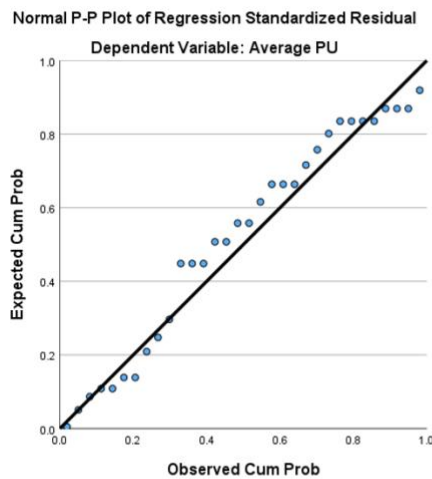

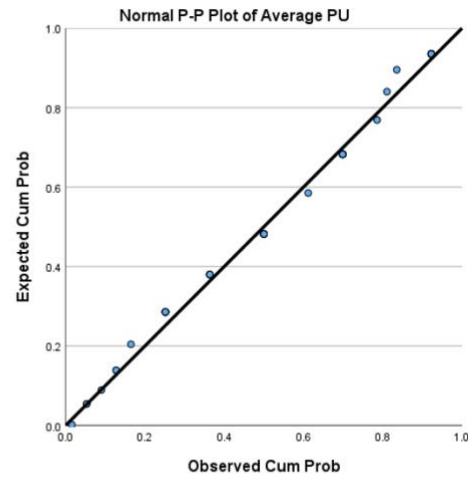**Figure 5a:** Average PU for Feedback Intervention group   **Figure 5b:** Average PU for Social Facilitation group

After running the regression analysis, the primary antecedents of perceived usefulness, feedback interventions ($\beta=0.718$, $p<0.1$) and social facilitations ($\beta=0.407$, $p<0.01$) were found statistically significant supporting H4 and H5 as shown in table 6.

Chapter 6 Discussion

6.1 Theoretical Implications

This study extends ECM in the domain of mobile scheduling applications and positive effects of feedback interventions (H4) and social facilitation (H5) as the antecedents of perceived usefulness. Eight of the nine hypotheses were supportive. Hence, this study promises the applicability of ECM to mobile applications in accordance with prior research and demonstrates a new model with respect to scheduling mobile applications within the context of real world. This model warrants a better apprehension of the

significant impact of confirmation on both perceived usefulness (H1a) and satisfaction (H1b), as well as positive impact of satisfaction on continuance intention (H3). These results align with prior studies based on the ECM based research (Bhattacherjee, 2001; Oghuma et al., 2016). The results also demonstrated that there was no significant relationship between perceived usefulness and satisfaction (H2a). This result follows with previous studies with similar results of insignificant relationship between perceived usefulness and satisfaction (Daneji et al., 2019; Alraimi et al., 2015; Chang, Hung, Cheng, & Wu, 2015). One of the reasons behind this can be strong positive correlation between confirmation and satisfaction. In order words, in the context of the study, confirmation is a stronger predictor of satisfaction (β=0.917) than perceived usefulness (β=0.020). As pointed out by prior researches, an additional factor contributing to the lack of a significant association between perceived usefulness and satisfaction in this experiment may be attributed to the impact of cultural variations within the study group consisting of university students (Alraimi et al., 2015). Formation of satisfaction can differ notably among individuals from different cultures (Roca et al., 2010). Furthermore, this study also points out that users' perceived usefulness does in fact influences their continuance usage intention positively (H2b). This raises an interesting observation and can be further interpreted as; user's decision to continue using a technology can be irrespective of their satisfaction with the actual technology. In terms of increase in productivity with scheduling applications, the results suggest that continuance intention will positively influence productivity (H6). Moreover, there was a positive effect of users' satisfaction on their mindfulness (H7).

6.2 Managerial Implications

In terms of practical implications, this one-week long longitudinal study provides numerous practical use cases. Firstly, it further cements the idea of how providing users with feedback on their scheduling and planning will positively affect their application's usefulness. Furthermore, enabling users to collaborate with their peers and friends increases usefulness as well. Secondly, the highly significant impact of continuance intention on productivity provides evidence of a fitting strategy to augment productivity with such applications and speaks for their rising demand in mobile application categories. The correlation observed between user satisfaction, the intention to continue using a mobile application, and subsequent productivity can be extrapolated to diverse

categories of mobile applications. This relationship becomes particularly pertinent in the context of user retention challenges, a prevalent concern within this category of mobile applications. Enhancing user satisfaction and fostering continued usage intention can prove instrumental in mitigating the prevalent issue of user retention, thereby contributing to overall productivity in various forms of mobile applications. Additionally, the positive impact of satisfaction on mindfulness provides further support for mindfulness-based mobile applications (MBMAs) and their growing positive impact on user's mental health. As highlighted by participants in the experiment, it was noted that the user interface (UI) of an application also holds significance in influencing mindfulness and impacting the mental health of users.

6.3 Limitations and future research

Our research also had some limitations. First, data collected in this experiment's application usage was self-reported. To improve research validity, future researches may include actual user behaviour data which should be collected directly from the mobile application's database. Second, the participant sample of this research represented highly educated group and relatively younger population, although this sample ensures digital literacy, future studies can test this proposed model in a different demographic and region with a varying degree of familiarity with digital products. Another interesting outlook at this model can be tested by using a different technology. This study used mobile application as the medium, future research can be conducted using websites like google calendar or comparing digital products with offline scheduling products. Moreover, although a group of students is a crucial sample in the context of mobile applications since it represents crucial users of mobile phones and are considered as early adopters of the technology (Kim et al. 2014), it is not representative of the entire population of North America or any geography. To further improve the external validity and generalization, participants in future studies may exclude students.

Chapter 7
Conclusion

The purpose of this study was to explore the factors influencing users' intention to continue using scheduling mobile application and what features encourages this behaviour positively. An extended expectation-confirmation model (ECM) research model was proposed and examined with a week-long study of 55 participating students and working professionals. The result of the study's SEM analysis voiced past literature by demonstrating strong relation between items of ECM and the positive influence of social facilitation and feedback interventions on users' perceived usefulness. It interestingly also revealed that perceived usefulness has no significant influence on satisfaction but positively influences continuance intention in the case of scheduling mobile application usage. Hence, based on the positive effect of users' perceived usefulness and satisfaction on continuance intention, it makes the case for users' inclination to continue using these applications. The study also uniquely demonstrates the positive effect of scheduling applications on productivity and mindfulness. The statistical support for these findings substantiates the proposed extended Expectation-Confirmation Model (ECM) and effectively establishes the key factors influencing the continued usage of scheduling mobile applications.

References

1. Abeele, M. V., Roe, K., & Pandelaere, M. (2007, October). Construct validation of the concepts social presence, emotional presence and connectedness and an application of Zajonc's social facilitation theory to social presence research. *In Proceedings of 10th international workshop on presence* (pp. 215-224).

2. Abhari, Kaveh, and Isaac Vaghefi. "Screen Time and Productivity: An Extension of Goal-Setting Theory to Explain Optimum Smartphone Use." *AIS Transactions on Human-Computer Interaction* 14, no. 3 (2022): 254–88.

3. Agarwal, R. and Karahanna, E. (2000) Time Flies when You're having Fun: Cognitive Absorption and Beliefs about Information Technology Usage, *MIS Quarterly*, 24, 4, 665-694.

4. Aiello, John R., and Kathryn J. Kolb. "Electronic Performance Monitoring and Social Context: Impact on Productivity and Stress." *Journal of Applied Psychology* 80, no. 3 (1995): 339.

5. Alexander, C. N., Langer, E. J., Newman, R. I., Chandler, H. M., & Davies, J. L. (1989). Transcendental meditation, mindfulness, and longevity: an experimental study with the elderly. *Journal of personality and social psychology*, 57(6), 950.

6. Alraimi, K. M., Zo, H., & Ciganek, A. P. (2015). Understanding the MOOCs continuance: The role of openness and reputation. Computers & Education, 80, 28–38.

7. Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin, 103(3), 411–423.

8. Ambalov, Igor A. "A Meta-Analysis of IT Continuance: An Evaluation of the Expectation-Confirmation Model." *Telematics and Informatics* 35, no. 6 (2018): 1561–71.

9. Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological bulletin*, *103*(3), 411.

10. Awang, Z., Afthanorhan, A., & Asri, M. A. M. (2015). Parametric and non parametric approach in structural equation modeling (SEM): The application of bootstrapping. Modern Applied Science, 9(9), 58.

11. Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. Assessment, 11(3), 191-206.

12. Barnes, Stuart J., and Martin Böhringer. "Modeling Use Continuance Behavior in Microblogging Services: The Case of Twitter." *Journal of Computer Information Systems* 51, no. 4 (2011): 1–10.

13. Barone, L., Ozturk, Y., & Lionetti, F. (2019). The key role of positive parenting and children's temperament in post-institutionalized children's socio-emotional adjustment after adoption placement. A RCT study. *Social Development*, 28(1), 136-151.

14. Baumeister, Roy F. "Choking under Pressure: Self-Consciousness and Paradoxical Effects of Incentives on Skillful Performance." *Journal of Personality and Social Psychology* 46, no. 3 (1984): 610.

15. Bhattacherjee, Anol. "Understanding Information Systems Continuance: An Expectation-Confirmation Model." *MIS Quarterly*, 2001, 351–70.

16. Brohman, Kathryn, Shamel Addas, Jeff Dixon, and Alain Pinsonneault. "Cascading Feedback: A Longitudinal Study of a Feedback Ecosystem for Telemonitoring Patients with Chronic Disease." *MIS Quarterly* 44, no. 1 (2020).

17. Byrne, B. M. (2013). Structural equation modeling with Mplus: Basic concepts, applications, and programming. New York, NY: Routledge.

18. Chang, C. C., Hung, S. W., Cheng, M. J., & Wu, C. Y. (2015). Exploring the intention to continue using social networking sites: The case of Facebook. Technological Forecasting and Social Change, 95, 48–56.

19. Chang, Ya Ping, and Dong Hong Zhu. "The Role of Perceived Social Capital and Flow Experience in Building Users' Continuance Intention to Social Networking Sites in China." *Computers in Human Behavior* 28, no. 3 (2012): 995–1001.

20. Chin, W. W. (1998). Commentary: Issues and opinion on structural equation modeling. MIS quarterly, vii-xvi.

21. Daneji, A. A., Ayub, A. F. M., & Khambari, M. N. M. (2019). The effects of perceived usefulness, confirmation and satisfaction on continuance intention in using massive open online course (MOOC). Knowledge Management & E-Learning, 11(2), 201-214.

22. Fadzil, Fakhri. "A Study on Factors Affecting the Behavioral Intention to Use Mobile Apps in Malaysia." *Available at SSRN 3090753*, 2017.

23. Fong, Carlton J., Diane L. Schallert, Kyle M. Williams, Zachary H. Williamson, Jayce R. Warner, Shengjie Lin, and Young Won Kim. "When Feedback Signals Failure but Offers Hope for Improvement: A Process Model of Constructive Criticism." *Thinking Skills and Creativity* 30 (2018): 42–53.

24. Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39–50.

25. Frandsen, Kenneth D., and Michael A. Millis. "On Conceptual, Theoretical and Empirical Treatments of Feedback in Human Communication: Fifteen Years Later." *Communication Reports* 6, no. 2 (1993): 79–91.

26. Geen, Russell G., and James J. Gange. "Drive Theory of Social Facilitation: Twelve Years of Theory and Research." *Psychological Bulletin* 84, no. 6 (1977): 1267.

27. Gokhale, Anuradha A. "Collaborative Learning Enhances Critical Thinking." *Volume 7 Issue 1 (Fall 1995)*, 1995.

28. Gupta, Sharad, and Harsh V. Verma. "Mindfulness, Mindful Consumption, and Life Satisfaction: An Experiment with Higher Education Students." *Journal of Applied Research in Higher Education* 12, no. 3 (2020): 456–74.

29. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis (7th ed.). New Jersey: Prentice-Hall.

30. Hamari, J., Koivisto, J., & Sarsa, H. (2014, January). Does gamification work? --a literature review of empirical studies on gamification. In 2014 *47th Hawaii international conference on system sciences* (pp. 3025-3034). Ieee.

31. Hoffmann, A. and Birnbrich, C. (2012), "The impact of fraud prevention on bank-customer relationships: an empirical investigation in retail banking", International Journal of Bank Marketing, Vol. 30 No. 5, pp. 390-407.

32. Hsiao, Chun-Hua, Jung-Jung Chang, and Kai-Yu Tang. "Exploring the Influential Factors in Continuance Usage of Mobile Social Apps: Satisfaction, Habit, and Customer Value Perspectives." *Telematics and Informatics* 33, no. 2 (2016): 342–55.

33. Hsu, Chin-Lung, and Judy Chuan-Chuan Lin. "What Drives Purchase Intention for Paid Mobile Apps?–An Expectation Confirmation Model with Perceived Value." *Electronic Commerce Research and Applications* 14, no. 1 (2015): 46–57.

34. Huang, Yong-Ming. "Examining Students' Continued Use of Desktop Services: Perspectives from Expectation-Confirmation and Social Influence." *Computers in Human Behavior* 96 (2019): 23–31.

35. Huberty, J., Green, J., Glissmann, C., Larkey, L., Puzia, M., & Lee, C. (2019). Efficacy of the mindfulness meditation mobile app "calm" to reduce stress among college students: Randomized controlled trial. *JMIR mHealth and uHealth*, 7(6), e14273.

36. Issahaku, Haruna, Benjamin Musah Abu, and Paul Kwame Nkegbe. "Does the Use of Mobile Phones by Smallholder Maize Farmers Affect Productivity in Ghana?" *Journal of African Business* 19, no. 3 (2018): 302–22.

37. Kim, M. J., & Park, J. (2014). Mobile phone purchase and usage behaviours of early adopter groups in Korea. *Behaviour & Information Technology*, 33(7), 693-703.

38. King, Paul E. "When Do Students Benefit from Performance Feedback? A Test of Feedback Intervention Theory in Speaking Improvement." *Communication Quarterly* 64, no. 1 (2016): 1–15.

39. Kline, R. B. (2015). Principles and practice of structural equation modeling (4th ed.). New York, NY: Guilford Publications.

40. Kluger, Avraham N., and Angelo DeNisi. "The Effects of Feedback Interventions on Performance: A Historical Review, a Meta-Analysis, and a Preliminary Feedback Intervention Theory." *Psychological Bulletin* 119, no. 2 (1996): 254.

41. Lee, M. C. (2010). Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation–confirmation model. *Computers & education*, *54*(2), 506-516.

42. Long, T., & Suomi, R. (2022). Continuance Intention of Theme Park Apps: An Extended Expectation Confirmation Theory Perspective.

43. Liao, Chechen, Prashant Palvia, and Jain-Liang Chen. "Information Technology Adoption Behavior Life Cycle: Toward a Technology Continuance Theory (TCT)." *International Journal of Information Management* 29, no. 4 (2009): 309–20.

44. Liao, C., Liu, C. C., Liu, Y. P., To, P. L., & Lin, H. N. (2011). Applying the expectancy disconfirmation and regret theories to online consumer behavior. *Cyberpsychology, Behavior, and Social Networking*, *14*(4), 241-246.

45. Lin, Cathy S., Sheng Wu, and Ray J. Tsai. "Integrating Perceived Playfulness into Expectation-Confirmation Model for Web Portal Context." *Information & Management* 42, no. 5 (2005): 683–93.
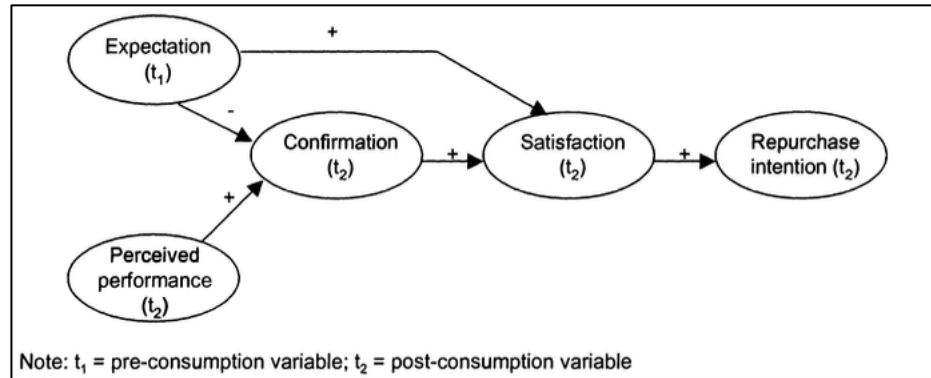
46. Malik, Garima, and A. Sajeevan Rao. "Extended Expectation-Confirmation Model to Predict Continued Usage of ODR/Ride Hailing Apps: Role of Perceived Value and Self-Efficacy." *Information Technology & Tourism* 21, no. 4 (2019): 461–82.

47. McCalley, Lorna T. "From Motivation and Cognition Theories to Everyday Applications and Back Again: The Case of Product-Integrated Information and Feedback." *Energy Policy* 34, no. 2 (2006): 129–37.

48. McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). The impact of initial consumer trust on intentions to transact with a web site: a trust building model. The journal of strategic information systems, 11(3-4), 297-323.

49. Miranda, M. A. C., & Vergaray, A. D. (2021). Mobile Gamification Applied to Employee Productivity in Companies: A Systematic Review. *TEM Journal*, *10*(4), 1869.

50. Mourtzis, Dimitris, Michalis Doukas, and E. Vlachou. "A Mobile Application for Knowledge-Enriched Short-Term Scheduling of Complex Products." *Logistics Research* 9 (2016): 1–17.

51. Nair, Pradeep Kumar, Faizan Ali, and Lim Chee Leong. "Factors affecting acceptance & use of ReWIND: Validating the extended unified theory of acceptance and use of technology." Interactive Technology and Smart Education 12.3 (2015): 183-201.

52. Nunnally, J. C. (1978). An overview of psychological measurement. Clinical diagnosis of mental disorders: A handbook, 97-146.

53. OBISI, C., & Gbadamosi, A. A. O. (2017). Impact of Mobile Applications on Workforce Productivity in Road Transport Industry in Nigeria. *BVIMSR Journal of Management Research*, *9*(2).

54. Oghuma, A. P., Libaque-Saenz, C. F., Wong, S. F., & Chang, Y. (2016). An expectation-confirmation model of continuance intention to use mobile instant messaging. Telematics and Informatics, 33(1), 34-47.

55. Oliver, Richard L. "A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions." *Journal of Marketing Research* 17, no. 4 (1980): 460–69.

56. Pal, Debajyoti, Suree Funilkul, and Vajirasak Vanijja. "The Future of Smartwatches: Assessing the End-Users' Continuous Usage Using an Extended Expectation-Confirmation Model." *Universal Access in the Information Society* 19 (2020): 261–81.

57. Rafaeli, Sheizaf, and Avi Noy. "Online Auctions, Messaging, Communication and Social Facilitation: A Simulation and Experimental Evidence." *European Journal of Information Systems* 11, no. 3 (2002): 196–207.

58. Rahi, S., Alghizzawi, M., Ishtiaq, M., Ngah, A., & Mehta, A. M. (2022). Examining consumer behaviour towards continuance use of mobile shopping apps with the integration of expectation confirmation theory and flow theory. International Journal of Business Information Systems, 2-24.

59. Rosenberg, Scott. *Dreaming in Code: Two Dozen Programmers, Three Years, 4,732 Bugs, and One Quest for Transcendent Software*. Currency, 2008.

60. Sarkan, Hasliza Md, Tengku Puteri Suhilah Ahmad, and Azuraini Abu Bakar. "Using JIRA and Redmine in Requirement Development for Agile Methodology." In *2011 Malaysian Conference in Software Engineering*, 408–13. IEEE, 2011.

61. Sarkar, Subhro, and Arpita Khare. "Influence of Expectation Confirmation, Network Externalities, and Flow on Use of Mobile Shopping Apps." *International Journal of Human–Computer Interaction* 35, no. 16 (2019): 1449–60.

62. Sarker, Suprateek, Saonee Sarker, Xiao Xiao, and Manju Ahuja. "Managing Employees' Use of Mobile Technologies to Minimize Work-Life Balance Impacts," 2012.

63. Shapiro, S.L., Carlson, L.E., Astin, J.A., and Freedman, B. 2006. "Mechanisms of Mindfulness," *Journal of Clinic Psychology* (62:3), pp. 373–386.

64. Shiau, Wen-Lung, Li-Chun Huang, and Chia-Hui Shih. "Understanding Continuance Intention of Blog Users: A Perspective of Flow and Expectation Confirmation Theory," 2011.

65. Statista. "Lifestyle - Worldwide | Statista Market Forecast." Accessed August 29, 2023. https://www.statista.com/outlook/dmo/app/lifestyle/worldwide.

66. Stewart, D. W., & Pavlou, P. A. (2002). From consumer response to active consumer: Measuring the effectiveness of interactive media. *Journal of the academy of marketing science*, *30*(4), 376-396.

67. Statista. "Productivity - Worldwide | Statista Market Forecast." Accessed August 29, 2023. https://www.statista.com/outlook/dmo/app/productivity/worldwide.

68. Sun, H. (2011). Making sound adoption decisions: A longitudinal study of mindfulness in technology adoption and continued use.

69. Tam, C., Santos, D., & Oliveira, T. (2020). Exploring the influential factors of continuance intention to use mobile Apps: Extending the expectation confirmation model. *Information Systems Frontiers*, *22*, 243-257.

70. Tenenhaus, M., Vinzi, V., Chatelin, Y.M. and Lauro, C. (2005), "PLS path modelling", Computational Statistics and Data Analysis, Vol. 48 No. 1, pp. 159-205.

71. Thong, James YL, Se-Joon Hong, and Kar Yan Tam. "The Effects of Post-Adoption Beliefs on the Expectation-Confirmation Model for Information Technology Continuance." *International Journal of Human-Computer Studies* 64, no. 9 (2006): 799–810.

72. Tsafou, Kalliopi-Eleni, Denise TD De Ridder, Raymond van Ee, and Joyca PW Lacroix. "Mindfulness and Satisfaction in Physical Activity: A Cross-Sectional Study in the Dutch Population." *Journal of Health Psychology* 21, no. 9 (2016): 1817–27.

73. Urueña, Alberto, Álvaro E Arenas, and Antonio Hidalgo. "Understanding Workers' Adoption of Productivity Mobile Applications: A Fuzzy Set Qualitative Comparative Analysis (FsQCA)." *Economic Research-Ekonomska Istraživanja* 31, no. 1 (2018): 967–81.

74. Ventola, C. Lee. "Mobile Devices and Apps for Health Care Professionals: Uses and Benefits." *Pharmacy and Therapeutics* 39, no. 5 (2014): 356.

75. Wajcman, Judy. "The Digital Architecture of Time Management." *Science, Technology, & Human Values* 44, no. 2 (2019): 315–37.

76. Wasko, M. M., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. MIS quarterly, 35-57.

77. Wu, Chuanhui, Yusheng Zhou, Rui Wang, Shijing Huang, and Qinjian Yuan. "Understanding the Mechanism between IT Identity, IT Mindfulness and Mobile Health Technology Continuance Intention: An Extended Expectation Confirmation Model." *Technological Forecasting and Social Change* 176 (2022): 121449.

78. Zajonc, Robert B. "Social Facilitation: A Solution Is Suggested for an Old Unresolved Social Psychological Problem." *Science* 149, no. 3681 (1965): 269–74.

Appendix

A. Expectation-confirmation theory (Oliver, 1980),

ECT (Oliver, 1980)