Use, Acceptance, and Adoption of Automated Systems with Intrinsic and Extrinsic Motivation Based Incentive Mechanisms

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***Abstract*— Incentive mechanisms are used to encourage a behavior. Incentive mechanisms can be reputation incentives (social standing risks and rewards), gamification incentives (game-based elements in non-gaming environments), and feedback incentives (verbal or text feedback). Previous research suggests that reputation and gamification incentives provide extrinsic motivation (EM), while feedback incentives provide intrinsic motivation (IM). Incentive mechanisms vary in effectiveness, but most studies indicate that IM yielding incentives are most effective. Incentive mechanisms used to promote the use, acceptance, and adoption of automated systems can prove useful to organizations that do not want to waste resources on unused systems. Incentivizing the use, acceptance, and adoption of automated systems can enhance productivity, overall safety, and work-life balance. Though there are many studies on these topics, the relative effectiveness of different IM and EM incentive mechanisms has not been studied. This study fills that gap by examining the effectiveness of incentive mechanisms that affect IM and EM. The current study utilized reputation incentives, gamification incentives, feedback incentives, and a control group to compare the use, acceptance, and adoption of an unmanned aerial vehicle (UAV) in a simulated hostage rescue task. Data were collected on how frequently participants used the system. Following the hostage rescue task, participants were given questionnaires measuring motivation, acceptance, and adoption. This study provides insight into the relative influence of IM and EM-based incentive mechanisms to promote automated technologies. These results will help elucidate the steps that organizations like the Military can take to enhance warfighter buy-in and use of new technologies.**

Keywords—extrinsic motivation, intrinsic motivation, incentive mechanisms, automation

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I. Introduction

A. Automation

Employers have many reasons to encourage the use of automated systems due to their many applications [1]. Automation has been defined as "…As a device or system that accomplishes (partially or fully) a function that was previously, or conceivably could be, carried out (partially or fully) by a human operator" [2]. A ten-level framework has been the most common way of describing the different levels of automation [2]. The goal of automating is to enhance safety, performance, and satisfaction and may involve a tradeoff, as users prefer when automation takes over boring and repetitive tasks [3]. In addition to the desire for a certain cognitive load, the use, acceptance, and adoption of these automated systems are a function of many elements including user trust, user emotions, experience with automation, design features, and system performance [3-20].

B. Acceptance and Adoption of Technology

Acceptance is one's attitude towards an automated system and is essential to the adoption of a system [4]. Adoption occurs once a user completely favors a system and begins making full use of its capabilities [4]. Acceptance can be affected by many factors, including numerous personality traits and emotions [5]-[7]. Computer anxiety has also been found to affect acceptance as an element of perceived ease of use [8]. Acceptance tends to decrease as the automation level increases; rejection occurs when decision-making is removed from the user [9]-[10]. Automation of boring tasks is more accepted, as users prefer to stay cognitively challenged at their jobs [3]. Prior exposure to automation has been shown to both increase [11] and decrease acceptance [10]. Users are also more accepting of automation that conforms to how they think [12]-[13]. Acceptance can be driven by different extrinsic and intrinsic motivators and has been shown to be positively influenced by IM [14]. One such model of technology acceptance is the Technology Acceptance Model (TAM) [15], wherein perceived usefulness of a system, perceived ease of use of a system, and attitude toward using a system all affect system acceptance. Perceived ease of use has been shown to be positively influenced by IM [8]. Adoption of technology is affected by many factors, such as trust [16]-[17] and the comments and actions of others [18]-[19]. Inhibitors oppose adoption and promoters support adoption; both can change the rate of adoption [20]. Adoption can be affected by one's belief that technology increases control and flexibility, one's confidence in his/her ability to learn new technology, one's feeling of being enslaved by technology, and one's belief that technology increases the ability to be taken advantage of [21]. Late adoption has been shown to be affected by users' ideas about the desirability of a given technology, knowledge of a brand and what differentiates them from competitors, the propensity to adopt technology early, and users who develop needs before the general market and significantly benefit from solving those needs [20]. Motivation can also inhibit the acceptance and adoption of technology.

C. *Motivation to Use Technology*

Motivation has been described as a physiological process from which behavior stems [22] and as the root of all voluntary human behavior [23]; it can be affected by a vast number of factors [24]. The leadership type of managers has been shown to affect motivation to use technology [25]. Perceived task-technology fit, how appropriate one perceives a certain technology to be for completing a task, has also been described as influencing motivation to use technology [26].

Contemporary models of motivation include expectancy-value theory, attribution theory, social-cognitive theory, goal orientation theory, and self-determination theory [27]. The expectancy-value theory states that motivation is influenced by one's perception of his/her competence at an activity, one's beliefs of how well he/she will perform on a future task, and the components of subjective task values (including the importance of performing well on a task, utility of the task, cost of completing a task, and more) [28]. Attribution theory states that motivation begins when one appraises an outcome, which produces an affective state (such as happiness if the outcome was interpreted as being positive). The affective states and expectancy of success for a given outcome lead to changes in behavior [29]. Social-cognitive theory states people monitor their self-efficacy on a task and compare it to their standards of performance. When one's performance is short of their personal standard, one engages in self-regulation to meet that standard and prevent incongruence [30]. Goal-orientation theory states that motivation is oriented around learning goals (a desire to master content) and performance goals (a desire to appear competent and avoid social ridicule). Avoidance goals are a subtype of performance goals focused on avoiding negative outcomes [31]. Self- determination theory states that humans have three needs: competence, relatedness, and autonomy. When these innate psychological needs are met, motivation is fostered; otherwise, motivation is undermined [32].

Motivation is often separated into IM and EM, which stem from different needs and desires and serve different purposes [27], [33]. EM involves the desire for some outcome; it is the most common form of motivation, as people often feel driven to action by social demands [33]-[34]. It is also distinctly instrumental in nature [33], as it occurs when some external reward is the motivating factor for a behavior; extrinsically motivated behaviors are a means to an end [31], [35]. Different types of EM have been identified based on the degree to which the behavior is self-determined [33]. IM, on the other hand, involves the pleasure or satisfaction derived from partaking in that behavior; it serves no instrumental purpose [33]-[34]. Intrinsically motivated behavior is usually caused by positive psychological states and the memory of behaviors that have previously achieved those states [35]. IM can affect acceptance through computer playfulness, which is the desire to interact with a system just out of a desire to use it [8].

While EM and IM can both affect behavior, they are not necessarily equally effective. Studies have found that intrinsic motivators are more effective in affecting behavior [36]-[37]. Little to no connection between EM and behavioral intention has been found [35]. When analyzing systems based on whether they are utilitarian (productivity-oriented) or hedonic (pleasure-oriented), the outcomes are much different. Intrinsic motivators tend to be more effective in promoting the use of hedonic systems, while extrinsic motivators are more effective in promoting the use of utilitarian systems [35]. In the workplace, extrinsic motivators may be more effective in promoting the use of systems. When one is intrinsically motivated, the addition of rewards can undermine IM and lead to the behavior being extrinsically motivated instead, which is known as the "undermining effect" [33], [38]-[40]. It is likely that both IM and EM can affect the use, acceptance, and adoption of technology. However, there is a gap in the literature where incentive mechanisms used to promote automation have not been studied based on whether they influence IM or EM. Previous studies suggest that IM may be more effective in promoting the use, acceptance, and adoption of automation, but there are no studies to date investigating this.

D. *Incentives to Use Technology*

Incentivizing users to use, accept, and adopt automated systems can be critical, especially to companies who do not want to waste resources on systems that will not be used or to designers who make money off creating systems that are seen as worth purchasing. It is also beneficial to incentivize the use of these systems wherein they can enhance a user's productivity and overall safety. For example, even when human advisors make larger mistakes than automated advisors, humans will still prefer to rely on the human advisor [41]. Additionally, automation can be intimidating or frightening to some people, leading to a disinclination to use automation [42]. These fears may stem from fear of being replaced by technology in the workplace or by a general lack of knowledge about the technology [42]-[43]. Some people are uncomfortable with the changes that automation causes in their daily tasks and activities in the workplace, but many realize that they must accept these changes [43]. Incentivizing the use of automation may support behavior change that leads to quicker adoption of the technology in the workplace. Automation can shift workload from trivial tasks to more meaningful tasks and help create a better work-life balance, but frightened users may not see these benefits [43]. These apprehensive users may be motivated to use and adopt the technology through incentivization.

Incentive mechanisms have traditionally been financial incentives, reputation incentives, and gamification-based incentives [40]. Financial incentives are monetary rewards that people expect from performing some behavior [44]-[45]. Reputation systems (akin to a scoreboard, for example) manipulate EM when people are told that their performance will be ranked or that their social standing is at risk; they are motivated to improve and engage in prosocial behaviors [40], [46]. Status is sought as a resource, though it varies in intensity in different cultures and genders [47]. People seek to avoid social disapproval and seek to gain social approval [48]. One study utilized a reputation system to obtain realistic datasets from users [49]. Another study found that employees feel incentivized by changes in social status [50]. The use of game-based elements in non-gaming environments increases motivation through an extrinsic reward [40], [51]-[53]. Gamification has been shown to be mostly effective; however, its success seems to vary based upon the context of its use and differences in users [54]. Users differed in the amount of hedonic value they found in gamified products [55]. Users in the workforce have been described as having motivational differences [56]. Gamification has been used to incentivize numerous areas of life [51]-[53], [57]. There is seemingly no end to what can be gamified.

The use of financial, reputation and gamification incentive mechanisms are all forms of EM. IM is another approach to overcoming hurdles in the acceptance and adoption of technology. Feedback on a task has been used to manipulate IM and differs from gamification-based elements in that it uses purely words to convey performance. It has been suggested that feedback can be used to manipulate IM because it can fulfill the basic psychological need to feel competent [34], as described by the Self-Determination Theory of emotion [32]. One study found that providing feedback seems to increase IM, while lack of feedback seems to decrease IM [58]. Another study stated that providing negative feedback decreases IM when compared with positive feedback [59]. Feedback is integral to several employee motivation theories [60]-[62]. In these theories, feedback is important because it allows one to know whether they need to modify their actions to suit their goal or adjust their goal. It is likely that providing negative or positive task feedback will be effective at manipulating IM.

E. The Present Study

While there have been many studies on incentivizing users to try new technologies, there have not been any studies separating incentive mechanisms into intrinsic and extrinsic motivators. Because IM and EM affect behavior differently, incentive mechanisms may vary in effectiveness based upon whether they manipulate one's IM or EM. No study to date seems to have compared incentive mechanism strategies to allow for an understanding of the relative influence of each on use, acceptance, and adoption. By understanding how different incentive mechanisms work, designers can better create automated systems with embedded incentive mechanisms that promote use, acceptance, and adoption. Given the findings of the previously discussed research differences are expected in: the IM **(H1),** the EM **(H2)**, the general motivation **(H3)**, the acceptance **(H4)**, the adoption (**H5)**, the time taken to rescue hostages **(H6)**, and the time used to manually control the drone **(H7)** brought about by each incentive mechanism.

II. Methods

A. Participants

A convenience sample of participants (*N* = 47) was selected from students at The University of Alabama in Huntsville. Four participants were excluded due to not completing the study, making the final sample *N* = 43.

B. Design

This study utilized a between-subjects design. Each participant experienced one type of incentive mechanism (control, feedback, gamification, or reputation).

C. Materials

This study utilized a search and rescue simulation implemented in Unity. Qualtrics was used to administer questionnaires to participants. The Situational Motivation Scale (SIMS) was used to measure IM and EM [63]. System acceptance was measured using the Unified Theory of Acceptance and Use of Technology (UTAUT) scale [64]. System adoption was measured using the Technology Adoption Propensity (TAP) scale [19]. All scales were adapted to a 7-point Likert scale, as previous studies showed that this should not affect the reliability or validity of the results [65].

D. Procedure

First, informed consent was received from participants. The experimental procedure was explained, and participants were presented with the opportunity to ask questions before beginning. The study began by instructing participants on how to interact with the simulation, followed by the simulation where participants interacted with an automated system to search for and rescue hostages.

This simulation contained a UAV that could switch between being automated and user-controlled. The UAV provided information on hostage locations. Users could choose to follow the recommendations of the system or not. Some users were assigned to a control group where they experienced no incentive mechanism. Some of the incentives relied on the manipulation of EM using reputation systems and gamification. The reputation incentive (EM) informed participants that their performance would be ranked alongside the other participants, but they were actually compared to fake participants on a "leaderboard" displayed on the screen. The gamification incentives (EM) assigned a score based on how many hostages were rescued; the score began at zero and increased by 5 as users rescued hostages. Feedback (IM) involved the system displaying "Well done" on the screen after rescuing a hostage. Users experienced only one of these incentive mechanisms, but the mechanism was present throughout the study; these can be seen in Fig. 1.

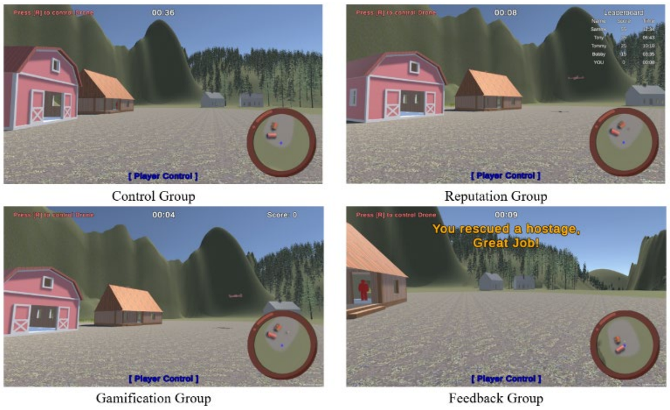

Fig. 1. Visual depictions of each condition.

During the search and rescue task, data was collected as to how often participants took control of the system, measured for each hostage rescued. Time taken to rescue each hostage was also recorded. These data are used as identifiers of the use of automation. Following the task, a questionnaire regarding motivation (the SIMS) while using the drone in the search and rescue environment was administered to assess participants' motivation with regard to automation use. The adapted UTAUT scale was then used to measure acceptance, followed by the adapted TAP index utilized to measure adoption. Participants were also asked to fill out a demographics questionnaire including their age, race, and gender. Participants were then debriefed and thanked for their time. The study session took no longer than an hour.

III. Results

All data analyses were conducted using ANOVAs in JASP statistical software [66]. In addition to traditional frequentist statistics, we have included Bayes Factors (BF_{10}) which are immune to smaller sample sizes and provide an evidentiary weight in favor of both the null and alternative hypotheses. A BF_{10} of 1 – 3 is considered anecdotal evidence in favor of the alternative hypothesis, 3 – 10 is considered moderate evidence, 10 – 30 is considered strong, 30 – 100 is considered very strong, and 100+ is considered extremely strong. In order to interpret the evidence in favor of the null hypothesis 1 should be divided by the aforementioned numbers. So, for example, a BF_{10} of .2 is considered moderate evidence in favor of the null hypothesis. Preliminary results (data collection is still ongoing) suggest that none of our hypotheses are supported. Results indicated moderate support for the null hypothesis for **H1**, $F(3, 39) = .357$, $p = .784$, $BF_{10} = .173$; there are no differences in IM between incentive mechanisms. Results indicated moderate support for the null hypothesis for **H2**, $F(3, 39) = .363$, $p = .780$, $BF_{10} = .171$; there are no differences in EM between incentive mechanisms. Results indicated moderate support for the null hypothesis for **H3**, $F(3, 39) = .185$, $p = .906$, $BF_{10} = .145$; there are no differences in general motivation between incentive mechanisms. Results indicated anecdotal support for the null hypothesis for **H4**, $F(3, 39) = 1.137$, $p = .346$, $BF_{10} = .335$; there are no differences in acceptance between incentive mechanisms. Results indicated anecdotal support for the null hypothesis for **H5**, $F(3, 39) = 1.429$, $p = .249$, $BF_{10} = .428$; there are no differences in adoption between incentive mechanisms. Results indicated anecdotal support for the null hypothesis for **H6**, $F(3, 39) = 1.128$, $p = .349$, $BF_{10} = .348$; there are no differences in time taken to rescue hostages between incentive mechanisms. Results indicated moderate support for the null hypothesis for **H7**, $F(3, 39) = .272$, $p = .845$, $BF_{10} = .157$; there are no differences in time used to manually control the drone between incentive mechanisms. These results can be seen in Fig. 2.

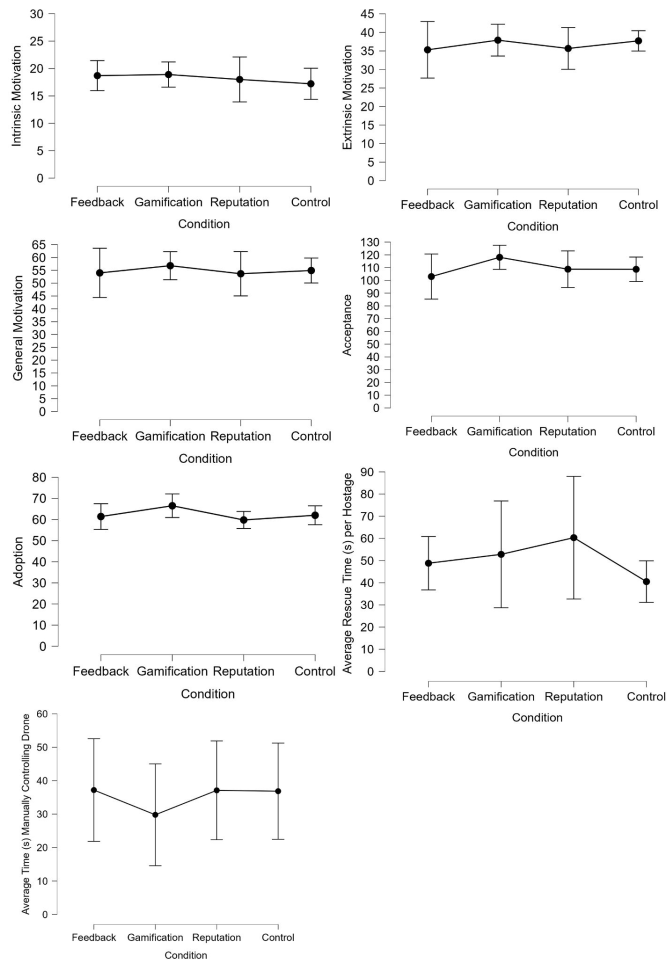

Fig. 2. Graphs of relationship, with error bars representing the 95% CI.

IV. Discussion

The preliminary results found in this study indicate that the different incentive mechanisms used here may not differ in effectiveness in their promotion of use, acceptance, and adoption of automation. In fact, they do not seem to differ at all from a control group having no incentive mechanism in place. This deviates significantly from many previous research findings touting the benefits of different incentive mechanisms such as the ones utilized in this study [34], [40], [46], [51]-[54]. Gamification, reputation, and feedback have all been described as methods of incentivizing people and manipulating motivation. The results of this study seem to contradict their previously described effectiveness, however.

The lack of differences in the effectiveness of incentive mechanisms described as manipulating IM and EM found in this study also adds more complications to an already complex discussion. Previous studies tend to indicate that IM is more useful for promoting behavioral change [35]-[37], while this study indicates no behavioral change based upon whether incentive mechanisms are described as promoting IM or EM. It could be that this is due to an ineffective application of incentive mechanisms, or possibly an indication that IM and EM are equally effective at promoting the use, acceptance, and adoption of automation. Further research should aim to alter the application of incentive mechanisms to determine whether it truly was the reason for a lack of differences.

Unlike what is mentioned in previous research [34], our findings showed no effect of feedback on IM. It is important to know, however, that this was a small sample-size study using a novel research environment. It is quite reasonable to question the finding that feedback had no impact on IM given these circumstances.

It could also be possible that our use of feedback was not appropriate as an incentive mechanism for the manipulation of IM; further research likely needs to be conducted to determine if feedback truly is an effective incentive mechanism, and if so, how to customize it for the best effect. Perhaps our manipulation of feedback was interpreted more as a reward to be sought than a fulfillment of Self-Determination Theory's [32] need to feel competent [34], which had previously been described as a method for feedback to create IM.

These results are only preliminary, and the findings may change as we recruit a large enough sample size to reach appropriate statistical power. However, the findings thus far seem to indicate that incentive mechanisms, be they proposed influencers of IM or EM, do not have much effect on the use, acceptance, and adoption of automation, at least in the instance of this simulation. Given that we created our own novel paradigm, it is possible that the issue could lie within our paradigm or our manipulation of incentive mechanisms. It could be possible that the simulation was entertaining enough on its own, given its similarity to many video games, that the incentive mechanisms did not add anything to the participants' motivation. If the results of this study maintain the current trend once appropriate statistical power is reached, the field will have to do more research to determine whether incentive mechanisms even are helpful in this use case, as well as find what incentive mechanisms are appropriate for this use case.

REFERENCES

[1] Goldberg, K. (2012). What is automation? IEEE Transactions on Automation Science and Engineering, 9(1), 1–2.

[2] Parasuraman, R., Sheridan, T. B., and Wickens, C. D. (2000). A model for types and levels of human interaction with automation. IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans, 30(3), 286–297.

[3] Bekier, M., Molesworth, B. R. C., and Williamson, A. (2011). Why air traffic controllers accept or refuse automated technology. 16th International Symposium on Aviation Psychology, 615–620.

[4] Matsuyama, L., Zimmerman, R., Eaton, C., Weger, K., Mesmer, B., Tenhundfeld, N., Van Bossuyt, D., and Semmens, R. (2021). Determinants that are believed to influence the acceptance and adoption of mission critical autonomous systems. AIAA Scitech 2021 Forum.

[5] Devaraj, U. S., Easley, R. F., and Crant, J. M. (2008). How does personality matter? Relating the five-factor model to technology acceptance and use. Information Systems Research, 19(1), 93–105.

[6] Behrenbruch, K., Söllner, M., Leimeister, J. M., and Schmidt, L. (2013). Understanding diversity – the impact of personality on technology acceptance. In P. Kotzé, G. Marsden, G. Lindgaard, J. Wesson, and M. Winckler (Eds.), Human-Computer Interaction – INTERACT 2013 (Vol. 8120, pp. 306–313). Springer Berlin Heidelberg.

[7] Beaudry, A., and Pinsonneault, A. (2010). The other side of acceptance: Studying the direct and indirect effects of emotions on information technology use. MIS Quarterly, 34(4), 689.

[8] Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. Information Systems Research, 11(4), 342–365.

[9] Bekier, M., Molesworth, B. R. C., and Williamson, A. (2012). Tipping point: The narrow path between automation acceptance and rejection in air traffic management. Safety Science, 50(2), 259–265.

[10] Bekier, M., and Molesworth, B. R. C. (2017). Altering user' acceptance of automation through prior automation exposure. Ergonomics, 60(6), 745–753.

[11] Nees, M. A. (2016). Acceptance of self-driving cars: An examination of idealized versus realistic portrayals with a self- driving car acceptance scale. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 60(1), 1449–1453.

[12] Hilburn, B., Westin, C., and Borst, C. (2014). Will controllers accept a machine that thinks like they think? The role of strategic conformance in decision aiding automation. Air Traffic Control Quarterly, 22(2), 115–136.

[13] Westin, C., Borst, C., and Hilburn, B. (2016). Strategic conformance: Overcoming acceptance issues of decision aiding automation? IEEE Transactions on Human-Machine Systems, 46(1), 41–52.

[14] Gursoy, D., Chi, O. H., Lu, L., and Nunkoo, R. (2019). Consumers acceptance of artificially intelligent (AI) device use in service delivery. International Journal of Information Management, 49, 157–169.

[15] Davis, F. D. (1985). A technology acceptance model for empirically testing new end-user information systems: Theory and results [Doctoral Dissertation]. Sloan School of Management, Massachusetts Institute of Technology.

[16] Choi, J. K., and Ji, Y. G. (2015). Investigating the importance of trust on adopting an autonomous vehicle. International Journal of Human-Computer Interaction, 31(10), 692–702.

[17] Kaur, K., and Rampersad, G. (2018). Trust in driverless cars: Investigating key factors influencing the adoption of driverless cars. Journal of Engineering and Technology Management, 48, 87–96.

[18] Hinz, O., Schulze, C., and Takac, C. (2014). New product adoption in social networks: Why direction matters. Journal of Business Research, 67(1), 2836–2844.

[19] Jahanmir, S. F., and Cavadas, J. (2018). Factors affecting late adoption of digital innovations. Journal of Business Research, 88, 337–343.

[20] Mutingi, M., and Matope, S. (2013). Dynamics of information technology adoption in a complex environment. 2013 IEEE International Conference on Industrial Technology (ICIT), 1466–1471.

[21] Ratchford, M., and Barnhart, M. (2012). Development and validation of the technology adoption propensity (Tap) index. Journal of Business Research, 65(8), 1209–1215.

[22] Murphy, P. K., and Alexander, P. A. (2000). A motivated exploration of motivation terminology. Contemporary Educational Psychology, 25(1), 3–53.

[23] Vroom, V.H. (1964). Work and motivation. Wiley.

[24] Sánchez, R. A., and Hueros, A. D. (2010). Motivational factors that influence the acceptance of Moodle using TAM. Computers in Human Behavior, 26(6), 1632–1640.

[25] Rezvani, A., Khosravi, P., and Dong, L. (2017). Motivating users toward continued usage of information systems: Self-determination theory perspective. Computers in Human Behavior, 76, 263–275.

[26] Larsen, T. J., Sørebø, A. M., and Sørebø, Ø. (2009). The role of task-technology fit as users' motivation to continue information system use. Computers in Human Behavior, 25(3), 778–784.

[27] Cook, D. A., and Artino, A. R. (2016). Motivation to learn: An overview of contemporary theories. Medical Education, 50(10), 997–1014.

[28] Wigfield, A., and Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. Contemporary Educational Psychology, 25(1), 68–81.

[29] Weiner, B. (1986). An attributional theory of achievement, motivation and emotion. In B. Weiner, An Attributional Theory of Motivation and Emotion (pp. 159–190). Springer US.

[30] Bandura, A. (1989). Human agency in social cognitive theory. American Psychologist, 44(9), 1175–1184.

[31] Dweck, C. S., and Leggett, E. L. (1988). A social cognitive approach to motivation and personality. Psychological Review, 95(2), 256–273.

[32] Ryan, R. M., and Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68–78.

[33] Legault, L. (2016). Intrinsic and extrinsic motivation. In V. Zeigler-Hill and T. K. Shackelford (Eds.), Encyclopedia of Personality and Individual Differences (pp. 1–4). Springer International Publishing.
[34] Ryan, R. M., and Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary Educational Psychology, 25(1), 54–67.
[35] Wu, J., and Lu, X. (2013). Effects of extrinsic and intrinsic motivators on using utilitarian, hedonic, and dual-purposed information systems: A meta-analysis. Journal of the Association for Information Systems, 14(3), 153–191.
[36] Yoo, S. J., Han, S. H., and Huang, W. (2012). The roles of intrinsic motivators and extrinsic motivators in promoting e-learning in the workplace: A case from South Korea. Computers in Human Behavior, 28(3), 942–950.
[37] Çınar, O., Bektaş, Ç., and Aslan, I. (2011). A motivation study on the effectiveness of intrinsic and extrinsic factors. Economics and Management, 690–695.
[38] Murayama, K., Matsumoto, M., Izuma, K., and Matsumoto, K. (2010). Neural basis of the undermining effect of monetary reward on intrinsic motivation. Proceedings of the National Academy of Sciences, 107(49), 20911–20916.
[39] Gneezy, U., Meier, S., & Rey-Biel, P. (2011). When and why incentives (Don't) work to modify behavior. Journal of Economic Perspectives, 25(4), 191–210.
[40] Flynn, M., Smitherman, H. M., Weger, K., Mesmer, B., Semmens, R., Van Bossuyt, D., and Tenhundfeld, N. L. (2021). Incentive mechanisms for acceptance and adoption of automated systems. 2021 Systems and Information Engineering Design Symposium (SIEDS), 1–6.
[41] Dietvorst, B. J., Simmons, J. P., and Massey, C. (2015). Algorithm aversion: People erroneously avoid algorithms after seeing them err. Journal of Experimental Psychology: General, 144(1), 114–126.
[42] McClure, P. K. (2018). "You're fired," says the robot: The rise of automation in the workplace, technophobes, and fears of unemployment. Social Science Computer Review, 36(2), 139–156.
[43] Fernandez, D., and Aman, A. (2021). The influence of robotic process automation (Rpa) towards employee acceptance. International Journal of Recent Technology and Engineering, 9(5), 295–299.
[44] Becker, J. U., Clement, M., and Schaedel, U. (2010). The impact of network size and financial incentives on adoption and participation in new online communities. Journal of Media Economics, 23(3), 165–179.
[45] Thibault Landry, A., Gagné, M., Forest, J., Guerrero, S., Séguin, M., and Papachristopoulos, K. (2017). The relation between financial incentives, motivation, and performance: An integrative sdt-based investigation. Journal of Personnel Psychology, 16(2), 61–76.
[46] Cheng, R., and Vassileva, J. (2005). User motivation and persuasion strategy for peer-to-peer communities. Proceedings of the 38th Annual Hawaii International Conference on System Sciences, 193a–193a.
[47] Huberman, B. A., Loch, C. H., and Önçüler, A. (2004). Status as a valued resource. Social Psychology Quarterly, 67(1), 103–114.
[48] Fehr, E., and Falk, A. (2002). Psychological foundations of incentives. European Economic Review, 46(4–5), 687–724.
[49] Haderer, N., Rouvoy, R., and Seinturier, L. (2013). A preliminary investigation of user incentives to leverage crowdsensing activities. 2013 IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOM Workshops), 199–204.
[50] Avcı, B., Loutfi, Z., Mihm, J., Belavina, E., and Keck, S. (2014). Comparison as incentive: Newsvendor decisions in a social context. Production and Operations Management, 23(2), 303–313.
[51] Monu, K., and Ralph, P. (2013). Beyond gamification: Implications of purposeful games for the information systems discipline. ArXiv:1308.1042 [Cs].
[52] Seaborn, K., and Fels, D. I. (2015). Gamification in theory and action: A survey. International Journal of Human-Computer Studies, 74, 14–31.
[53] Vanduhe, V. Z., Nat, M., and Hasan, H. F. (2020). Continuance intentions to use gamification for training in higher education: Integrating the technology acceptance model (Tam), social motivation, and task technology fit(Ttf). IEEE Access, 8, 21473–21484.
[54] Hamari, J., Koivisto, J., and Sarsa, H. (2014). Does gamification work? -- A literature review of empirical studies on gamification. 2014 47th Hawaii International Conference on System Sciences, 3025–3034.
[55] Montola, M., Nummenmaa, T., Lucero, A., Boberg, M., and Korhonen, H. (2009). Applying game achievement systems to enhance user experience in a photo sharing service. Proceedings of the 13th International MindTrek Conference: Everyday Life in the Ubiquitous Era on - MindTrek '09, 94.
[56] Eickhoff, C., Harris, C. G., de Vries, A. P., and Srinivasan, P. (2012). Quality through flow and immersion: Gamifying crowdsourced relevance assessments. Proceedings of the 35th International ACM SIGIR Conference on Research and Development in Information Retrieval - SIGIR '12, 871.
[57] Blohm, I., and Leimeister, J. M. (2013). Gamification: Design of it-based enhancing services for motivational support and behavioral change. Business and Information Systems Engineering, 5(4), 275–278.
[58] Butler, R., and Nisan, M. (1986). Effects of no feedback, task-related comments, and grades on intrinsic motivation and performance. Journal of Educational Psychology, 78(3), 210–216.
[59] Fong, C. J., Patall, E. A., Vasquez, A. C., and Stautberg, S. (2019). A meta-analysis of negative feedback on intrinsic motivation. Educational Psychology Review, 31(1), 121–162.
[60] Locke, E. A., and Latham, G. P. (1990). A theory of goal setting and task performance. Prentice-Hall, Inc.
[61] Klein, H. J. (1989). An integrated control theory model of work motivation. The Academy of Management Review, 14(2), 150–172.
[62] Frese, M., & Zapf, D. (1994). Action as the core of work psychology: A German approach. In H. C. Triandis, M. D. Dunnette, & L. M. Hough (Eds.), Handbook of industrial and organizational psychology (pp. 271–340). Consulting Psychologists Press.
[63] Guay, F., Vallerand, R. J., and Blanchard, C. (2000). On the Assessment of Situational Intrinsic and Extrinsic Motivation: The Situational Motivation Scale (SIMS). Motivation and Emotion, 24(3), 175–213.
[64] Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425.
[65] Newstead, S. E., and Arnold, J. (1989). The Effect of Response Format on Ratings of Teaching. Educational and Psychological Measurement, 49(1), 33–43.
[66] JASP Team, JASP. 2022.