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PORTUGUESA

**EXPLORING THE IMPACT OF NUDGES ON EMPLOYEES'
TECHNOLOGY ADOPTION:
THE ROLE OF RESISTANCE TO CHANGE AND AGE**

Dissertation presented to Universidade Católica
Portuguesa to obtain the Master's Degree in Psychology in
Business and Economics

By

Anja Dannewitz

Faculty of Human Sciences

September 2024



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Abstract

Effective digital transformation is becoming increasingly important to a company's success. Employees are crucial to these transformation processes as their active participation in decision-making and adoption of new behaviours are required for driving and sustaining change. A prominent approach to facilitating behaviour change is the concept of nudging which refers to interventions that gently steer people to a specific positive behaviour while preserving their freedom of choice. In this study, the effects of three types of nudges (default, social influence, feedback) on innovative technology adoption behaviour were investigated in an online experiment ($N = 159$). In hypothetical scenarios, participants were introduced to a new fictitious collaboration tool, named COTEWO. The experimental groups received different user interface settings coupled with nudges to experience features of the new tool, whereas the control group was not presented with any nudge. Participants were randomly assigned to one of the groups. Seven variables (acceptance, motivation, attitude, commitment, willingness, satisfaction, and preference) were analysed as factors of the multidimensional construct of innovative technology adoption among the employees. The variables resistance to change and age were evaluated as potential moderators. Results showed that nudges motivate employees to explore a new tool. Other differences were not found to be significant. Moderation analyses confirmed that resistance to change influences the impact of nudges on motivation. Despite age differences, age did not necessarily moderate the tested influence. These findings support the use of nudges as potential effective strategy for new technology implementation at work, particularly for designing more individualised interventions in organisations. Furthermore, this research also discusses recommendations for future investigations and limitations associated with this study. Conclusions and results must be interpreted with caution due to the lack of statistical power caused by the small sample size.

Keywords: nudge, adoption of technology, collaboration, resistance to change, age

Resumo

A transformação digital torna-se cada vez mais crucial para o sucesso das empresas. Os colaboradores desempenham um papel fundamental nestes processos, dado que a sua participação ativa na tomada de decisões e a adoção de novos comportamentos são essenciais para impulsionar e sustentar a mudança. Uma abordagem relevante para facilitar a mudança de comportamento é o conceito de “nudging”, referindo-se a intervenções que orientam suavemente as pessoas para comportamentos positivos específicos, preservando a sua liberdade de escolha. Neste estudo, foram investigados os efeitos de três tipos de nudges (default, influência social, feedback) no comportamento de adoção de tecnologias inovadoras numa experiência online (N = 159). Em cenários hipotéticos, os participantes foram apresentados uma nova ferramenta de colaboração fictícia, denominada COTEWO. Os grupos experimentais receberam diferentes configurações da interface do utilizador, associadas a nudges para experimentar as funcionalidades da nova ferramenta, enquanto o grupo de controlo não recebeu qualquer nudge. Os participantes foram distribuídos aleatoriamente pelos diferentes grupos. Foram analisadas sete variáveis (aceitação, motivação, atitude, empenho, vontade, satisfação, e preferência) como fatores da construção multidimensional da adoção de tecnologias inovadoras pelos trabalhadores. A resistência à mudança e idade foram avaliadas como potenciais moderadores. Os resultados revelaram que os nudges motivam eficazmente os colaboradores a utilizar uma nova ferramenta. As restantes diferenças não foram consideradas significativas. As análises de moderação confirmaram que a resistência à mudança influencia o impacto dos nudges na motivação. Apesar das disparidades etárias, a idade não moderou necessariamente a influência testada. Estes resultados apoiam a utilização de nudges como estratégia potencialmente eficaz para a implementação de novas tecnologias no trabalho, nomeadamente para conceber intervenções mais individualizadas. Este estudo também apresenta recomendações para investigação futura e limitações associadas ao trabalho. As conclusões devem ser analisadas tendo em conta a falta de poder estatístico, resultante da pequena dimensão da amostra.

Palavras-chave: nudge, introdução de tecnologia, colaboração, resistência à mudança, idade

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List of Abbreviations

AI	Artificial Intelligence
ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
CI	Confidence Interval
COTEWO	Communication for Teamwork
DINU	Digital Nudging Process Model
DND	Digital Nudge Design
DV	Dependent Variable
EAST	Easy, Attractive, Social, and Timely - Nudge Framework
EEG	Electroencephalography
FORGOOD	Fairness, Openness, Respect, Goals, Opinions, Options and Delegation – Nudge Ethics Framework
ICT	Information and Communication Technology
IT	Information Technology
M	Mean
MAPS	Model of Acceptance with Peer Support
MINDSPACE	Messenger, Incentives, Norms, Defaults, Salience, Priming, Affect, Commitment and Ego - Nudge Framework
RTC	Resistance to Change
SD	Standard Deviation
SE	Standard Error
SS	Sum of Squares
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
UTAUT	Unified Theory of Acceptance and Use of Technology

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Introduction

“It is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able best to adapt and adjust to the changing environment.”

- Megginson (1963, p. 4)¹

Digital transformation is one of the biggest advances and at the same time one of the biggest challenges companies face nowadays. The concept of digital transformation is defined as “the use of technology to radically improve performance or reach of enterprises” (Westerman et al., 2014, p. 1). Companies can benefit from this development and the potential of increased revenues for example through new business model opportunities and optimised streamlining of activities (Fitzgerald et al., 2013).

Digital transformation means change. In recent years, digital transformation has become a necessity to be competitive and to achieve increasing revenues (Orlov, 2022). Spendings on digital transformation technologies and services are continuously increasing and predictions state that these numbers will almost double in the next four years (Sherif, 2024). Even though investments are increasing, this does not necessarily imply effective implementation. The Boston Consulting Group revealed that just 30% of organisations are successful in this regard (BCG, n.d.). This number is consistent with the data of McKinsey and Company (2018) which specified 70% failure in digital transformation initiatives. One reason for this failure is the employees’ resistance to new tools and technologies (Erwin & Garman, 2010). Referring to the opening quotation, it is therefore essential for businesses to ensure that all employees are dedicated and motivated to the digital transformation process.

Decisions play the most crucial role in this context. A conscious decision must be made favouring change to implement a new technology. However, science has shown that human decision-making is not as rational as assumed in economy. Instead, people frequently use heuristics and are affected by biases (Tversky & Kahneman, 1974) because “people often choose not to choose” (Sunstein, 2019, p. 69). This so-called ‘bounded rationality’ implies limitations in the information available, mental capacities, and the time of decision-making

¹ Megginson summarises with this quote Darwin’s famous work ‘On the Origin of Species’ referring to change as fundamental development that is ubiquitous in human nature.

process, causing choices that are satisfactory but not necessarily optimal (Simon, 1955, 1957). One important theory that explains this phenomenon is the dual process theory of 'System 1' and 'System 2', introduced by Kahneman (2011), to describe different approaches to our thinking process. System 1 operates automatically and effortlessly with emotions and associations as underlying guides. The opposite, conscious, System 2 is demanding a lot of effort to make deliberate decisions (Kahneman, 2011, pp. 20-21).

Further, individuals' thinking and decision-making directly influence their behaviour. From making a decision to acting on it, several factors drive the process. Decisions are depended on one's motivation, intention, and individual characteristics (Ajzen, 1985, 1991; Deci & Ryan, 1985; Rustichini et al., 2016). How people decide and act upon their decisions is furthermore influenced by emotions, information processing capabilities, contextual cues, preferences, and social factors (Camilleri & Berger, 1967; Chun & Jiang, 1998; Jacoby & Galak, 2016; Kahneman & Tversky, 1979; Lerner et al., 2015; Miller, 1956). The individual's behavioural decision-making is thereby affected by cognitive, social, and affective components as well as cognitive biases (Cialdini & Griskevicius, 2010; Kahneman, 2011; Lerner et al., 2015; Tversky & Kahneman, 1974).

Several theories provide explanations for behavioural decision-making. For example, Neumann and Morgenstern (1944) revealed that economic decisions are based on the principles of maximising expected utility. Another example is the prospect theory that states the opportunity for gain and simultaneously a risk of loss in every choice (Kahneman & Tversky, 1979). People are known to be loss-averse, implying that losses outweigh gains (Kahneman & Tversky, 1979). Furthermore, behavioral decision theory stresses the relevance of beliefs and values in decision-making (Slovic et al., 1977). One of the leading behavioural theories, the theory of planned behavior (TPB) (Ajzen 1985, 1991), describes attitudes, subjective norms, and perceived behavioural control as crucial determinants of intention leading to an individual's behaviour. Particularly this theory is relevant for understanding technology adoption behaviour.

Moreover, various choice architectural methods can influence and change behavioural patterns, ranging from implementation intentions to nudges among others. One approach to achieve a desired behaviour are implementation intentions, whereby people can make plans for specific situations according to the form 'If x, then y' (Gollwitzer et al., 2005).

Another popular and effective method are nudges (Thaler & Sunstein, 2021). As people are prone to make decisions as effortlessly as possible, nudges can initiate smart decisions. Nudges guide individuals toward specific decision outcomes through psychological mechanisms and the design of the choice environment. Thus, a nudge can take various intervention forms aiming to help people internalise a desired behaviour. Nonetheless, one of the key requirements is that choice architects need to ensure the freedom of choice. Although the goal of nudges is to improve decisions, individuals must actively choose for themselves (Thaler & Sunstein, 2021).

Initially, nudges were mainly used for public policy interventions but the scope of application has expanded greatly. The Behavioural Insights Team advising the United Kingdom government was one of the first initiatives that based their strategic work on the nudging approach (Halpern, 2016). Digital nudges, which are applied in the digital choice environment, have become more prominent in recent years (Weinmann et al., 2016). In the systematic literature review by Hummel and Maedche (2019), nudge effectiveness was analysed and no significant differences between classical and digital nudging was found. Thus, nudges can be used to alter people's decision-making across different kinds of settings.

In recent years, literature has mainly focused on nudges in the public policy, health, or economic context (Banerjee & John, 2023; Bergram et al., 2022; Brandon et al., 2017; Gregor & Lee-Archer, 2016; Hummel & Maedche, 2019; Thaler & Sunstein, 2021). However, nudges are barely studied in the work environment for employees' decision-making. The aging workforce and the rapidly evolving technological tools that workers must incorporate into their work routines are two workplace developments that require particular attention. The development of technology includes change and therefore requires new habits and behavioural patterns. Nonetheless, many employees may not fully integrate new digital technology into their daily work routines. Hence, the primary objective of this research will be on how nudges may affect this adoption decision.

Technology adoption is classified as a relevant factor related to effective digital transformation among employees (Trenerry et al., 2021). In their framework for workplace digital transformation, Trenerry et al. (2021) stressed that communication and collaboration among other factors are necessary for any team to achieve digital transformation success. Further, their review disclosed that acceptance of technology is more likely when viewed as useful and easy to use, stressing that contextual factors influence different perceptions and

behaviour (Trenerry et al., 2021). Information and Communication Technologies (ICTs) are typically introduced and used to facilitate seamless workflows. Wang et al. (2020) showed in their review that employees are affected by ICT in their job demands, job autonomy and relational aspects. ICTs are particularly relevant with the rise of digital workplaces. The term 'Digital workplace' describes "the broad set of technologies and practices involved in employees' digital workplace experience irrespective of physical location; it encompasses, yet also goes beyond, traditional notions of ICTs" (Marsh et al., 2022, p. 2).

Ineffective communication is one of the main challenges of remote work (Wang et al., 2021). Since ICT communication increases the likelihood of misunderstandings, it can also have a major influence on employees' well-being, especially exhaustion (Day et al., 2012). To overcome these challenges, it is necessary to ensure commitment and acceptance from employees. Especially, geographically dispersed, virtual teams can benefit from effective collaboration procedures (Morrison-Smith & Ruiz, 2020). In a survey conducted by Microsoft (n.d.), collaboration tools were stated to be a key effort of digital transformation within their company by 85% of employees. Stieler and Henike (2021) showed in their longitudinal observatory case study in a German manufacturing firm that different nudges can increase innovation engagement by mitigating innovation barriers, stating a digital workflow tool as a crucial innovation nudging enabler. Hence, an independent use of collaboration tools is inevitable to communicate and work more effectively.

In this study, simulation scenarios are used to control the potential effect of nudges that may influence employees' adoption of a new collaboration tool. Different nudging methods and their effect on adoption behaviour were assessed. Thus, this study provides an important theoretical contribution to the understanding of the role that nudges play in organisational efforts to undergo digital transformation. A focus on personality and age intends to provide insights into more individualised approaches for successful technology implementations.

The present work is structured into three main sections: The theoretical background, the empirical study, and the discussion. The theoretical framework presents existing research and relevant contributions within the field of nudges and technology implementation referring to resistance to change and age. The purpose, participants, instruments, data analysis, and results of the study are demonstrated in the second main part. Finally, the results will be discussed and analysed, limitations identified, practical implications expressed, and future research recommendations outlined.

Literature Review

People are influenced by many determinants in their decisions and perceptions. To increase engagement with new technologies and their adoption, behaviour change techniques are a promising psychological method.

Behaviour change interventions affecting the choice architecture can be designed using for example the COM-B framework which is based on three essential behaviour sources: capability, opportunity, and motivation (Michie et al., 2011). These sources are presented in the center of the therewith developed Behaviour Change Wheel. Accordingly, both psychological and physical capabilities must be present for a behaviour to be exhibited. Motivation is responsible for the activation of behaviour requiring the environmental opportunity to enable the behaviour. Based on these three sources, specific interventions are suggested (Michie et al., 2011).

Within this research design, the behaviour change technique of nudging is employed. Nudges have been proven to steer people in an intended direction (Dinner et al., 2011; Haile et al., 2020; Hummel & Maedche, 2019; Ingendahl et al., 2021; Jesse & Jannach, 2021; Komatsu et al., 2023; Michels et al., 2023; Müller et al., 2023; Venema et al., 2018), even in the technology adoption domain (Brandon et al., 2017; Schneider et al., 2020; Stieglitz et al., 2017). Therefore, nudges can be assigned to two categories of the Behaviour Change Wheel. The opportunity component is affected by the way nudges shape the environment in which decisions are made. However, nudges may also impact motivation and promote certain behaviours.

This study is motivated by the lack of effective adoption strategies for new collaboration tools within organisations as well as the research gap in quantitative studies addressing (digital) nudging within work environments and its influence on technology adoption. Therefore, the following exploratory research question will be examined:

How do (digital) nudges affect employees' adoption of innovative technologies as a function of resistance to change and age?

Nudges

The concept of nudging is based on insights from behavioural economics and the dual process theory (Mertens et al., 2022). A nudge is defined as “any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options

or significantly changing their economic incentives” (Thaler & Sunstein, 2008, p.6). Many authors have extended and complemented the definition (Hansen, 2016; Marchiori et al., 2017). Marchiori et al. (2017) stressed the modification of cues in the physical and social behavioural context, whereas Hansen (2016) referred to cognitive boundaries, biases, habits, and routines as the origin and existence of nudges. Therefore, Sunstein (2023) has acknowledged some of the comments and has adapted and redefined the original definition thereof: “A nudge is an intervention that affects behavior while preserving freedom of choice (without significantly altering material incentives, and without imposing a mandate or a ban).” (Sunstein, 2023, p. 4). The author is also differentiating two categories of nudges, the educative and the architectural nudges. Educative nudges entail informational prompts, whereas architectural serve mostly as a decision aid, providing a predefined choice setting (Sunstein, 2023). An important definition of terms is that nudges are neither mandates nor bans because this would harm the main idea of libertarian paternalism. The concept of libertarian paternalism stresses the liberty-preserving characteristic of a nudge (Thaler & Sunstein, 2021) while allowing and encouraging choice architects like private and public organisations “to steer people in directions that will promote their welfare” (Thaler & Sunstein, 2003, p. 179). Freedom of choice is thereby the most prevalent objective.

Prominent frameworks in public policy nudging, like MINDSPACE (Dolan et al., 2012) and EAST (Behavioural Insights Team, 2014) are used to design and implement nudge interventions. MINDSPACE (Messenger, Incentives, Norms, Defaults, Salience, Priming, Affect, Commitment, and Ego) gathers up the nine most robust effects that influence behaviour (Dolan et al., 2012). The four EAST principles stress that initiatives need to be Easy, Attractive, Social, and Timely (Behavioural Insights Team, 2014).

In recent years, a new field of application of nudges has emerged. Nudges which are implemented in digital environments are called digital nudges. They are defined as “the use of user-interface design elements to guide people’s behavior in digital choice environments” (Weinmann et al., 2016, p. 433). In general, digital nudging incorporates personalisation and interconnectedness which is missing in the classical approach of nudging (Bergram et al., 2022). The literature review of Bergram et al. (2022) further identified that digital nudging focuses more on social media, e-commerce/marketing, and privacy/security contexts.

To design such nudges Meske and Potthoff (2017) have developed the DINU (Digital nudging process) model and provided a slightly different definition of digital nudges

describing them as “subtle form of using design, information and interaction elements to guide user behavior in digital environments, without restricting the individual’s freedom of choice” (Meske & Potthoff, 2017, p. 2589). The DINU model incorporates concepts of persuasion and nudging, with three phases of implementing digital nudging: (1) Analyzing, (2) Designing, (3) Evaluating (Meske & Potthoff, 2017).

Many authors have investigated the effectiveness of digital nudges in environmental, health, policy, and consumer contexts (Auf et al., 2021; Bergram et al., 2022; Gregor & Lee-Archer, 2016; Haile et al., 2020; Jesse & Jannach, 2021; Meske et al., 2019; Ren & Liu, 2024; Schultz et al., 2016; Stieglitz et al., 2023; Stryja & Satzger, 2019; Venema et al.; 2018). Among others, digital nudges contribute to environmental issues. According to Stieglitz et al. (2023), digital nudges have a direct influence on energy-saving behaviour but cannot close the pro-environmental attitude-behaviour gap. Such a gap describes how far an attitude will correspond to future behaviour, since often people have a positive attitude, but then fail to implement it in their behaviour. Social norm nudges were shown to reduce water consumption for households, with personalised norms moderating this influence (Schultz et al., 2016). Regarding health issues, Haile et al. (2020) have shown that a nudge-based digital intervention is effective in improving wellbeing. Moreover, elicited implementation nudges in combination with gamification elements, such as developing a narrative utilising app character, can contribute to enhancing mental health apps (Auf et al., 2021). Venema et al. (2018) showed the positive impact of a default nudge on stand-up working encouragements to be persistent even after removing the nudge. Digital nudges can also have a great impact in the social context of policy, for example, social security administration (Gregor & Lee-Archer, 2016). In the consumer context, Stryja and Satzger (2019) explored how digital nudging can increase the adoption likelihood for a sustainable innovation. Using the scenario method on a rental car decision, feedback and default nudges were found to be useful in overcoming cognitive biases (Stryja & Satzger, 2019). To summarise, Jesse and Jannach (2021) showed in their systematic literature review that digital nudging mechanisms can be successfully implemented in the online user environment, for example through recommender systems.

Evidence illustrates that nudges are effective behaviour change interventions, in particular decision structure interventions, like the default nudge, that outperform others (Mertens et al., 2022). Therefore, the research design of this study will test three nudges,

namely default, social influence, and feedback nudge, which will be elaborated on in the following sub-sections.

Default Nudge

The most efficient nudge is the default nudge (Hummel & Maedche, 2019; Sunstein, 2014). Particularly in the organ donation context, this nudge has proven to be extremely successful (Johnson & Goldstein, 2003). People tend to choose the option that requires the least effort, more explicitly defaults are defined as “an option that will prevail if the chooser does nothing” (Thaler & Sunstein, 2021, p.108). Differences in reference dependence and preference determine the effectiveness (Dinner et al., 2011). Default nudges have been further found to be effective in organisational change settings (Müller et al., 2023; Venema et al., 2018), price decisions (Dinner et al., 2011), and pro-environmental behaviour (Campbell-Arvai et al., 2014). Regarding digital technology, Schneider et al. (2020) showed that default nudges increase digital verification technologies adoption. Users of the collaboration tool ‘Slack’ preferred default digital nudges in privacy decisions (Schöbel et al., 2020). Moreover, in a small-sampled pre-test, the choice for an innovative electric car trial was significantly influenced by the default option (Stryja et al., 2017).

The reasons why default nudges are as successful as the literature has shown is explained by Sunstein (2019). He underlines three foundations that default nudges make use of, namely: (1) Inertia and procrastination, (2) Informational signal with an implicit recommendation, and (3) Loss aversion (Sunstein, 2019).

Besides a default nudge, social influence nudges were proven to be an efficient decision-making technique (Ingendahl et al., 2021).

Social Influence Nudge

Social norm nudges, which inform people about the actions and thoughts of others, are a popular type of nudges (Thaler & Sunstein, 2021, pp. 83-88). Since hypothetical settings cannot be personalised to the real social context due to unknown individual circumstances, the design of social norms is challenging in this regard.

Instead, a social influence nudge is likely to achieve greater effects in this setting. Three core motivations promote social influence: accuracy, affiliation, and the maintenance of a positive self-concept (Cialdini & Goldstein, 2004). Accuracy refers to the motivation of goal achievement in the most efficient way. The importance of relationships with others is

understood by affiliation. Actions, beliefs, traits, and commitments define a positive self-concept (Cialdini & Goldstein, 2004). Additionally, Rogers (1962) proposed his diffusion of innovations theory as a concept that describes how new ideas are adopted. The theory states that the diffusion effect can be described as a “cumulatively increasing degree of influence upon an individual to adopt or reject an innovation, resulting from the activation of peer networks about an innovation in a social system” (Rogers, 1983, p. 234). Hence, social influence is indispensable in the adoption process. Also, employee adoption behaviour of innovations is influenced by social networks, which have a substantial impact on attitudes toward innovations (Talukder & Quazi, 2011; Talukder, 2012). The Model of Acceptance with Peer Support (MAPS) underlines the impact of social networks within the work environment and the peer influence on new information system use (Sykes et al., 2009). Furthermore, social comparison nudges can impact habit formation and technology adoption (Brandon et al., 2017). According to Kretzer and Maedche (2018), social nudges were sufficient in encouraging users to reuse particular reports in the context of business information systems. Therefore, the use of a social influence nudge in this research will allow others, the colleagues, to react to one’s action, providing some kind of social proof, comparison, and reinforcement.

Feedback Nudge

A feedback nudge “provides information about a past or a current behavior of a user” (Bergram et al., 2022, p. 5). In a blended learning environment, a progress feedback nudge was able to positively influence online study behaviour, so that lecture videos were viewed more often and for a longer duration (van Oldenbeek et al., 2019). Additionally, the feedback nudge showed high efficiency in consumer innovation adoption behaviour (Stryja & Satzger, 2019). In a field experiment with truck drivers, digital feedback led to improved energy efficiency (Hoffmann & Thommes, 2020). Another study by Okeke et al. (2018) used a haptic feedback nudge in the form of vibration to reduce the digital overload of social media usage. When a daily usage restriction was reached, users were gently encouraged to end the mobile application (Okeke et al., 2018).

The selected nudges were chosen based on their efficiency and varied positioning. These nudges address different biases, target not only automatic but also reflective thinking, and belong to different types of triggers (Caraban et al., 2019). Caraban et al. (2019) presented

six categories, called facilitate, confront, deceive, social influence, fear and reinforce, into which different kinds of nudges can be classified. Another approach to differentiate the mechanism of nudges is stated by Jesse and Jannach (2021), based on four factors: decision information, decision structure, decision assistance, and social decision appeal. The classification of the selected nudges in this study can be found in Table 1.

Table 1

List of Applied Nudges

Nudge Description	Category
Default Nudge	
A Nudge which presents a pre-set option as desired behaviour.	Facilitator, simplify the task (Caraban et al., 2019) Decision structure (Jesse & Jannach, 2021)
Social Influence Nudge	
A Nudge which enables a reference or appreciation within the social network.	Spark, increase motivation (Caraban et al., 2019) Social Decision Appeal (Jesse & Jannach, 2021)
Feedback Nudge	
A nudge which provides information regarding an individual's past or current behaviour.	Signal, remind the task (Caraban et al., 2019) Decision Assistance (Jesse & Jannach, 2021)

Hummel and Maedche (2019) quantified the average effect sizes of these nudges with 87% for the default nudge, 29% for the social reference nudge, and 23% for the feedback nudge. According to Mirsch et al. (2017), there are several different psychological effects associated with nudges, whereas each digital nudge principle has a corresponding implementation nudge. For instance, the default nudge's guiding principle is the status quo bias (Mirsch et al., 2018). This bias explains the tendency why people prefer the present state over a future change, due to the belief that the costs are higher than the benefits of changing as well as the psychological commitment and consistency (Samuelson & Zeckhauser, 1988). Additionally, decision inertia can be identified as a fundamental issue when utilising the default nudge (Johnson et al., 2012). Furthermore, the underlying psychological herd instinct bias and social comparison bias impact the success of social influence nudges (Caraban et al., 2019; Festinger, 1954). Thereby the social influence nudge serves as a trigger to increase motivation by leveraging the spotlight effect by raising visibility (Gilovich et al., 2000). Lastly, the success of a positive feedback nudge is grounded in positive reinforcement, hence boosts motivation and enhances individuals' performance (Burgers et al., 2015; Cameron & Pierce, 1994; Kluger & DeNisi, 1996; Peifer et al., 2020).

Nudge Ethics

Although nudges are supposed to support the individual, some nudges serve more the nudge designer which raises ethical questions (Congiu & Moscati, 2022). The inventors of the term nudge also outlined the potential risks of ‘Sludges’ which is understood as the opposite of a nudge (Thaler & Sunstein, 2021). An intervention might be considered a sludge if it promotes self-defeating behaviour or discourages behaviour that is to the person’s best advantage (Thaler, 2018). If nudge design works transparent and ethically, sludges can be avoided. Hence, different researchers have focused on outlining ethical considerations that need to be followed to guide ethical nudge designs for different areas, for example in the health context (Blumenthal-Barby & Burroughs, 2012) or the FORGOOD (Fairness, Openness, Respect, Goals, Opinions, Options, and Delegation) framework in public policy context (Lades & Delaney, 2022).

However, some nudges are seen as contentious which causes debate over their ethical applicability. Sunstein (2015) analysed and contradicted certain aspects of criticism by clarifying that mainly paternalistic, noneducative, and exploiting behavioural biases nudges are controversial. To overcome this potential coercion, freedom of choice needs to be the driving force, whereas the use and design of nudges should aim to increase navigability (Sunstein, 2015). An important consideration thereby is the differentiation between System 1 and System 2 nudges (Jung & Mellers, 2016). System 1 nudges, such as defaults, are viewed as more harmful to autonomy; compared to System 2 nudges, such as educational opportunities or informational reminders, which facilitate better decision-making (Jung & Mellers, 2016).

The evaluation of nudges is important to ensure ethical standards. One approach is the 4S framework by Mills and Whittle (2023), stating significance, sufficiency, scalability, and subjectivity as relevant factors for policy interventions. Another proposal by Meske and Amoyo (2020) is a checklist for developing digital nudges to ensure that ethical standards are fulfilled. Consequently, nudges can be categorised into four evaluation categories, depending on transparency and the system addressed. Transparent System 1 nudges are ethically justifiable, whereas System 2 transparent nudges are truly libertarian. For non-transparent nudges affecting System 1, the nudge designer needs to either disclose the information or ask for consent. System 2 nudges which are non-transparent tend to be manipulative (Meske & Amoyo, 2020).

Additionally, public organisations can increase the acceptability of nudges by describing their purpose and effectiveness (Rafai et al., 2022). The authors Marchiori et al. (2017) suggest disclosing the whole nudge development and process to ensure awareness of being nudged. Different other studies have tested the disclosure of transparent information about the nudge altering its effectiveness (Gråd et al., 2024; Michels et al., 2023; Loewenstein et al., 2015). The efficacy of disclosing default nudges was examined by Loewenstein et al. (2015). In a hypothetical advance decision, participants had to choose a medical treatment. The findings revealed that either pre- or post-informing about the nudge presence maintained the nudge's effectiveness (Loewenstein et al., 2015). Similar findings were demonstrated in the recent research by Gråd et al. (2024), which showed that informing people about a nudge in donation decisions, did not inhibit the efficiency of the nudges. The same pattern was reported by Michels et al. (2023), even if self-nudges were applied the transparent disclosure regarding the nudge did not alter its effectiveness. The assumption that people's satisfaction or harmony is undermined when they are informed about the nudge, could be further not confirmed by Wachner et al. (2021) when people were indeed nudged.

A recent concept to enhance individuals' autonomy by being the choice architect oneself is self-nudging (Reijula & Hertwig, 2022). This approach boosts the realisation of goals but requires the provision of behavioural knowledge (Reijula & Hertwig, 2022). Accordingly, Michels et al. (2023) concluded that the combination of self-nudges and transparency may be a solution to overcome ethical concerns. Based on the ethical discussions on nudges, proper preventions can be designed to ensure ethical autonomy-preserving use.

Alternative Behavioural Frameworks to Nudging in Public Policy

The idea of nudges as behavioural intervention in public policy was added or updated by some authors, framing three new concepts: Thinks, Boosts, and Nudge+. 'Thinks' refer to the encouragement for critical thinking and reflecting on specific policy outcomes (Banerjee & John, 2023; John et al., 2009; John et al., 2020). 'Boosts' are designed to improve an individual's ability to make decisions in a certain environment, by fostering the competencies of each decision-maker (Grüne-Yanoff & Hertwig, 2016; Hertwig & Grüne-Yanoff, 2017). 'Nudge+' is an intervention that integrates thinking and nudging techniques, providing an element of reflection for policymaking (Banerjee & John, 2024). It is defined as "an intervention that has a reflective strategy embedded into the design of a nudge" (Banerjee & John, 2024, p. 70).

Adoption of Innovative Technologies

Many models have already been applied to technology adoption research. All these models are somehow based on the theory of planned behavior (TPB) (Ajzen 1985, 1991), which outlines that attitude, subjective norm, and perceived behavioural control influence an individual's behavioural intention resulting then in the actual behaviour.

Nonetheless, one of the most influential models for self-reported indicants of system use is the Technology Acceptance Model (TAM) (Davis, 1989). The model highlights the attitude towards IT usage and its intention to use which is determined by perceived usefulness and perceived ease of use (Davis, 1989). For efficient technology implementations, the usage behaviour and intention can furthermore be explained with the decomposed TPB which expands the TPB and TAM model by various determinants like peer and superiors' influence, self-efficacy, and resource facilitating conditions (Taylor & Todd, 1995). Moore and Benbasat (1996) also found that relative advantage and compatibility, combined with ease of use, are affecting the adoption of technologies. Contradictory, Lewis et al. (2003) did not find a significant effect of ease of use beliefs on usefulness beliefs, social influence was also not impactful. Rather top management commitment and individual factors of personal innovativeness influenced the technology use (Lewis et al., 2003).

Therefore, the TAM model was further developed, and various other models were taken into consideration to create a synthesis of prior technology acceptance research for employee technology acceptance, called the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). This model states that four key determinants (performance expectancy, effort expectancy, social influence, and facilitating conditions) influence technology use. These determinants, except for facilitating conditions, are directly affecting behavioral intention. Thus, the actual technology acceptance and use behaviour is influenced by behavioural intention and facilitating conditions. Furthermore, experience, voluntariness, gender, and age are proven to be significant moderating influences (Venkatesh et al., 2003).

The UTAUT model has been used in numerous studies since it was published in 2003 (Foon & Fah, 2011; Ifinedo, 2012; Venkatesh et al., 2011; Venkatesh et al., 2016), for example, to adopt wireless technologies (Anderson & Schwager, 2004) or to implement an online learning platform (Šumak et al., 2010). The model's validity has been examined in a

variety of cultural settings (Oshlyansky et al., 2007). Brown et al. (2010) already extended the UTAUT model for the specific use of collaboration technology by adding technology, task, individual & group, and situational characteristics as predictors of the UTAUT determinants. Moreover, social presence, immediacy, and concurrency have been shown to be influential in the adoption process of collaboration technology (Brown et al., 2010).

An extension for the consumer context, the UTAUT 2, was presented by Venkatesh et al. (2012) stating that hedonic motivation, price value, and habit have an additional influence on behavioural intention and technology use. Moreover, Venkatesh et al. (2016) identified two limitations of this model, namely the formulation of the model for organisational networks and low parsimony. They proposed a multi-level framework of technology acceptance and use, calling for extended moderation mechanisms (Venkatesh et al., 2016).

Besides these models, the decision-making process to implement an innovation is described by Rogers (2003) as a five-stage process: (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation. Personality and socioeconomic variables, in this study resistance to change and age, are forming the knowledge base. These then influence the perception and persuasion of the innovation with five relevant characteristics: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 1995, Chapter 6, pp. 204-251). If individuals see a relative advantage or benefit in the innovation, the adoption rate is higher. An innovation is classified as compatible if it is consistent with the own experience, values, and needs. Then individuals perceive the new idea as more familiar. Furthermore, the use needs to be easy and understandable, otherwise if the complexity is too high, individuals would perceive it as a challenge. In addition, the opportunity to experiment with the innovation is necessary to create a meaningful association. The visible outcome and result of the innovation use for others is important to increase the adoption likelihood. The perception of these five attributes determines the adoption rate for the specific innovation (Rogers, 1995). The third stage is the decision about the innovation either to adopt or to reject, which then leads to the fourth stage, implementation, and lastly, the confirmation stage (Rogers, 2003).

Additional variables impacting the adoption of technology play an important role in understanding the complexity of this adoption process. Factors like organisational context, workgroup attributes, job and individual characteristics are shown to be influencing individual adjustment to innovation (Nelson, 1990). In the longitudinal analysis by

Venkatesh et al. (2000), gender was demonstrated to be relevant for the adoption and usage of new technology. In their more recent work, Venkatesh et al. (2012) specified the interaction of consumers' age, gender, and experience as moderators of hedonic motivation on behavioural intention as an important supplement. Based on the theory of planned behaviour, attitude is the influencing factor for men to use new technology, in contrast to subjective norms and perceived behavioural control for women (Venkatesh et al., 2012). The same researchers studied gender and age as moderators of individual adoption, showing that with increasing age gender differences were more pronounced (Morris et al., 2005). In an Indian study, using the UTAUT scale, age, gender, and experience were shown to be significant moderators on employees' acceptance of IT (Dutta & Borah, 2018). There was no discernible attitude variation between age groups. While younger employees were more confident in their ability to learn and use all new IT improvements, older employees had stronger behavioural intentions to accept new technology (Dutta & Borah, 2018).

Urge for Research

One recent management approach to increase knowledge worker productivity is nudge management, which has the goal "to design organizational contexts so to optimize fast thinking and unconscious behaviour of employees in line with the objectives of the organization" (Ebert & Freibichler, 2017, p. 2). Based on this approach, and the fact that employers are often just seen as important choice architects for retirement plans or health care (Thaler & Sunstein, 2021), this research aims to offer another viewpoint on how employers and organisations might function as choice architects to facilitate digital transformation for the benefit of everyone.

In semi-structured interviews with employees of a German company that implemented Skype as a communication and collaboration tool the necessity of nudges in the digital workplace to support the employees in their adoption of the specific technology was stressed (Stieglitz et al., 2017). Furthermore, the call of Brown et al. (2010) to evaluate possible interventions for collaboration technology adoption research is thus followed. To the best of my knowledge, the three chosen digital nudges (default, social influence, feedback) are barely studied in the work and innovation application. This is confirmed by the literature review of Bergram et al. (2022).

To gain a deeper comprehension of how nudges affect the adoption of technology in the workplace, the following hypotheses are investigated:

Hypothesis 1: Nudges (vs. control) will have a positive effect on employees' adoption of innovative technologies.

H1a: Nudges (vs. control) will increase the employees' acceptance to use innovative technologies.

H1b: Nudges (vs. control) will increase the employees' motivation to explore innovative technologies.

H1c: Nudges (vs. control) will positively influence employees' attitude toward innovative technologies.

H1d: Nudges (vs. control) will increase the employees' commitment to innovative technologies.

H1e: Nudges (vs. control) will increase the employees' willingness to adopt innovative technologies.

H1f: Nudges (vs. control) will increase the employees' satisfaction with adopting innovative technologies.

H1g: Nudges (vs. control) will increase the employees' preference to adopt innovative technologies.

Resistance to Change

The reaction and behaviour associated with change often depend on whether the change is voluntary or inclined. Individuals, however, vary in their internal inclination to either embrace or reject change (Erwin & Garman, 2010; Oreg, 2003; Oreg & Sverdlik, 2011). Maladaptive defenses impact the behavioral intention to resist (Bovey & Hede, 2001). Dispositional resistance to change is defined as "an individual's tendency to resist or avoid making changes, to devalue change generally, and to find change aversive across diverse contexts and types of change" (Oreg, 2003, p. 680). A resistance to change (RTC) scale was developed by Oreg (2003) to provide a reliable and cross-context measurement.

Often resistance is a result of the desire to maintain the status quo (Ellen et al., 1991). Therefore, one major challenge for organisations is to deal with employees' and team members' reluctance towards new projects, new technology, or organisational changes. Moreover, individuals make their decisions dependent on the corresponding sunk costs (Kahneman & Tversky, 1979). Employees' resistance to innovations can be also explained by this phenomenon (Zwick, 2002). Additionally, change-specific cynicism is linked to the intention to resist organisational change (Stanley et al., 2005). Further, Oreg (2006)

demonstrated the impact of personality and context as antecedents of resistance to change, following work-related outcomes. Especially, trust in management and social influence significantly affects employee's resistance to change (Oreg, 2006). In a longitudinal study on organisational change, using an adapted version of Oreg's (2003) scale, emotional exhausted individuals were more resistant to change. This relationship was moderated by perceived organisational support and informational team climate (Turgut et al., 2016). Consequently, managers implementing change need to consider the behavioural, cognitive, and affective dimensions of change in their strategies to overcome resistance, with an emphasis on the importance of emotions (Oreg, 2006; Smollan, 2011). A possible intervention that organisations can use to overcome the individual's resistance is revised personal compacts and the strengthening of greater commitment, as shown in the Philips case study by Strebel (1996).

Besides organisational efforts, consumer research encounters similar problems. For example, new product development for consumers needs to deal with the challenge of resisting attitudes. Innovations in the consumer domain are significantly hampered by passive innovation resistance (Koch et al., 2021). Although it can be minimised by greater openness to experience, this resistance increases with age (Koch et al., 2021). A qualitative focus study in the Netherlands by Kleijnen et al. (2009) confirmed the following drivers of consumer resistance: traditions and norms, existing usage patterns, perceived image, and risk (physical, economic, functional, and social). Furthermore, evidence illustrates that identified sources of technology resistance are self-efficacy and performance satisfaction (Ellen et al., 1991). As an example, Nov and Ye (2008) stated that resistance to change as a personality trait is crucial in determining the perceived ease of use of digital libraries. These findings indicate that the adoption of unknowns is less likely if people are more resistant to change, which is in line with the study result of Heidenreich et al. (2016) that high resistance to change inhibits product innovation adoption.

Concluding, research shows that it is important to take resistance to change into consideration when evaluating the success of technological adoption and implementation activities. The Person-Implementation framework (Rizzuto & Reeves, 2007) highlights resistance as the most frequent failure symptom for IT implementations with participation as a common problem source. The authors stressed that psychological methods are essential to understand and differentiate technology implementation in the workplace (Rizzuto &

Reeves, 2007). Additionally, Brown et al. (2010) outlined that it is necessary to consider additional moderators to explain collaboration technology adoption. Since resistance to change has an impact on the performance of routine tasks, the daily use of a collaboration tool should be affected by this personality trait (Oreg, 2018). Hence, resistance to change will be analysed as moderating influence on innovative technology adoption in this study.

Hypothesis 2: Resistance to change will moderate the relationship between any nudge (vs. control) and the adoption of innovative technologies. Nudges will positively impact the adoption of innovative technologies for employees with high dispositional resistance to change compared to lower dispositional resistance to change.

Age Differences

Research has shown contradictory results about the stereotype that older employees are more resistant to change and innovation. Some results indicated that older employees are less resistant whereas others showed the opposite. Rizzuto (2011) studied the relationship between the workplace context on employees' IT implementation satisfaction and showed that older workers react more positively than younger workers to a new IT initiative. Moreover, Kunze et al. (2013) have shown that younger employees in German firms were more resistant to change than older employees using the RTC Scale from Oreg (2003). Nevertheless, common workplace age stereotypes were identified by Posthuma and Campion (2009), emphasising the association of older employees being less adaptable and more resistant to change. Likewise, age stereotypes and associated discriminatory attitudes at work were compared in a study with participants from Hong Kong and the UK (Chiu et al., 2001). In the UK sample, older workers were perceived as more efficient, despite the notion that they were less adaptive. Discriminatory attitudes against older workers were more prevalent in Hong Kong due to the significant influence of biased views toward older workers on how adaptable they perceive them to be (Chiu et al., 2001). A replication of an age discrimination study conducted in the 1970's (Rosen & Jerdee, 1976), found that age discrimination significantly decreased. However, compared to younger employees, older workers are still perceived as being more resistant to change (Weiss & Maurer, 2004) and their abilities specific to the ICT area tend to be lower (de Koning & Gelderblom, 2006).

Additionally, the age of employees seems to have an impact on ICT and related health issues. Common dark side effects of ICT entail stress, overload, or anxiety (Arnold et al.,

2023; Marsh et al., 2022). These effects often lead to negative outcomes, like conflicts and burnout as cognitive and affective outcomes, or lower productivity and turnover intentions as behavioural outcomes. Thereby, age moderates this relationship (Marsh et al., 2022). Further, the adoption of new ICT technologies can lead to technostress, which is defined as “stress experienced by individuals due to the use of ICTs” (Ragu-Nathan et al., 2008, p. 418). One main stressor hereby is high information overload (La Torre et al., 2019). Studies have shown that older workers experience less technostress (Kluge et al., 2019; Ragu-Nathan et al., 2008). Rather, employees aged 35 to 45 are more likely to experience stress and burnout when utilising ICT (Berg-Beckhoff et al., 2017).

Concluding, various research investigations have presented disparate findings about employees’ age and technology-related behaviours. Nonetheless, there is a consensus that social and demographic factors influence the individual adoption of innovation (Talukder, 2012). It implies that the impact of age needs to be considered as a potential moderator in this regard. The following hypothesis incorporates age into the research design.

Hypothesis 3: Age will moderate the relationship between any nudge (vs. control) and the adoption of innovative technologies. Nudges will positively impact the adoption of innovative technologies particularly for younger employees (vs. older).

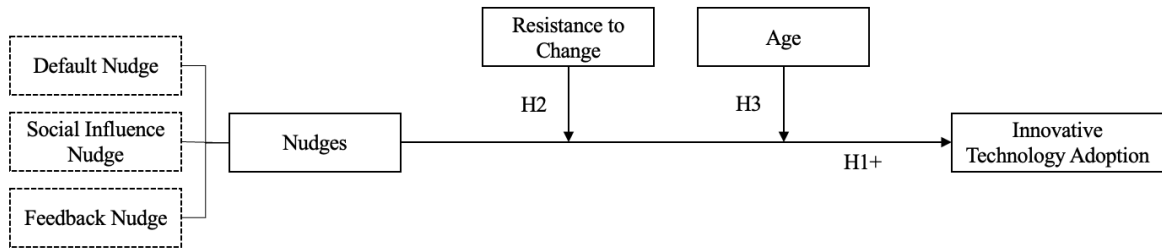
Studies have revealed that different factors contribute to successful individual technology adoption. Companies and employees need to continuously implement new routines or tools and adapt to new technology as part of their digital transformation process. A great choice architectural tool to positively impact decision-making in different contexts and enable behaviour change are nudges as research has shown. Based on the findings of Stieglitz et al. (2017), nudges may also support technology adoption of employees.

Therefore, the effect of three successfully investigated nudges (default, social influence, and feedback) on employees’ innovative technology adoption will be explored. In addition, resistance to change and age are influencing factors in the change process. While resistance to change appears to be a predictor of change failures, research yields contradictory results about the extent to which age influences the workplace and the deployment of new technology. Thus, the moderating function of both characteristics will be examined.

Figure 1 depicts the proposed research model, including all hypotheses.

Figure 1

The Research Model with Hypotheses



Methodology

Participants

Participants were recruited through snowball sampling, a non-probability sampling method. The link to the study was publicly shared on social media (LinkedIn, WhatsApp, Instagram, and Surveycircle.com), available from May 2, 2024, to July 1, 2024. Respondents received no compensation for their participation. The inclusion criteria for this study were to be currently employed, to be older than 18 years, and to either have the opportunity to work remotely or to be a member of a partly remote working team.

After data cleaning, the sample comprised a total of 159 participants, 58% males and 41% females, with 1% of respondents preferring not to state their gender. The respondents' age ranged from 21 to 63 years ($M = 38.85$, $SD = 13.97$). The study included participants from 18 countries, mainly Germany (81.8%), Portugal (3.1%), Austria (2.5%), Poland (1.9%), Argentina (1.3%), Belgium (1.3%), France (1.3%) and others (6.8%). Seventy-five percent of respondents identified themselves as employed, 3.1% as self-employed, 3.8% as students, and just one person was already retired. Additionally, 12% were students who were employed at the same time, and 5% were employed while also practicing self-employment. The educational level of the sample was not representative, since it had a rather high educational level: 5.7% had a PhD or higher, 43.4% had a master's degree, 22% had a bachelor's degree, and 28.9% had other degrees. Further, 37.7% of the respondents had children, with the majority having adult children aged 18 years and older (56.7%). The population worked on average sometimes remotely. More specifically, 11.3% indicated to never work remotely, while 17.6% stated occasionally (1-3 days per month), 39% answered sometimes (1-2 days per week), 28.3% said often (3-4 days per week) and just 3.8% worked always remotely (5 or more days per week).

Ethical approval was obtained from the Deliberation of the Ethics Committee for Technology, Social Sciences and Humanities of Universidade Católica Portuguesa under number CETCH2024-76 (see Appendix A).

Research Design

This study was conducted as a between-subjects design survey experiment in the form of an online questionnaire using Qualtrics (<https://www.qualtrics.com>). Participants were asked about their hypothetical behaviour in one of four nudging scenario experimental groups (control vs. default vs. social influence vs. feedback). Innovative adoption of technology represents the dependent variable of this study. Resistance to change and age were analysed as moderators.

Through automatic randomisation each participant was assigned to one scenario. Thereby internal validity was enhanced, and participant fatigue was prevented. To avoid primacy effects the statements of the different scales were randomised (Asch, 1946).

Manipulations

By using simulation scenarios, a realistic but hypothetical situation was created for the participants, in which respondents were asked to imagine themselves in a described scenario setting. Scenario experiments are beneficial for measuring psychological responses to situations (Kwon & Weingart, 2004). This method is often used to assess behaviour since it represents a real-world event artificially (Harrington & Simon, 2022).

In this study, the introduction of a new technology into the workplace was given by a newly invented collaboration tool called COTEWO (communication for teamwork), which aimed to support each employee in the organisation of their daily work routine. Participants were asked to put themselves in a situation where they are responsible for the launch of a new project that requires collaboration across different areas and colleagues. Additionally, a brief definition of collaboration tools was presented to ensure the same knowledge base. How to learn and explore the functions of COTEWO was then simulated with different nudging methods. The complete survey can be found in Appendix B.

Moreover, information provision as a text with illustrations has proven to be especially effective when using nudge messages to promote a more innovative attitude (Komatsu et al., 2023). Hence, icons and symbols were integrated into the scenario descriptions.

In the following, the selected manipulated variable, nudge, will be presented in more detail for each condition.

Default Nudge

Participants who were assigned to the default nudge condition ($n = 38$) were shown a short wrap-up video which automatically opens as soon as the laptop is started. This video entailed a start dashboard with different icons and information about activities that happened during their offline time as well as the focus and upcoming appointments of the new day. Then, the video zoomed in on the two main areas. Firstly, the “What you have missed out”-section displayed unread e-mails, missed calls, and messages. Secondly, the “Your focus of the day”- section reminded someone of meetings and today’s tasks. The video ends with the same dashboard overview as in the beginning.

Social Influence Nudge

The introduction text of the social influence scenario described an open and sharing working mentality. Participants in this scenario ($n = 39$) needed to imagine themselves finishing an important ongoing task. Their colleagues’ screens would then display a pop-up window about their success, allowing the colleagues to react with different stickers to celebrate and support this achievement.

Feedback Nudge

Participants who were assigned to the feedback scenario ($n = 41$) had personalised messages on their desktops regarding their engagement with COTEWO, highlighting their improved efficacy or completed tasks. Further, motivating words of praise emphasised the positive feedback.


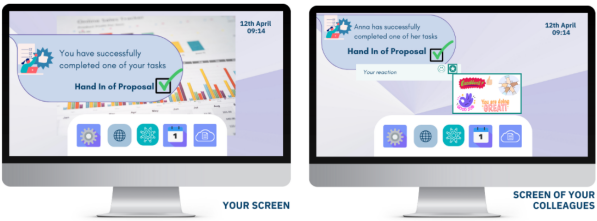
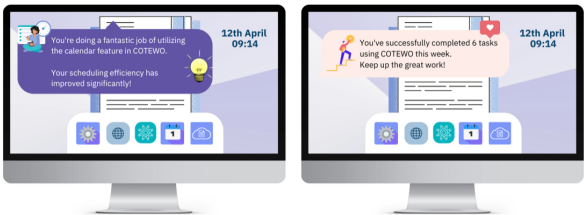

Control Condition

Forty-one participants were randomly assigned to the control condition ($n = 41$). In contrast to the nudge manipulations, participants just received general instructions about the introduction of a new collaboration tool without further messages. The desktop showed the COTEWO app icon in the middle of the bar with other daily-use apps.

Table 2 displays the scenario descriptions and desktop screenshots of the fictitious tool called COTEWO that participants received in the different nudge scenarios.

Table 2

Nudge Manipulations

Scenario Description	Desktop
<p>Default Nudge (displayed as Video)</p>	
<p>By starting your laptop, the app COTEWO opens automatically and shows you the following short wrap-up video with “What you have missed out” and “Your focus of the day”.</p> <p>You can easily see how many unread emails and messages you have, who have tried to call you, and which tasks and meetings you need to accomplish today.</p>	
<p>Social Influence Nudge</p>	
<p>You are working in a culture of active engagement and shared responsibility, fostering a more integrated and productive team environment.</p> <p>Embracing one finished task in your open task process, your colleagues will get a notification about your success in your team board and can directly react with stickers like the one shown below (see the screen of your colleagues’ picture).</p>	
<p>Feedback Nudge</p>	
<p>Throughout your workday, you will receive personalised feedback messages regarding your engagement with COTEWO.</p> <p>For example, you might receive notifications like this:</p>	
<p>Control Condition</p>	
<p>During your workday you are interacting with your company’s systems, you will have access to the new technology and can choose whether or not to explore it on your own. The COTEWO App can be found in the middle of the bar.</p> <p>You do not receive specific guidance or encouragement to learn about the functions of the new software.</p>	

Measurements

Adoption of Innovative Technology

Adoption of innovative technology was measured by seven variables, namely motivation, acceptance, attitude, commitment, willingness, satisfaction, and preference. After each scenario participants' motivation to explore the tool was assessed ("I would be motivated to explore the new COTEWO tool further"). Nonetheless, the main target variable was the 18-item Unified Theory of Acceptance and Use of Technology (UTAUT) scale (Venkatesh et al., 2003). This scale has a high reliability as shown in the meta-analysis of Dwivedi et al. (2011) and was validated in various cultural settings (Oshlyansky et al., 2007). Five determinants (performance expectancy, effort expectancy, social influence, behavioral intention, facilitating conditions) for user acceptance behaviour are used in this scale, computed to a total mean score in this research. To suit the current study's context, the included items have been adjusted and modified. The last item of facilitating conditions was deleted due to missing concurrence. Example items include, "I would find the tool useful in my job" and "I would intend to use the tool in the next months". In the present study, the scale revealed a high internal consistency ($\alpha = .91$). Various additional variables were measured to gain a better insight into the extent to which the new collaboration tool would be successfully adopted: attitude, commitment ("I would be willing to subscribe to COTEWO independently to organize my work routine and collaborate with my colleagues more effectively."), willingness ("I would be willing to engage in learning tasks to explore the features of COTEWO."), and satisfaction ("I would recommend the use of COTEWO to other co-workers."). Attitude impacts the individual's intention to use technological innovations as well as usage behaviour (Dwivedi et al., 2019; Talukder & Quazi, 2011). The 4-item attitude scale from Taylor and Todd (1995) was incorporated.

Respondents answered each item of the seven variables on a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7).

Before and after the intervention, the likelihood of integrating a collaboration tool into everyday working life was analysed. A direct comparison of pre-preference ("How likely is it that you will integrate a new collaboration tool into your day-to-day work?") and post-preference ("Overall, how likely is it that you would integrate this new collaboration tool COTEWO into your day-to-day work?") was drawn. Participants answered these items on a 5-point Likert scale from not likely at all (1) to extremely likely (5).

To enable an accurate interpretation and differentiation of the results, Table 3 differentiates the dimension variables that were examined under the umbrella term of the multidimensional construct of innovative technology adoption as the dependent variable.

Table 3

Innovative Technology Adoption Variables

Variable	Focus	COTEWO related
Acceptance (UTAUT)	Readiness	<i>How do employees perceive COTEWO and therefore intent to accept and use it?</i>
Motivation	Exploring	<i>Is the employee eager to explore COTEWO or does it lead to resistance?</i>
Attitude	Liking	<i>Do employees like or dislike the idea of COTEWO?</i>
Commitment	Attachment	<i>Is the employee convinced of COTEWO and would pay a subscription fee?</i>
Willingness	Investment	<i>Does the employee want to adopt to COTEWO? Also, if time needs to be invested in learning tasks?</i>
Satisfaction	Expectations	<i>Are the individual expectations meet? If so, is it also worth as recommendation?</i>

Resistance to Change

Dispositional resistance to change was measured with Oreg’s (2003) 17-item RTC scale. Four factors, namely routine seeking, emotional reaction to change, short-term focus, and cognitive rigidity, were assessed by a 6-point Likert scale ranging from strongly disagree (1) to strongly agree (6), computed to a total mean score. Some variables were reverse-coded. Example items include, “I generally consider changes to be a negative thing” and “I don’t change my mind easily”. The reliability of this scale was $\alpha = .84$. High reliability and validity were also shown cross-national, among others in Germany (Oreg et al., 2008). Only in some countries like Russia and Ukraine a lack of measurement of the cognitive rigidity factor was demonstrated (Oreg et al., 2008; Stewart et al., 2009).

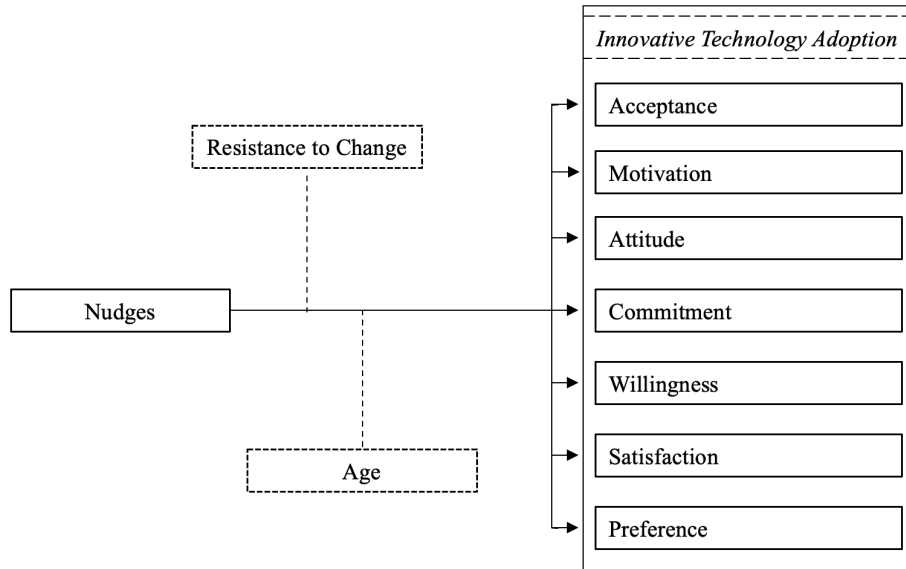
Age

Age was assessed by asking the respondents a single item in which they indicated their age in absolute years. For statistical purposes, age was treated as a continuous variable in this study.

Figure 2 shows all variables that were considered to be factors in the adoption decision.

Figure 2

Proposed Theoretical Model



Validated scales were adapted to fit the current study context. The questionnaire was translated into German as many respondents were expected to have German as their native language. Respondents could change their default language from English to German. A slightly adapted version of the translation of the University of Kassel for the RTC Scale (University of Kassel, n.d.) was used. Harborth and Pape’s (2018) version was used as an orientation for the UTAUT scale translation. For the translation of items that were unavailable in a validated German version, the procedure recommended by Schaffer and Riordan (2003) was followed, which included a translation and back-translation process by two individuals who were fluent in both English and German as their native language.

Additional Variables

One of the first questions that respondents had to answer was about their occupational status and how often they work remotely. Age, gender, country of residence, and education were the surveyed sociodemographic variables. Additionally, participants were asked if they had children. Respondents who had children then provided information on how many and if the child is living together with them. Research on consumer decisions has outlined that children influence the parent’s decision-making to buy new products (Flurry, 2007; Götze et al., 2009). Furthermore, children have a significant social influence on their parents’ behaviours (Kuczynski et al., 2016; Lansford et al., 2018). Therefore, a potential effect between having children and being more open to new technology was expected.

Pre-Test

To ensure that the various nudge scenarios were recognised and perceived as such in comparison to the control condition, a pre-test was conducted with $N = 22$ participants. An online survey was carried out within five days online using the Qualtrics software. Each participant was randomly assigned to a scenario, after which they had to answer two questions. The first question addressed the conscious recognition of a cue or prompt (“Following the scenario, did you notice any prompts or cues that influenced your decision-making?”), and the second question concerned the usage likelihood (“Based on the information presented in this scenario, how likely is it that you would use COTEWO as your standard collaboration tool?”). Additionally, for the default nudge scenario, participants were asked whether they would want to use the new tool without the automatic summary feature (“Would you consider opening the COTEWO app as one of your initial tasks each morning if there were no automatic summary feature available?”). The questions were answered using a 5-point Likert scale, where the lowest value represented the lowest level of agreement or usage likelihood, very unlikely/ strongly disagree/ No, definitely not (1) to very likely/ strongly agree/ Yes, definitely (5).

The results indicate that the prompts in the nudge conditions were recognised, see Appendix C. It was also shown that nudges seem to increase the likelihood of usage of a new collaboration tool in comparison to the control condition. Some scenarios were slightly adapted after these findings to ensure the best understanding and presentation of the nudges.

Procedures

This study was conducted as an online questionnaire, administered using the Qualtrics platform. Participation was voluntary and confidentiality guaranteed. All participants needed to accept the informed consent and confirm the study’s requirements to be able to continue with the study. Requirements included being older than 18 years, currently employed, as well as having the option of working remotely or being in a partially remote team. The survey procedure is illustrated in Figure 3.

Figure 3

Procedure of the Survey



The questionnaire started with general instructions and the consent form. After determining their eligibility, the participant's current employment status and remote work frequency were assessed. Additionally, the pre-preference for collaboration tools was analysed. Then, a short introduction to the fictitious collaboration tool, COTEWO, was presented. The participants were randomly assigned to one scenario. Respondents' technology adoption was examined by seven randomised displayed variables (motivation, acceptance [UTAUT], attitude, commitment, willingness, satisfaction, post-preference). After this section, the Resistance to Change (RTC) scale was measured. Sociodemographic variables were collected before the stated purpose of this study concluded the end of the survey. Altogether, completing the survey took between 12-15 minutes.

Data Analysis

Statistical software SPSS (version 28) of IBM was used to analyse the data. After the data cleaning from 271 responses, just $N = 159$ remained valid due to unfinished responses, unaccepted consent forms, or participants who indicated that they did not meet the eligibility criteria. Participants were randomly distributed between four different experimental groups, resulting in $n = 41$ in the control group, $n = 38$ experiencing the default nudge, $n = 39$ having the social influence nudge, and $n = 41$ responding to the feedback nudge.

To examine the effect of the nudges on the individual's innovative technology adoption, descriptive statistics, and a one-way analysis of variance (ANOVA) were used to determine any statistically significant differences between the groups. ANOVA assumptions – qualitative independent variable, continuous dependent variables, comparison between at least three groups – were satisfied. Homogeneity of variances was not met for motivation and satisfaction (see Appendix D); therefore, Welch's ANOVA was used as a robust alternative. Resistance to change and age were analysed as continuous moderator variables with Model 1 from SPSS (Hayes, 2013). Although previously validated, the reliability of the scales has been tested using Cronbach's alpha. Results indicated good internal consistency for the 18-item Unified Theory of Acceptance and Use of Technology (UTAUT) scale ($\alpha = .91$) and the 17-item Resistance to Change (RTC) scale ($\alpha = .84$).

To confirm that all seven variables (acceptance, motivation, attitude, commitment, willingness, satisfaction, preference) measured the multidimensional construct of innovative technology adoption, an exploratory factor analysis was carried out. Results showed that the variables were highly related to each other, hence representing one factor (see Appendix E).

Results

Following the call of Venkatesh et al. (2016) for further research in the technology adoption domain, the nudging concept was utilised as a possible influencing factor in the individual adoption of a new technology. Moreover, the implementation of nudges was anticipated to increase the motivation and adoption likelihood of a new collaboration technology. Individual data on resistance to change and age was expected to have a moderating influence. To the best of my knowledge and research, the use of the selected nudges in collaboration tools in the work environment has not been quantitatively tested.

The results section firstly presents the effect of nudges on innovative technology adoption and the pre-and post-preference difference. Secondly, correlations between the constructs are shown. Thirdly, the moderation analysis identifies significant interaction effects. Lastly, the section closes with an exploratory analysis of other influencing variables.

Differences Between the Control and Nudge Conditions

The first hypothesis to analyse was that any nudge condition (vs. control) would have a positive effect on employees' adoption of innovative technologies. To test possible differences in the single dependent variables, descriptive analyses and one-way analyses of variance (ANOVA), were carried out. The nudge conditions showed slightly higher mean values for all technology adoption variables compared to the control condition, see Table 4. Even if these differences are not statistically significant, an important trend can be identified.

Table 4

Descriptive Statistics for the Innovative Technology Adoption Variables per Condition

Scenario	n	Motivation		Acceptance		Attitude		Commitment		Willingness		Satisfaction		Preference	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Control	41	4.17	1.43	4.47	0.81	4.74	1.10	3.54	1.63	4.54	1.34	4.49	1.21	3.02	0.94
Default	38	5.50	0.98	4.71	0.82	5.03	0.85	4.13	1.85	5.00	1.53	5.00	1.10	3.16	1.00
Social Influence	39	5.13	1.13	4.73	0.78	4.95	0.95	3.74	1.67	5.00	1.49	4.74	1.19	3.05	1.05
Feedback	41	4.90	1.24	4.56	0.96	4.88	1.15	3.83	1.60	5.00	1.63	4.63	1.53	3.05	1.02
All Nudges	118	5.17	1.14	4.66	0.86	4.95	0.99	3.90	1.70	5.00	1.54	4.80	1.29	3.08	1.02

Note. Preference is evaluated with a different scale than the other variables. Motivation, acceptance, attitude, commitment, willingness, and satisfaction are assessed on a 7-point Likert scale, whereas preference is examined on a 5-point Likert scale.

The results of the univariate analyses of variance revealed that just motivation was found to be significant ($p < .001$) across conditions. Six out of the seven innovative technology

adoption variables, more specifically, acceptance, attitude, commitment, willingness, satisfaction, and preference showed non-significant differences (see Table 5).

Table 5

ANOVA Results between Nudge Conditions Including Effect Size

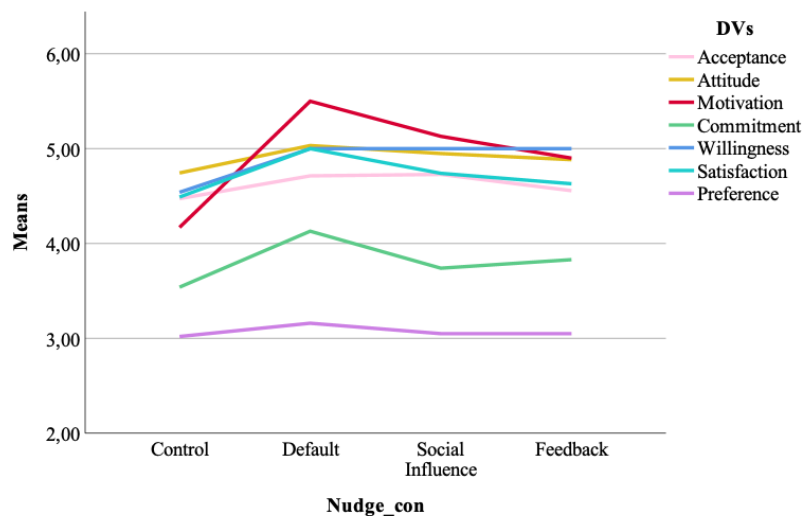
Dependent Variable	SS	Mean Square	<i>F</i> (3,155)	Welch's <i>F</i> (3,85,9)	<i>Sig.</i>	η^2
Acceptance	1.83	0.61	0.85		.470	.016
Attitude	1.77	0.59	0.56		.641	.011
Motivation				7.97	<.001***	
Commitment	7.18	2.39	0.84		.472	.016
Willingness	6.53	2.18	0.97		.409	.018
Satisfaction				1.36	.260	
Preference	0.41	0.14	0.14		.938	.003

*** $p < .001$.

Moreover, the effect of nudges on motivation was tested. Nudges were included as the independent factor, and motivation was the dependent variable. The effect was statistically significant, $F(3,85.9) = 7.97, p < .001$. Bonferroni post-hoc comparisons revealed that the control condition ($M = 4.17, SD = 1.43$), was significantly different from the default ($M = 5.50, SD = 0.98, p < .001$), the social influence ($M = 5.13, SD = 1.13, p = .003$), and the feedback nudge ($M = 4.90, SD = 1.24, p = .042$). Nevertheless, there was not a significant difference between the nudge conditions. The differences between the control and the nudge conditions for all dependent variables are illustrated in Figure 4.

Figure 4

Means of Each Dependent Variable Based on the Different Conditions



Additionally, the respondent's pre- and post-preference toward a new collaboration tool were assessed. The goal was to test whether employees had a similar preference towards a new tool before the fictitious presentation of COTEWO and after they had received more information. A repeated measure ANOVA between the pre- and post-preference as within-subjects and the nudge conditions as between-subject variables showed that preference changed significantly before and after the scenarios, although the effect size is small, $F(1, 155) = 4.55, p = .034, \eta_p^2 = .029$. Pairwise comparisons revealed that the pre-preference was significantly higher ($M = 3.25, SE = 0.08$) than the post-preference ($M = 3.07, SD = 0.08$), $M_{diff} = 0.178, SE = 0.083, p = .034$. To test if this difference is driven by the disliking of a specific nudge condition, the interaction between pre- and post-preference and the different nudge conditions was analysed. The effect of the preference decrease does not significantly differ depending on which nudge condition was displayed, $F(3,155) = 1.55, p = .203, \eta_p^2 = .029$. The between-subjects effect of the nudge conditions was not statistically significant, indicating no significant differences between the nudge conditions on preference, $F(3,155) = 0.50, p = .686, \eta_p^2 = .009$.

Hypothesis H1 is just partially supported, as only H1b failed to be rejected. H1a, H1c, H1d, H1e, H1f, and H1g need to be rejected.

Correlation Analysis

The intercorrelations for all key study variables were assessed using Pearson's correlation. The analysis revealed that the younger the respondents were the higher they were motivated to explore COTEWO, $r(157) = -.24, p = .002$. The younger respondents had a more positive attitude towards the tool ($r(157) = -.24, p = .003$), were more likely to accept it ($r(157) = -.21, p = .008$), were higher committed ($r(157) = -.30, p < .001$) and more satisfied with COTEWO ($r(157) = -.22, p = .005$). Pearson's correlations did not demonstrate significant relationships between the innovative technology adoption variables given and resistance to change. Significant large relationships at $p < .01$ were however found between all the dependent variables. Appendix F shows the Pearson correlation coefficients.

Moderation Analysis

The aim was to test if the relationship between nudges and employees' adoption of a new collaborative technology was moderated by either resistance to change or age or both.

Resistance to Change

Before conducting the moderation analysis an independent t-test was carried out to explore potential significant differences between low vs. high RTC levels and the dependent variables, see Table G1. Employees were separated into two groups, showing low ($n = 78$) or high ($n = 81$) levels of dispositional resistance to change. The groups were divided based on the median of total values of the RTC scale. Respondents who showed values higher than or equal 3.25 were classified as high in resistance, while respondents with values lower than 3.25 were characterised as low in resistance. No significant results were found. There was a trend that employees with higher RTC showed slightly higher means of the dependent variables except for motivation and willingness, where individuals with lower RTC showed higher means (motivation: $M = 5.00$, $SD = 1.17$; willingness: $M = 4.95$, $SD = 1.48$) than those with higher RTC (motivation: $M = 4.83$, $SD = 1.40$; willingness: $M = 4.81$, $SD = 1.53$).

Further, PROCESS was used to test a simple moderation model (Model 1, Hayes, 2013). According to Hypothesis 2, it was tested whether nudges positively impact the innovative technology adoption of employees showing high dispositional resistance to change. Nudges were included as between-subject factors, and each dependent variable – acceptance, attitude, motivation, commitment, willingness, satisfaction, preference – was analysed in order. Results show that resistance to change is the only significant predictor of one innovative technology variable, namely motivation ($b = -0.83$, $SE = 0.32$, $t(151) = -2.58$, $p = .011$, 95% CI [-1.46; -0.19]), see Table G2. This strong effect can be interpreted as a decrease in employee motivation with increasing resistance to change. The results of the respective moderation effects of the seven dependent variables and different nudge conditions are presented below.

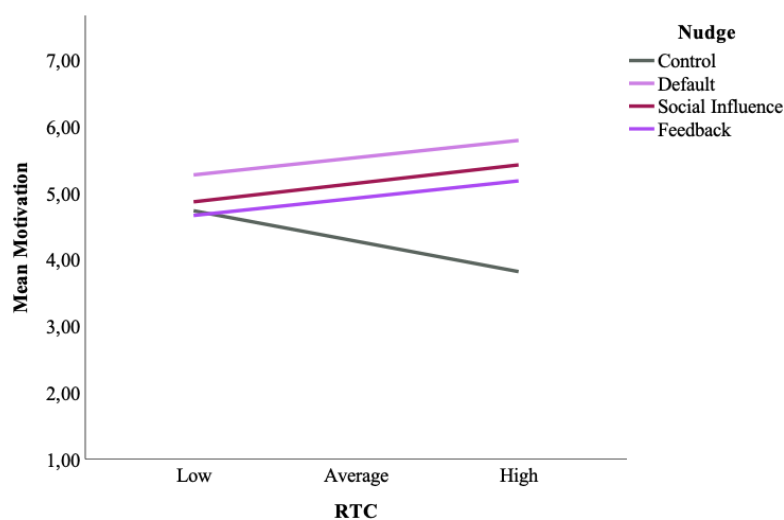
Acceptance (UTAUT). The overall model accounted for approximately 8.6% of the variance in acceptance, $F(7,151) = 2.03$, $p = .055$. Resistance to change had a moderation effect on acceptance just for the social influence nudge ($b = 0.83$, $SE = 0.34$, $t(151) = 2.48$, $p = .014$, 95% CI [0.17; 1.50]), see Table G3. When compared to the control condition, the social influence nudge increased the acceptance of technology for those people who are highly resistant to change ($b = 0.72$, $SE = 0.25$, $t(151) = 2.82$, $p = .005$, 95% CI [0.22; 1.22]), see Table G4. The interaction between the feedback nudge and RTC was marginal ($b = 0.57$, $SE = 0.33$, $t(151) = 1.74$, $p = .084$, 95% CI [-0.08; 1.22]) which suggests that this relationship might be also moderated by RTC (see Table G3).

Attitude. The interaction between the social influence nudge and RTC on attitude was found to be significant ($b = 0.84$, $SE = 0.41$, $t(151) = 2.05$, $p = .043$, 95% CI [0.03; 1.64]), see Table G3. The social influence nudge, when compared to the control condition, increased the attitude toward a new tool for those employees who are highly resistant to change ($b = 0.69$, $SE = 0.31$, $t(151) = 2.23$, $p = .027$, 95% CI [0.08; 1.30]), see Table G4. However, the overall model was not significant, $F(7,151) = 1.58$, $p = .145$, explaining an additional 6.83% of the variance.

Motivation. The overall model explained an additional 20.61% of the variance, $F(7,151) = 5.60$, $p < .001$. The effect of all nudges, default ($b = 1.29$, $SE = 0.48$, $t(151) = 2.70$, $p = .008$, 95% CI [0.34; 2.25]), social influence ($b = 1.33$, $SE = 0.48$, $t(151) = 2.78$, $p = .006$, 95% CI [0.38; 2.27]), and feedback ($b = 1.30$, $SE = 0.47$, $t(151) = 2.78$, $p = .006$, 95% CI [0.37; 2.22]), on motivation was moderated by RTC, see Table G3. Regression slopes analysis emphasised the link between all nudges and motivation as statistically significant when compared to the control condition, for those who show an average and high level of RTC, see Table G4. The same pattern was not replicated for individuals who showed low levels of RTC (see Table G4). The motivation to explore the new tool is therefore significantly higher in all nudge conditions compared to the control scenario, especially for people with higher resistance to change this effect increases, as shown in Figure 5.

Figure 5

RTC as Moderator of Nudges and Motivation



Commitment. The effect of all nudges on commitment is not moderated by RTC, see Table G3. Marginal results were found for the default nudge when employees showed average ($b = 0.64$, $SE = 0.38$, $t(151) = 1.67$, $p = .096$, 95% CI [-0.12; 1.40]) or high ($b = 0.99$, $SE = 0.53$, $t(151) = 1.87$, $p = .063$, 95% CI [-0.05; 2.04]) levels of resistance to change (Table G4). Also, the overall model was not significant, $R^2 = 0.04$, $F(7,151) = 0.99$, $p = .438$.

Willingness. The overall model was not statistically significant, $R^2 = 0.06$, $F(7,151) = 1.42$, $p = .203$. Nevertheless, RTC moderates the impact of the social influence nudge on willingness ($b = 1.52$, $SE = 0.60$, $t(151) = 2.53$, $p = .012$, 95% CI [0.34; 2.71]), see Table G3. Particularly, when compared to the control condition, the social influence nudge increased the willingness to engage in learning tasks for those employees who are highly resistant to change ($b = 1.27$, $SE = 0.46$, $t(151) = 2.78$, $p = .006$, 95% CI [0.36; 2.17]), see Table G4.

Satisfaction. The overall model predicting satisfaction was not statistically significant, $R^2 = 0.06$, $F(7,151) = 1.31$, $p = .249$. However, RTC moderates the effect of a social influence nudge on satisfaction ($b = 1.02$, $SE = 0.51$, $t(151) = 1.99$, $p = .048$, 95% CI [0.01; 2.03]), see Table G3. This effect can be interpreted as follows; individuals who are more resistant to change might respond more positively to social influence nudges impacting more positive recommendations of the use of COTEWO. This finding is confirmed through the regression slopes, indicating that for those who are highly resistant to change, the social influence nudge, when compared to the control condition, increased their satisfaction with the tool and therefore their likelihood to recommend COTEWO to co-workers ($b = 0.80$, $SE = 0.39$, $t(151) = 2.06$, $p = .041$, 95% CI [0.03; 1.56]), see Table G4.

Preference. The effect of all nudges on preference is not moderated by RTC, see Table G3. The overall model that nudges and RTC predict preference was not statistically significant, $R^2 = 0.04$, $F(7,151) = 0.84$, $p = .554$.

The effect of all nudges on motivation, and of the social influence nudge on acceptance, attitude, willingness, and satisfaction is moderated by an individual's dispositional resistance to change, as the overview in Table 6 shows. Therefore Hypothesis 2 is just supported for the dependent variable, motivation. Altogether, all nudges impact the motivation to adopt the new collaboration tool positively, especially for employees with average and high resistance to change.

Table 6*Overview of Significant RTC Moderation Effects*

<i>DV</i>	Default Nudge	Social Influence Nudge	Feedback Nudge
<i>Acceptance</i>	x	✓	<i>marginal</i>
<i>Attitude</i>	x	✓	x
<i>Motivation</i>	✓	✓	✓
<i>Commitment</i>	x	x	x
<i>Willingness</i>	x	✓	x
<i>Satisfaction</i>	x	✓	x
<i>Preference</i>	x	x	x

Age

For exploratory purposes, a one-way ANOVA between the age groups and the different dependent variables was conducted. Three age groups were created based on the cumulative percentage of the frequency distribution. The cumulative percentage approach was employed to create approximately equal-sized groups. Respondents aged 21 to 27 were categorised as younger employees, the ones between 28 to 48 as middle-aged employees, and respondents aged 49 to 63 years were defined as older employees. Significant differences between the age groups on all dependent variables were found, see Table G5. Especially all mean differences between middle-aged employees (28-48 years) and older employees (49-63 years) were significant, as shown in the Bonferroni post hoc comparisons, see Table G6. Additionally, attitude, motivation, and commitment also showed significant differences between the younger (21-27 years) and the older (49-63 years) employees, see Table G6. Descriptive statistics indicated that older workers show the lowest mean for all dependent variables, see G7, even though these differences are just small. This finding suggests that age is a relevant differential factor in the technology adoption context.

Thereupon, the moderated regression analysis for age as moderator was statistically analysed. The same procedure was applied as for resistance to change; thus, PROCESS was utilised to test simple moderation models (Model 1, Hayes, 2013).

Initially the direct effects of age on innovative technology adoption were explored. Results showed that age is a significant predictor for acceptance ($b = -0.02$, $SE = 0.01$, $t(151) = -2.34$, $p = .020$, 95% CI [-0.04; -0.00]) and commitment ($b = -0.04$, $SE = 0.02$, $t(151) = -2.22$, $p = .028$, 95% CI [-0.07; -0.00]), see Table G8. Nevertheless, it must be emphasised that these are small effects.

Furthermore, Hypothesis 3 of whether nudges would predict a higher innovative technology adoption rate as a function of age was investigated. The following shows the findings for the various nudge conditions and moderating effects on the dependent variables.

Acceptance (UTAUT). The effect of nudges on acceptance is not moderated by age. Only the default nudge was marginal ($b = 0.02$, $SE = 0.01$, $t(151) = 1.69$, $p = .094$, 95% CI [-0.00; 0.05]), see Table G9, especially for older employees ($b = 0.55$, $SE = 0.27$, $t(151) = 2.03$, $p = .044$, 95% CI [0.02; 1.09]), see Table G10. The overall model is explaining an additional 8.9% of the variance, $F(7,151) = 2.11$, $p = .046$.

Attitude. The overall model is explaining an additional 10.73% of the variance, $F(7,151) = 2.59$, $p = .015$. Nonetheless, the effect of nudges on attitude is not moderated by age, see Table G9. The default nudge was only marginal ($b = 0.03$, $SE = 0.02$, $t(151) = 1.81$, $p = .072$, 95% CI [-0.00; 0.06]). When analysing the regression slopes individually for each group, it was possible to observe that the link between the default nudge and attitude towards the new tool was statistically significant only for those who were older ($b = 0.70$, $SE = 0.32$, $t(151) = 2.16$, $p = .032$, 95% CI [0.06; 1.34]), see Table G10.

Motivation. The effect of nudges on motivation is not moderated by age, see Table G9. Nonetheless, the feedback nudge condition was marginal ($b = -0.03$, $SE = 0.02$, $t(151) = -1.83$, $p = .069$, 95% CI [-0.07; 0.00]). The overall model was explaining an additional 22.74% in variance, $F(7,151) = 6.35$, $p < .001$. The simple slopes of all nudges on motivation were significant for younger employees, middle-aged employees, and except for the feedback nudge also for older employees, see Table G10. This indicates that nudges generally influence motivation with variations in age even though age does not significantly moderate the overall effect.

Commitment. The effect of nudges on commitment is not moderated by age, see Table G9. Nevertheless, the overall model explained an additional 10.34% of the variance, $F(7,151) = 2.49$, $p = .019$.

Willingness. Results found a small negative and significant moderating impact of age on the relationship between the feedback nudge and willingness ($b = -0.05$, $SE = 0.02$, $t(151) = -2.15$, $p = .033$, 95% CI [-0.09; -0.00]), compared to the control condition, see G9. The overall model was significant, explaining an additional 11.06% of the variance, $F(7,151) = 2.68$, $p = .012$. For younger age employees the feedback nudge was significant ($b = 1.20$, $SE = 0.46$, $t(151) = 2.61$, $p = .010$, 95% CI [0.30; 2.10]) and the social influence nudge ($b =$

0.89, $SE = 0.46$, $t(151) = 1.91$, $p = .058$, 95% CI [-0.03; 1.81]) was marginal, see Table G10. Contradictory, the default nudge, when compared to the control condition, increased the willingness to engage in learning tasks for older employees ($b = 1.01$, $SE = 0.47$, $t(151) = 2.13$, $p = .035$, 95% CI [0.07; 1.94]), see Table G10.

Satisfaction. The main effect of nudges on satisfaction is not moderated by age, see Table G9. However, the overall model explains an additional 10.97% of the variance, $F(7,151) = 2.66$, $p = .013$. The feedback nudge was marginal ($b = -0.03$, $SE = 0.02$, $t(151) = -1.71$, $p = .090$, 95% CI [-0.07; 0.01]), see Table G9, particularly for younger employees ($b = 0.66$, $SE = 0.39$, $t(151) = 1.70$, $p = .093$, 95% CI [-0.11; 1.43]), see Table G10. Middle-aged ($b = 0.52$, $SE = 0.28$, $t(151) = 1.86$, $p = .065$, 95% CI [-0.03; 1.06]) and older ($b = 0.77$, $SE = 0.40$, $t(151) = 1.92$, $p = .056$, 95% CI [-0.02; 1.56]) employees showed a marginal result for the default nudge on satisfaction, see Table G10.

Preference. The overall model did not explained a significant amount of variance, $R^2 = .053$, $F(7,151) = 1.22$, $p = .297$. The effect of the default nudge on preference is positively moderated by age ($b = 0.03$, $SE = 0.02$, $t(151) = 2.04$, $p = .043$, 95% CI [0.00; 0.06]), see Table G9. As individuals get older, the default nudge, compared to the control condition, has a stronger positive impact on their preferences ($b = 0.60$, $SE = 0.32$, $t(151) = 1.86$, $p = .065$, 95% CI [-0.04; 1.24]), see Table G10.

All in all, the moderation by age was statistically significant solely for the feedback nudge and willingness to adopt the innovative technology ($p = .033$) and the default nudge and preference toward the new tool ($p = .043$), see Table 7. Therefore, Hypothesis 3 needs to be rejected with these two exceptions just mentioned. Nevertheless, there was no discernible trend suggesting that younger employees were more responsive to nudges.

Table 7
Overview of Significant Age Moderation Effects

<i>DV</i>	Default Nudge	Social Influence Nudge	Feedback Nudge
<i>Acceptance</i>	<i>marginal</i>	✘	✘
<i>Attitude</i>	<i>marginal</i>	✘	✘
<i>Motivation</i>	✘	✘	<i>marginal</i>
<i>Commitment</i>	✘	✘	✘
<i>Willingness</i>	✘	✘	✓
<i>Satisfaction</i>	✘	✘	<i>marginal</i>
<i>Preference</i>	✓	✘	✘

Overall, resistance to change moderated the relationship between all nudges and motivation toward the new collaboration tool. Additionally, resistance to change was found to be a significant moderator for the link between the social influence nudge and acceptance, attitude, satisfaction, and willingness, see Table 6. In contrast, age was a limited differential moderator on the effect of nudges on innovative technology adoption. As Table 7 shows, age just moderated the relationship between the default nudge and preference as well as between the feedback nudge and willingness. Nonetheless, age differences were found in the direct relationship on the technology adoption variables. An overview of the supported hypotheses can be found in Appendix H.

Other Influencing Factors: Exploratory Analysis

Descriptive analysis was performed to determine possible influences of gender differences, whether children had an influence, or if different remote working situations had an impact on the only significant dependent variable, motivation. The selection of cases revealed interesting findings. Participants who often or always worked remotely ($n = 51$) did not show significant changes in motivation between the control and the nudge conditions, $F(3,47) = 1.32, p = .280, \eta^2 = .078$. Employees who never or occasionally worked remotely ($n = 46$) also did not show significant differences between the nudge conditions and the control, $F(3,42) = 1.93, p = .139, \eta^2 = .121$. However, for participants who sometimes work remotely ($n = 62$), nudges had an impact on their motivation, Welch's $F(3,31.75) = 7.64, p < .001, \eta^2 = .342$. Bonferroni post-hoc comparisons revealed that the control condition ($M = 3.71, SD = 1.36$), was significantly different from the default ($M = 5.63, SD = 0.89, p < .001$), social influence ($M = 5.19, SD = 1.05, p = .001$) and feedback nudge ($M = 5.23, SD = 0.93, p = .002$). Therefore, the results suggest that employees working sometimes (1-2 days per week) remotely, practicing a flexible hybrid work arrangement, seem to be more prone to nudges compared to those who rarely or frequently work remotely.

Additionally, an analysis of Covariance (ANCOVA) was performed to examine the effect of different nudge conditions on motivation, while controlling for gender differences, whether having children had an influence, educational background, or the remote working situation as covariates. All these four potential covariates did not explain the effect of nudges on motivation in this analysis. After controlling for gender, there was a significant effect of nudges on motivation, $F(3,154) = 8.43, p < .001, \eta p^2 = .141$, nonetheless, gender was not significantly related to motivation, $F(1,154) = 0.34, p = .564, \eta p^2 = .002$. After adjusting for

whether people had children, the effect of nudges on motivation remained statistically significant, $F(3,154) = 8.94, p < .001, \eta p^2 = .148$, nonetheless, having children had a marginal relationship to motivation, $F(1,154) = 3.40, p = .067, \eta p^2 = .022$. The covariate, education, was not significantly related to motivation, $F(1,154) = 2.76, p = .099, \eta p^2 = .018$. The significant effect of nudges on motivation, $F(3,154) = 8.67, p < .001, \eta p^2 = .145$, persisted after controlling for education. After adjusting for remote frequency, there was a significant effect of nudges on motivation, $F(3,154) = 8.65, p < .001, \eta p^2 = .144$, nonetheless, the remote frequency was not significantly related to motivation, $F(1,154) = 0.66, p = .416, \eta p^2 = .004$.

To conclude, data on gender, education, having children, and the amount of remote working were not related to motivation as covariates. The robustness of the effect of nudges on motivation was therefore not restricted by the analysed covariates. However, exploratory data revealed that nudges in particular affected respondents who work in flexible hybrid work settings. Further implications and a discussion of the results will follow in the next section.

Discussion

This study aimed to explore the potential impact of nudges on the innovative technology adoption of a new collaboration tool while analysing age and resistance to change as moderating influences. Some of the results were contrary to what was hypothesized. Nevertheless, the goal of investigating the impact of nudges and the importance of age and resistance to change in the work technology implementation was achieved. Several insights are yielded by this study. Firstly, nudges significantly influenced the motivation of employees to explore a new tool compared to the control condition, whereas nudges did not have a significant impact on the other dependent variables. Secondly, employees' dispositional resistance to change moderated the impact of nudges on motivation, especially for social influence nudges on technology adoption variables. Lastly, age did not moderate the relationship between nudges and innovative technology adoption but had a direct influence on the adoption variables. Thus, this study contributes to strengthening the scientific knowledge on this topic. Limitations and future research recommendations are outlined. Moreover, theoretical implications for research as well as practical managerial suggestions are presented.

One of the main findings of this research was that all variables measuring the innovative technology adoption were non-significantly different regardless of the examined condition, except for motivation. A trend suggests that nudges especially impacted the motivation of individuals who worked once or twice a week remotely. Moreover, resistance to change moderated this effect.

Motivation is one of the most important factors for behavioural change (Deci & Ryan, 1985; Michie et al., 2011) and concluding sustained technology adoption. This study has shown that nudges can increase employees' motivation to explore a new tool. The research by van Gestel et al. (2021) has outlined that default nudges and motivation both influence behaviour, but do not specifically interact with each other. Contradictory, findings of this research have shown that nudges directly impact motivation. As motivation is a crucial requirement of behaviour change and a central component of the COM-B framework (Michie et al., 2011), this finding reveals important implications for the influence of nudges on motivation.

However, this research did not find significant results for the impact of nudges on acceptance, attitude, satisfaction, willingness, and commitment of employees. These results are not consistent with the findings of Stryja and Satzger (2019), which stated that reactions toward innovation are more positive when nudges are presented, leading to increasing adoption rates. Moreover, Hyytinen et al. (2022) have shown that nudges do affect technology adoption in the context of public online services. The authors conducted an experiment with Finnish citizens and found that especially for slow adopters, nudges are an effective behavioural intervention method. Nonetheless, a tendency that nudges influence the adoption behaviour exists also in this research, see Table 4.

Three possible explanations for this limited success of the nudges will be elaborated in the following. Firstly, the scenario setting could have been a challenge due to its hypothetical decision-making. Respondents may lack the ability to empathise with the situation. Secondly, the small sample size and resulting missing statistical power could be another reason. A larger sample can provide statistically significant results instead of tendencies. Lastly, innovation fatigue or contradictory innovation enthusiasm could have altered the findings. The intensity of previous innovation implementations and feelings of helplessness impact the beliefs about the innovation, resulting in potentially more fatigued behaviour (Chung et al., 2017). This is also accompanied by the opposite phenomenon suggesting

technology-savvy people to be generally more open to new tools (Barak, 2018). Concluding, respondents could have been in favour of the idea as such, despite little available information as in the control scenario. This would inhibit significant findings of differences between control and nudge scenarios.

Another surprising finding of the study was that the preference towards the integration of a new collaboration tool into daily work routines decreased after participants received information regarding COTEWO. As the authors de Ridder et al. (2022) have pointed out pre-existing preferences are crucial to ensure the effectiveness of nudges. Moreover, Sunstein (2017) described strong antecedent preference due to their inertia overcoming effect as one of the main reasons for ineffective nudges. As an example, Callaway et al. (2023) found that a default nudge is ineffective for individuals with idiosyncratic preferences. This suggests that the sample may not have been nudgeable. Further, certain preconditions which were not known may have been present, for example, intentions that are not in line or too strong in line with the intended behavioural outcome. Hence, those who use collaboration tools frequently or never may have different experiences and expectations regarding such a tool. A further rationale for this outcome could be that COTEWO as a fictitious tool was not appealing enough.

Furthermore, the moderation analyses revealed interesting findings, which will be addressed in more depth in the following. Employees' resistance to change moderated the effect between all tested nudges and motivation. Specifically, nudges had a stronger positive effect on motivation for individuals with higher RTC. This result is particularly noteworthy because RTC had a strong direct negative effect on motivation ($b = -0.83$), which implies that employees with increasing levels of resistance to change had decreasing motivation. For those people, nudges can be considered particularly successful by changing this relationship for the better. Considering that resistance to change usually decreases motivation to change a behaviour (Oreg, 2003) and that unconscious motivations are related to resistance to change (Bovey & Hede, 2001), this success of nudges needs to be emphasised even more.

The age moderation analysis findings reflect the existing literature and research on the duality of age and new technologies. In line with Morris and Venkatesh (2000), the present results revealed that age directly influences technology adoption. Moreover, the ageism stereotype (Posthuma & Campion, 2009; Mariano et al., 2021) can be conditionally confirmed in this sample since small correlational effects were found between younger

employees and higher adoption values. However, inconsistent with the findings of Venkatesh et al. (2003) and Brown et al. (2010), age did not moderate the acceptance behaviour. Furthermore, significant differences between the age groups on all dependent variables were found. These results are contradictory to that of Dutta and Borah (2018), where no significant age differences in attitudes were reported. This disparity may be caused by differences in cultures since this sample was mainly German whereas Dutta and Borah's (2018) study was conducted in India.

Nudges can push people to change their behaviour either by reinforcing existing behavioural patterns or by initiating new behaviour (Thaler & Sunstein, 2021), whereby the second influence can be observed in this study. Nudges seem to promote the adoption of innovative technology more frequently for employees who rated higher on the trait of resistance to change. In this research, especially the default and social influence nudge showed highly influential outcomes. Consistent with the literature, default nudges are one of the most effective choice architectural tools (Dinner et al., 2011; Hummel & Maedche, 2019; Johnson & Goldstein, 2003; Müller et al., 2023; Schneider et al., 2020; Schöbel et al., 2020; Stryja et al., 2017; Sunstein, 2014; Venema et al., 2018). The default nudge can be seen as a reference point that can be adjusted to the individual's motivation (van Gestel et al., 2021). Furthermore, this study has highlighted the use of social influence nudges to steer the behaviour of people who are more resistant to change. This result is consistent with the findings of Oreg (2006) that social influence correlates with affective resistance. Another possible explanation is employee connectedness, whereby engagement with one another through digital communication enables stronger connections based on common routines or ideas (Dery et al., 2017). An important consideration in this regard is that individuals' behaviour is motivated by accuracy and social influence to match one's decisions with another's behaviours (Cialdini & Goldstein, 2004). Therefore, the social influence nudge may be more influential than expected in overcoming resistance and adopting new technologies. Moreover, as Dianoux et al. (2019) have already proposed, nudges can be a great communication approach for an agile organisation, especially for employees in new situations.

To conclude, this study has shown potential opportunities for the use of nudges in transformation processes. Being a relatively new field of research, the results reflect the duality of existing research. The concept of nudging is still lacking a standardised application

procedure for comparing existing results. Thus, other contextual and individual factors will become more relevant and must be considered when comparing nudge efficacy measures. Especially a focus on personality traits as a possible influence in the relationship between nudges and the desired behavioural outcome is recommended.

Theoretical Contributions and Implications

The present research makes several important contributions to strategic objectives in organisational technology implementation processes. The potential of nudges is highlighted in this study. All three nudges had an impact on motivation. Therefore, it can be concluded that nudges may function as an effective persuasion strategy. This aligns with Rogers's (2003) innovation theory where the persuasion stage is followed by the decision to adopt.

Even though the Behaviour Change Wheel (Michie et al., 2011), presented at the beginning of this work, is intended to be applied in the policy domain, theoretical implications can be drawn for the purpose of this study. Nudges may function as enablement for automatic motivation, whereas nudges may also represent a persuasion strategy as a possible intervention of social opportunity behaviours. Based on this categorisation, instead of policy activities, nudges can be optimised to fit the context and enable behaviour change also in the workplace setting.

Nonetheless, nudges were not efficiently increasing the other innovative technology adoption variables (acceptance, attitude, willingness, commitment, satisfaction, preference). This finding may be explained due to prior preferences and their influence on these variables. An examination of the interplay between all these relevant adoption variables would be recommended to explore potential gaps where nudges could be integrated. Additionally, it is important to analyse the decision-maker who is getting nudged and to take all considerations like context, motivation, and abilities into account (Meske & Pothoff, 2017).

This research and other prior research suggest that differences in dispositional resistance to change must be analysed to achieve greater innovation adoption likelihoods (Ellen et al., 1991; Nov & Ye, 2008; Oreg, 2006; Smollan, 2011). These findings are important because, to the best of my knowledge, there has been no research to date on the relationship between nudges and motivation moderated by dispositional resistance to change. Results showed that nudges can impact personality trait-driven behaviour. Hence, the results provide a baseline for future studies of nudges designed to introduce collaboration tools.

Practical Implications

Several managerial implications can be drawn from the outcomes of this research. When introducing new technology, the decisive initial step in a company should be to analyse the corporate culture and the different personal traits in the team. The responsible project lead should be aware of the individual digital mindsets to accelerate and build a technological ecosystem. One notable finding is that nudges seem to motivate people who work in flexible hybrid models. People who operate fully remotely may not have been as nudgeable as others because they may feel overburdened or fatigued by the variety of instruments available to them to accomplish varying objectives. Further, employees who work never, or only a few times a month, remotely may be less reliant on collaborative technologies, which could explain the lack of significant differences as relevance or interest may be missing. Based on this result, I recommend managers to tailor their approach to new technology implementation initiatives to the respective employees' working situation. The trait of resistance to change has a greater influence on the relation between nudges and innovative technology adoption than age as this study has shown. Therefore, managers should focus more on individualised concepts for employees who are more resistant to change than on older employees in change processes.

Additionally, this study outlined that social influence nudges can be an effective strategy for people who are less open to change. The perception of change is also influenced by an individual's feeling toward the person who is progressing through this change (Oreg & Sverdlik, 2011). Therefore, it is advised to stress the importance of social influence in a change process. Sokol (1994) suggests organisational support groups which may assist users' needs and expectations, therefore facilitating the adoption of new technologies more easily. This study has shown that nudges can be an additional supplement to support the introduction of new technologies.

Limitations

The strength of this study is the gain of initial insights about the positive impact of three different nudges on the motivation to adopt a new collaboration technology. However, this study has a few limitations that should be noted.

The main limitation is the small sample size ($N = 159$). A power calculation was carried out with the software G*Power version 3.1 of the HHU4 (Faul et al., 2009). The required sample size was determined in a priori power analysis for one-way ANOVA aiming for 80%

statistical power ($\alpha = .05$, $\beta = .20$, $f = .25$). The result of the power calculation showed that ideally a sample size of at least $N = 180$ participants should be chosen, $n = 45$ participants per condition, to detect a medium effect (see Appendix I). Unfortunately, I was not able to recruit as many participants as required. Therefore, this study has solely 70% statistical power and provides thereby a potentially high risk of Type II error. Due to the lack of statistical power, all findings and conclusions must be properly assigned to their respective significance. The small sample further does not exclude a possible sampling bias, resulting from a not representative sample of the entire working population. Additionally, the inference problem may be present in this study. It refers to the misleading interpretation and conclusions about a population based on the existing sample, particularly low statistical power can affect how the results are interpreted.

The prior experience of the participants with collaboration tools or change processes may be another potential limitation. Participants with prior experience using collaboration tools may have specific expectations or beliefs that differ from those without such experience. As the study's results indicate, those who work sometimes remotely are more motivated to explore the new tool if they are being nudged, compared to the ones who work regularly remotely. Less experience coupled with a certain extent of use dependence could be a possible reason. Therefore, it would have been required to assess existing beliefs on collaboration tools and adapt the interface of COTEWO accordingly to prevent this potential influence factor.

Furthermore, many studies selected samples consisting of employees from the same organisation undergoing an implementation process partially coupled with training (Brown et al., 2010; Dutta and Borah, 2018; Morris et al., 2005; Talukder, 2012; Venkatesh et al., 2000; Venkatesh et al., 2003). Since employees in this study were working for different organisations, my results may be influenced by other unknown variables.

Another potential limitation to consider is the chosen scenario method, here resulting in less significant results than expected. Hypothetical decisions are prone to generate biased outcomes due to missing real effort or consequences (Kang et al., 2011; Loomis, 2011). Moreover, this study showed the positive impact of nudges on motivation which may be explained due to the unrealistic optimism. This optimism describes how individuals tend to make more optimistic decisions if the consequences are in the future (Tanner & Carlson, 2009). According to Kühberger et al. (2002) hypothetical and real decisions are generally

comparable but different incentives or consequences cause differences in choices. Another possible influencing factor in this regard is personality which may impact this hypothetical bias (Greibitus et al., 2013). Therefore, the selected nudges would need to be designed and implemented in a real-life setting to analyse the actual usage behaviour. Future research could make use of the Digital Nudge Design (DND) method (Mirsch et al., 2018) to achieve targeted nudge interventions while considering the optimal timing for the digital nudge (Purohit & Holzer, 2019). Through the DND method, digital nudges are designed in four phases: (1) Context, (2) Ideation and Design, (3) Implementation, and (4) Evaluation (Mirsch et al., 2018).

Recommendations for Future Research

The success of new collaboration tools is accompanied by the contribution of the individuals within a team. Oreg and Nov (2008) have emphasised that personal values impact the individual's contribution motivation. One important driver thereby is self-development (Oreg & Nov, 2008). In healthcare education initiatives, personality insights were shown to be a predictor for the selection of the corresponding nudge (Cardenas Canto et al., 2024). Examining additional personality characteristics may help to develop more individualised nudges that emphasise the opportunities for personal growth.

Instead of a hypothetical setting, a cross-cultural field experiment should be used. Furthermore, observations during implementation processes can be leveraged to make the tool more customised. Interviews with the leaders are essential since they usually play a key role in these change processes and represent the anchor between the goals of employees and the company. Even though the long-term efficacy of nudges has been proven in different contexts, like default nudges in health interventions (Venema et al., 2018) or social comparison nudges in energy consumption (Brandon et al., 2017), longitudinal data would be important to identify the sustained effects of the nudges on the actual adoption.

Another important consideration is the interplay between individual, group, and organisational factors with contextual moderators on the workplace digital transformation process, as Trenerry et al. (2021) have stressed in their review. This research has focused on the individual factors. When discussing the success of new technology initiatives other influencing factors should be considered. It is recommended to assess the prior experience of employees with other new technologies to identify possible correlational effects on their behaviour. Thus, an examination of whether participants are getting fatigued by innovations

because of earlier workplace implementations of other innovations, is crucial (Chung et al., 2017). Michie et al. (2011) underlined that motivation activates behaviour, but the environmental circumstances are important to enable the behaviour. Therefore, it would be necessary to gain a better insight into the individual work environment to ensure testing of the actual behaviour. Moreover, a diverse age workplace is the condition for effective technology adoption (Rizzuto, 2011). Future research should evaluate the work culture and team composition to get a better understanding of different influential factors. In particular, information about social networks and their value for the team members in remote work settings is necessary to understand the social exchange structures (Sykes et al., 2009).

Furthermore, there is a fundamental constraint regarding the extent to which nudges may change behaviour in the long term, the so-called attitude-behaviour or intention-behaviour gap which is present in this study. Collecting data on attitude and actual behaviours would be highly beneficial. For example, the research design of Stieglitz et al. (2023) could not reduce the gap between pro-environmental attitude and conservation behaviour using digital nudges but was able to show that nudges had a direct effect on behaviour. This calls for future research to address the issue by testing digital nudges as mediators of this attitude-behaviour relationship.

Based on the results of this study, I also recommend analysing resistance to change as a moderator of this relationship, as it has further been shown to be a key determinant between the intention to use and the actual use of a new system in a study of healthcare data analytics (Shahbaz et al., 2019). Alternatively, the openness and readiness to change, instead of resistance to change, could be determined to secure support for the change (Herscovitch & Meyer, 2002). Moreover, researchers should examine combining nudges with implementation intentions to increase the effectiveness of change initiatives, as implementation intentions have been shown to achieve long-term behaviour change success (Papies et al., 2009).

Drawing from the study's results, I recommend three further approaches to explore and increase the effect and legitimacy of nudges. First, a better understanding of the perception of nudges is necessary. Hence, I support Hummel and Maedche's (2019) call for the need for more research on digital nudging using neurophysiological measurements. For example, Electroencephalography (EEG) could be utilised to measure and see how users react to different nudges (Harmon-Jones & Amodio, 2012). Second, similar study designs could aim

to test which nudge is the preferred option through disclosure of the nudge and related outcome behaviour. As the authors Marchiori et al. (2017) have outlined, assuring awareness may influence the intervention's effectiveness. The third aspect is the representativeness of employees' individual characteristics. The impact of nudges on technology adoption should be tested in other countries to gain a deeper understanding of potential cross-cultural differences. Hereby, I suggest less technology-savvy populations.

Besides adoption efforts, the development of a digital mindset is crucial to internalise successful interaction and the use of a new tool (Neeley & Leonardi, 2022). In line with Parker and Grote (2022), the focus on strengthening employees' skills and ongoing learning culture is essential in digital workplaces to successfully integrate new technology and changes. Future studies need to investigate the extent to which nudges can be used to stimulate such a mindset.

Finally, I would like to highlight the work of the authors Karlsen and Andersen (2019, 2022), who presented smart nudges, as an advanced version of digital nudging, where personality and context awareness are specifically considered whilst nudges are adapted accordingly. This user-optimised nudge version could achieve even greater behavioural change enabling more efficient technology implementation strategies in the work environment. In the future, research-based simulation interfaces should be programmed and adapted to the respective user to measure the effect of these smart nudges on technology adoption.

Conclusion

Today's workforce is accustomed to a regular use of technology. The active contribution of employees is crucial to succeed in digital transformation processes. Therefore, behavioural change interventions are important to support employees in their adoption decision of new technologies. Even though nudges are usually most applied in public policy and marketing, this study's findings indicate a huge potential for nudge implementation in organisational technology change processes. Hence, the goal of this research was to get a better understanding of the impact of nudges on innovation technology adoption. By analysing the hypothetical decision-making of 159 employees, the study revealed that nudges can be a successful behavioural intervention method to support employees in becoming more motivated to explore a new collaboration tool (COTEWO). Exploratory findings indicate that employees who worked remotely once or twice per week seem to be more prone to be influenced in their decisions compared to those working frequently or never remotely. Further, resistance to change moderated the effect of all three nudges on motivation, whereas age did not have a moderating effect but was still determining differences in adoption behaviours. Results underlined that younger employees tend to show higher adoption values compared to older ones, revealing that the technological ageism stereotype may be reinforced in this sample. Nonetheless, the use of nudges did not increase the employees' acceptance, attitude, commitment, willingness, satisfaction, or preference toward a new collaboration tool. Preference which is decisive for the effectiveness of nudges has decreased after COTEWO was introduced. It is therefore possible that the COTEWO user interface as a simulated new collaboration tool may have been not appealing enough.

Overall, using (digital) nudges to support employees in their motivational behaviour to adopt a new technology has great potential. In this study, the default nudge and the social influence nudge provide a promising approach and show how this effect is influenced by employees' dispositional resistance to change. These findings provide a fundament for managerial and theoretical learning as they demonstrate the need for individualised change communication. This can easily be implemented by digital smart nudges. The results' practical relevance may support organisations to better address employees' resistance behaviour toward new innovative tools. In conclusion, the present work advances technology adoption research by unifying nudges as a trigger to grasp the benefits of new technologies and embrace change, particularly for people who tend to be resistant to change.

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Appendices

Appendix A - Ethics Approval



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Deliberação da Comissão de Ética em Tecnologia, Ciências Sociais e Humanidades sobre o estudo

Deliberation of the Ethics Committee for Technology, Social Sciences and Humanities concerning the research study

How do (digital) nudges affect employees' adoption to innovative technologies as a function of resistance to change and age?

Com base nos elementos apresentados pela investigadora Anja Dannewitz do Mestrado em Psicologia na Gestão e Economia da Universidade Católica Portuguesa, relativos ao projeto de investigação intitulado "*How do (digital) nudges affect employees' adoption to innovative technologies as a function of resistance to change and age?*", a Comissão de Ética em Tecnologias, Ciências Sociais e Humanidades (CETCH), considerou estarem reunidas as informações necessárias para poder avaliar o processo, tendo deliberado dar parecer ético favorável, ao pedido submetido em 2 de abril de 2024 sob o nº CETCH2024-76.

Considering the elements presented by the researcher Anja Dannewitz, from the Master in Psychology in Business and Economics at Universidade Católica Portuguesa, regarding the research project entitled "How do (digital) nudges affect employees' adoption to innovative technologies as a function of resistance to change and age", the Ethics Committee in Technology, Social Sciences and Humanities (CETCH), considered that the required elements were present in order to evaluate the process, and decided to favourably recommend the ethical approval to the request submitted on 2nd of April 2024 under number CETCH2024-76.

28 de Maio de 2024

A Presidente da CETCH | *The President of CETCH*

(Célia Manaia)

Appendix B - Qualtrics Survey

Introduction and Consent Form

Dear participant,

Thank you for your support in my research study as part of my master's thesis at Universidade Católica Portuguesa.

The current study aims to investigate the impact of subtle changes in the environment to support decision-making. By participating in this study, you will be making an important contribution to gaining knowledge about possible choice architectures that support the adoption of technology in the remote workplace.

Only participants older than 18 years, currently employed, and integrating remote work into their work routines are eligible to take part.

If you consent to participate, you will be presented with a simulation scenario featuring a newly developed Collaboration Tool named COTEWO. Following this, you will be asked questions aimed at evaluating its effectiveness. Afterwards, I would also like to collect some more information about different self-assessments that I expect to be related to the outcome relevant to the study.

The questions contained in the study will take **approximately 15 minutes to complete**, and your progress in the experiment will be indicated by a bar at the top of the screen.

Thank you for dedicating your time to support this project.
Enjoy your participation!

Best regards,
Anja

Informed Consent

This research project is part of my master's thesis in Psychology at UCP. Participation is not expected to lead to any discomfort or harm.

Your participation in this study is voluntary.

You may choose not to participate or to withdraw from the study at any time without penalty by closing the browser window. Your personal information and responses collected during the study will be treated confidentially. The data collected is analysed anonymously for purely scientific purposes, so that no conclusions can be drawn about you as an individual.

If you have any questions, please reach out to me at any time (s-adannewitz@ucp.pt).

By agreeing to participate in this study, you acknowledge that **you have read and understood** the information provided in this consent form.

Scenario Introduction
(Similar for all conditions)

Imagine yourself at work, faced with the following hypothetical situation.

In this survey I want to learn about your honest opinion, therefore there are no right or wrong answers. Please respond as you would in a real-life situation.

Imagine yourself sitting at your workplace turning your laptop/ desktop on. Most of your colleagues are working remotely. You are managing the launch of a new project. Within your team, you must coordinate the various areas of experience and knowledge.

Your organization is introducing COTEWO (communication for teamwork), a tool to divide responsibilities, share working documents easily, enable seamless communication, and meet up virtually.

COTEWO will therefore support each employee with organizing their daily work routine.



What is a collaboration tool?

A collaboration tool aims to support the collaboration of team members in various ways, particularly facilitating interaction between colleagues.

Measurement Scales and Items

<i>Items</i>	<i>Question</i>	<i>Answer</i>
Remote	How often do you work remotely?	1= Never, 2= Occasionally (1-3 days per month), 3= Sometimes (1-2 days per week), 4= Often (3-4 days per week), 5= Always (5 or more days per week)
Preference		
Pre	How likely is it that you will integrate a new collaboration tool into your day-to-day work?	1= Not likely at all, 2= Unlikely, 3= Neutral, 4= Likely, 5= Extremely likely
Post	Overall, how likely is it that you would integrate this new collaboration tool COTEWO into your day-to-day work?	
Motivation	I would be motivated to explore the new COTEWO tool further.	7-Point Likert Scale of Agreement (1 = Strongly disagree; 7 = Strongly agree)
UTAUT		
Performance Expectancy	1. I would find the tool useful in my job.	

	<p>2. Using the tool would enable me to accomplish tasks more quickly.</p> <p>3. Using the tool would increase my productivity.</p> <p>4. If I would use the tool, I would increase my chances of getting a raise.</p>	7-Point Likert Scale of Agreement (1 = Strongly disagree; 7 = Strongly agree)
Effort Expectancy	<p>1. My interaction with the tool would be clear and understandable.</p> <p>2. It would be easy for me to become skillful at using COTEWO.</p> <p>3. I would find the tool easy to use.</p> <p>4. Learning to operate the tool would be easy for me.</p>	
Social Influence	<p>1. Co-workers who influence my behavior would think that I should use this tool.</p> <p>2. Co-workers who are important to me would think that I should use the tool.</p> <p>3. The senior management of my business would have been helpful in the use of this tool.</p> <p>4. In general, my organization would support the use of the tool.</p>	
Facilitating Conditions	<p>1. I would have the resources necessary to use the tool.</p> <p>2. I would have the knowledge necessary to use the tool.</p> <p>3. The tool would not be compatible with other tools I use.^a</p>	
Behavioral Intention	<p>1. I would intend to use the tool in the next months.</p> <p>2. I predict I would use the tool in the next months.</p> <p>3. I would plan to use the tool in the next months.</p>	
Attitude	<p>1. Using COTEWO is a good idea.</p> <p>2. Using COTEWO is a wise idea.</p> <p>3. I like the idea of using COTEWO.</p> <p>4. Using COTEWO would be pleasant.</p>	7-Point Likert Scale of Agreement (1 = Strongly disagree; 7 = Strongly agree)
Commitment	I would be willing to subscribe to COTEWO independently to organize my work routine and collaborate with my colleagues more effectively.	7-Point Likert Scale of Agreement (1 = Strongly disagree; 7 = Strongly agree)
Willingness	I would be willing to engage in learning tasks to explore the features of COTEWO.	7-Point Likert Scale of Agreement (1 = Strongly disagree; 7 = Strongly agree)
Satisfaction	I would recommend the use of COTEWO to other co-workers.	7-Point Likert Scale of Agreement (1 = Strongly disagree; 7 = Strongly agree)
RTC		
Routine Seeking	<p>1. I generally consider changes to be a negative thing.</p> <p>2. I'll take a routine day over a day full of unexpected events any time.</p> <p>3. I like to do the same old things rather than try new and different ones.^a</p>	6-Point Likert Scale of Agreement (1 = Strongly disagree; 6 = Strongly agree)

	4. Whenever my life forms a stable routine, I look for ways to change it. 5. I'd rather be bored than surprised.	
Emotional Reaction	1. If I were to be informed that there's going to be a significant change regarding the way things are done at work, I would probably feel stressed. 2. When I am informed of a change of plans, I tense up a bit. 3. When things don't go according to plans, it stresses me out. 4. If my boss changed the criteria for evaluating employees, it would probably make me feel uncomfortable even if I thought I'd do just as well without having to do any extra work.	
Short-Term Focus	1. Changing plans seems like a real hassle to me. 2. Often, I feel a bit uncomfortable even about changes that may potentially improve my life. 3. When someone pressures me to change something, I tend to resist it even if I think the change may ultimately benefit me. 4. I sometimes find myself avoiding changes that I know will be good for me.	
Cognitive Rigidity	1. I often change my mind. ^a 2. Once I've come to a conclusion, I'm not likely to change my mind. 3. I don't change my mind easily. 4. My views are very consistent over time.	
Socio-demographic	Please enter your age (in years).	>Text Entry<
	Please indicate your gender.	Male, Female, Diverse/Other, Prefer not to say
	Do you have children?	Yes, No
	How old is your child/ your children? (multiple answers are possible)	0-2, 3-5, 6-9, 10-12, 13-15, 16-18, 18+ years
	Is your child/ your children living together with you?	Yes, Partially, No
	What is your country of residence?	>Text Entry<
	What is the highest degree or school level you have completed?	1= Less than secondary school diploma, 2= Secondary school diploma, 3= Vocational training, 4= High school graduate, 5= Bachelor's degree, 6= Master's degree, 7= PhD or higher, 8=Other
	Please indicate your current occupation (multiple answers are possible).	Employed, self-employed, unemployed, student, retired, other

^a reverse coded.

End of the Survey

Dear Participant,

thank you so much for taking part in this study!

You have now reached the end of this study, **please click on the "->" button at the bottom right to complete and record your data.**

Purpose of this study:

The scenario you have read about COTEWO was a hypothetical setting to study your response to a possible new technology implementation within your workplace. You have been randomly assigned to different scenarios either with a nudge (= intervention that gently steers individuals toward a desired action) or without any nudge.

This study aims to get a better understanding of whether employees who are being nudged are more likely to adopt to new technology depending on their age and resistance to change.

If you have any questions about the content, or the purpose, or if you are interested in the results of this study, please contact me at any time (s-adannewitz@ucpt.pt).

Best regards,
Anja

Appendix C – Pre-Test Results

Table C1

Descriptive Statistics for Nudge Scenarios in Pre-Test

Scenario	n	Prompt ^a		Likely use ^b		Consider use ^c	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Control	4	2.75	0.96	2.25	1.26		
Default Nudge	4	3.75	0.50	3.25	1.50	2.75	0.96
Social Nudge	8	4.25	0.71	4.00	1.20		
Feedback Nudge	6	4.00	1.27	4.50	0.55		

Note. Respondents answered each question on a 5-point Likert scale, more specifically:

^a 1= Strongly disagree, 5= Strongly agree

^b 1= Very unlikely, 5= Very likely

^c 1= No, definitely not; 5= Yes, definitely

Appendix D – Homogeneity of Variance Assumption

Table D1

Levene's Test Results for Error Variances

DV	Homogeneity of Variance		
	<i>F</i>	<i>df</i>	<i>p</i>
Acceptance	0.85	3,155	.469
Attitude	1.48	3,155	.222
Motivation	3.90	3,155	.010 ^a
Commitment	0.43	3,155	.729
Willingness	1.01	3,155	.389
Satisfaction	2.81	3,155	.041 ^a
Preference	0.64	3,155	.592

^a Levene's Test for homogeneity of variances showed significant differences between groups ($p < .05$), therefore Welch's test was used as robust alternative.

Appendix E – Exploratory Factor Analysis

Table E1

Exploratory Factor Analysis of the Multidimensional Innovative Technology Adoption

Construct

Factor and item	Factor loading
Motivation	0.70
I would be motivated to explore the new COTEWO tool further.	
Acceptance	0.90
<i>Scale^a</i>	
Attitude	0.85
<i>Scale^a</i>	
Commitment	0.63
I would be willing to subscribe to COTEWO independently to organize my work routine and collaborate with my colleagues more effectively.	
Willingness	0.70
I would be willing to engage in learning tasks to explore the features of COTEWO.	
Satisfaction	0.82
I would recommend the use of COTEWO to other co-workers.	
Preference	0.77
Overall, how likely is it that you would integrate this new collaboration tool COTEWO into your day-to-day work?	

^a All items of the scale were computed to a new composite variable.

Appendix F – Correlation Analysis Results

Table F1

Descriptive Statistics and Pearson Correlations of the Key Study Variables

Variable	<i>M</i>	<i>SD</i>	1a	1b	1c	1d	1e	1f	1g	2	3
1. Innovative technology adoption											
a. Acceptance	4.61	0.85	—								
b. Attitude	4.90	1.02	.75**	—							
c. Motivation	4.91	1.30	.66**	.63**	—						
d. Commitment	3.81	1.68	.54**	.52**	.45**	—					
e. Willingness	4.88	1.50	.63**	.60**	.48**	.40**	—				
f. Satisfaction	4.71	1.27	.73**	.71**	.59**	.49**	.58**	—			
g. Preference	3.07	0.99	.72**	.64**	.43**	.59**	.56**	.61**	—		
2. RTC	3.25	0.55	.15	.14	-.004	.11	-.03	.05	.17*	—	
3. Age ^a	38.85	13.97	-.021**	-.24**	-.24**	-.30**	-.09	-.22**	-.14	-.07	—

Note. Correlation is significant at *0.05 level **0.01 level. *N* = 159.

^a Age ranges from 21 to 63 years.

Appendix G – Moderation Analysis Results

Resistance to Change

Table G1

Independent T Test Results Between RTC Groups^a Including Effect Size

Dependent Variable	Low RTC (N=78)		High RTC (N=81)		t(157)	p	Cohen's d
	M	SD	M	SD			
	Acceptance	4.56	0.84	4.67			
Attitude	4.79	0.94	5.01	1.09	-1.35	.180	-0.21
Motivation	5.00	1.17	4.83	1.40	0.84	.402	0.13
Commitment	3.79	1.73	3.81	1.64	-0.08	.941	-0.01
Willingness	4.95	1.48	4.81	1.53	0.56	.575	0.09
Satisfaction	4.67	1.20	4.75	1.34	-0.43	.669	-0.07
Preference	2.97	1.01	3.16	0.98	-1.18	.239	-0.19

* $p < .05$. ** $p < .01$. *** $p < .001$

^aRTC groups were classified into low level RTC (strongly disagree, disagree, somewhat disagree) and high level RTC (somewhat agree, agree, strongly agree) based on their frequency distribution.

Table G2

Resistance to Change Predicting Innovative Technology Adoption

Dependent Variable	Effect	SE	t	p	LLCI	ULCI
Acceptance	-0.14	0.22	-0.62	.533	-0.58	0.30
Attitude	-0.00	0.27	-0.01	.994	-0.54	0.54
Motivation	-0.83	0.32	-2.58	.011*	-1.46	-0.19
Willingness	-0.56	0.40	-1.39	.168	-1.35	0.24
Commitment	0.05	0.46	0.11	.914	-0.85	0.95
Satisfaction	-0.32	0.34	-0.95	.344	-1.00	0.35
Preference	0.30	0.27	1.11	.268	-0.23	0.84

* $p < .05$.

Table G3

Moderated Regression Analysis of RTC predicting Acceptance, Attitude, Motivation, Commitment, Willingness, Satisfaction, Preference

DV	Interaction Effects Nudge ^a x RTC	Effect	SE	t	95% CI		p
					LL	UL	
Acceptance	Default	0.26	0.34	0.77	-0.41	0.93	.440
	Social Influence	0.83	0.34	2.48	0.17	1.50	.014*
	Feedback	0.57	0.33	1.74	-0.08	1.22	.084
Attitude	Default	-0.05	0.41	-0.11	-0.86	0.77	.909
	Social Influence	0.84	0.41	2.05	0.03	1.64	.043*
	Feedback	0.39	0.40	0.97	-0.40	1.18	.333
Motivation	Default	1.29	0.48	2.70	0.34	2.25	.008**
	Social Influence	1.33	0.48	2.78	0.38	2.27	.006**
	Feedback	1.30	0.47	2.78	0.37	2.22	.006**
Commitment	Default	0.63	0.69	0.92	-0.72	1.99	.359
	Social Influence	0.77	0.68	1.13	-0.58	2.12	.260
	Feedback	0.02	0.67	0.02	-1.30	1.33	.981
Willingness	Default	0.41	0.61	0.67	-0.79	1.60	.503
	Social Influence	1.52	0.60	2.53	0.34	2.71	.012*
	Feedback	0.35	0.59	0.60	-0.81	1.51	.553
Satisfaction	Default	0.21	0.51	0.42	-0.80	1.23	.677
	Social Influence	1.02	0.51	1.99	0.01	2.03	.048*
	Feedback	0.75	0.50	1.51	-0.23	1.74	.133
Preference	Default	-0.12	0.41	-0.31	-0.93	0.68	.761
	Social Influence	0.23	0.40	0.58	-0.57	1.03	.565
	Feedback	-0.05	0.39	-0.13	-0.83	0.73	.895

Note. N = 159. CI = confidence interval; LL = lower limit; UL = upper limit. *p < .05. **p < .01.

^aNudge conditions compared to Control Condition

Table G4*Conditional Effects of Different RTC Levels on Dependent Variables*

DV	RTC level	Interaction Effects (Nudge vs. Control)	Effect	SE	t	95% CI		p
						LL	UL	
Acceptance	Low	Default	0.09	0.27	0.32	-0.45	0.62	.753
		Social Influence	-0.20	0.27	-0.74	-0.74	0.34	.462
		Feedback	-0.23	0.27	-0.87	-0.76	0.30	.387
	Medium	Default	0.23	0.19	1.21	-0.14	0.60	.227
		Social Influence	0.26	0.19	1.38	-0.11	0.63	.170
		Feedback	0.08	0.19	0.45	-0.28	0.45	.654
	High	Default	0.37	0.26	1.43	-0.14	0.89	.154
		Social Influence	0.72	0.25	2.82	0.22	1.22	.005**
		Feedback	0.40	0.25	1.59	-0.10	0.89	.113
Attitude	Low	Default	0.31	0.33	0.95	-0.34	0.96	.346
		Social Influence	-0.23	0.33	-0.70	-0.89	0.42	.484
		Feedback	-0.06	0.33	-0.18	-0.70	0.58	.856
	Medium	Default	0.29	0.23	1.24	-0.17	0.74	.217
		Social Influence	0.23	0.23	1.00	-0.22	0.68	.317
		Feedback	0.16	0.23	0.69	-0.29	0.60	.494
	High	Default	0.26	0.32	0.82	-0.37	0.89	.416
		Social Influence	0.69	0.31	2.23	0.08	1.30	.027*
		Feedback	0.37	0.30	1.21	-0.23	0.97	.228
Motivation	Low	Default	0.54	0.39	1.40	-0.22	1.30	.164
		Social Influence	0.13	0.39	0.35	-0.63	0.90	.730
		Feedback	-0.07	0.38	-0.18	-0.82	0.68	.854
	Medium	Default	1.26	0.27	4.66	0.72	1.79	<.001***
		Social Influence	0.87	0.27	3.25	0.34	1.40	.001**
		Feedback	0.65	0.26	2.45	0.12	1.17	.016**
	High	Default	1.97	0.37	5.30	1.24	2.71	<.001***
		Social Influence	1.60	0.36	4.42	0.89	2.32	<.001***
		Feedback	1.36	0.36	3.82	0.66	2.07	<.001***
Commitment	Low	Default	0.30	0.55	0.54	-0.79	1.38	.593
		Social Influence	-0.19	0.55	-0.34	-1.28	0.91	.735
		Feedback	0.29	0.54	0.54	-0.78	1.37	.592
	Medium	Default	0.64	0.38	1.67	-0.12	1.40	.096
		Social Influence	0.24	0.38	0.62	-0.51	0.99	.534
		Feedback	0.30	0.38	0.80	-0.44	1.05	.424
	High	Default	0.99	0.53	1.87	-0.05	2.04	.063
		Social Influence	0.66	0.52	1.28	-0.36	1.68	.201

Willingness	Low	Feedback	0.31	0.51	0.61	-0.69	1.31	.542
		Default	0.16	0.49	0.33	-0.80	1.12	.744
		Social Influence	-0.42	0.49	-0.86	-1.39	0.55	.391
	Medium	Feedback	0.20	0.48	0.40	-0.76	1.14	.689
		Default	0.38	0.34	1.13	-0.29	1.05	.260
		Social Influence	0.42	0.34	1.26	-0.24	1.09	.211
	High	Feedback	0.39	0.33	1.16	-0.27	1.04	.248
		Default	0.61	0.47	1.30	-0.32	1.53	.195
		Social Influence	1.27	0.46	2.78	0.36	2.17	.006**
Satisfaction	Low	Feedback	0.58	0.45	1.29	-0.31	1.47	.199
		Default	0.35	0.41	0.84	-0.47	1.16	.402
		Social Influence	-0.33	0.42	-0.79	-1.15	0.49	.433
	Medium	Feedback	-0.29	0.41	-0.72	-1.10	0.51	.471
		Default	0.46	0.29	1.61	-0.10	1.03	.109
		Social Influence	0.24	0.29	0.83	-0.33	0.80	.410
	High	Feedback	0.12	0.28	0.43	-0.44	0.68	.665
		Default	0.58	0.40	1.47	-0.20	1.37	.144
		Social Influence	0.80	0.39	2.06	0.03	1.56	.041*
Preference	Low	Feedback	0.54	0.38	1.42	-0.21	1.29	.159
		Default	0.25	0.33	0.77	-0.39	0.90	.443
		Social Influence	-0.05	0.33	-0.15	-0.70	0.60	.883
	Medium	Feedback	0.10	0.32	0.31	-0.54	0.74	.756
		Default	0.18	0.23	0.80	-0.27	0.63	.425
		Social Influence	0.08	0.23	0.36	-0.37	0.53	.722
	High	Feedback	0.07	0.22	0.32	-0.37	0.51	.749
		Default	0.11	0.31	0.36	-0.51	0.73	.719
		Social Influence	0.21	0.31	0.68	-0.40	0.82	.495
		Feedback	0.04	0.30	0.14	-0.55	0.64	.888

Note. $N = 159$. CI = confidence interval; LL = lower limit; UL = upper limit. * $p < .05$. ** $p < .01$. *** $p < .001$. Medium, high, and low levels are corresponding to the mean and $\pm SD$.

Age

Table G5

ANOVA Results Between Age Groups^a Including Effect Size

Dependent Variable	SS	Mean Square	<i>F</i> (2,156)	<i>p</i>	η^2
Acceptance	9.56	4.77	7.16	.001**	.084
Attitude	11.96	5.98	6.10	.003** ^b	.073
Motivation	18.12	9.06	5.73	.004**	.068
Commitment	46.45	23.22	9.05	<.001***	.104
Willingness	14.28	7.14	3.27	.041*	.040
Satisfaction	13.00	6.50	4.20	.017*	.051
Preference	9.01	4.50	4.77	.010*	.058

p* < .05. *p* < .01. ****p* < .001.

^a Age groups are the following: Younger employees (21-27 years), Middle-aged employees (28-48 years), Older employees (49-63 years)

^b Attitude did not meet the homogeneity of variances assumption, therefore Welch's test was conducted and showed significance at the 0.002 level.

Table G6*Bonferroni Post Hoc Comparison Analysis of Age Groups*

DV	Age groups	Age Groups	Mdiff	SE	95% CI		p
					LL	UL	
Acceptance	Younger	Middle-aged	-0.26	0.16	-0.64	0.13	.330
		Older	0.35	0.16	-0.03	0.73	.080
	Middle-aged	Younger	0.26	0.16	-0.13	0.64	.330
		Older	0.61	0.16	0.22	1.00	<.001***
	Older	Younger	-0.35	0.16	-0.73	0.03	.080
		Middle-aged	-0.61	0.16	-1.00	-0.22	<.001***
Attitude	Younger	Middle-aged	-0.06	0.19	-0.53	0.41	1.00
		Older	0.55	0.19	0.09	1.01	.013*
	Middle-aged	Younger	0.06	0.19	-0.41	0.53	1.00
		Older	0.61	0.20	0.14	1.08	.007**
	Older	Younger	-0.55	0.19	-1.01	-0.09	.013*
		Middle-aged	-0.61	0.20	-1.08	-0.14	.007**
Motivation	Younger	Middle-aged	-0.10	0.25	-0.69	0.50	1.00
		Older	0.66	0.24	0.08	1.24	.019*
	Middle-aged	Younger	0.10	0.25	-0.50	0.69	1.00
		Older	0.76	0.25	0.16	1.36	.008**
	Older	Younger	-0.66	0.24	-1.24	-0.08	.019*
		Middle-aged	-0.76	0.25	-1.36	-0.16	.008**
Commitment	Younger	Middle-aged	-0.14	0.31	-0.90	0.62	1.00
		Older	1.07	0.31	0.33	1.81	.002**
	Middle-aged	Younger	0.14	0.31	-0.62	0.90	1.00
		Older	1.21	0.32	0.44	1.97	<.001***
	Older	Younger	-1.07	0.31	-1.81	-0.33	.002**
		Middle-aged	-1.21	0.32	-1.97	-0.44	<.001***
Willingness	Younger	Middle-aged	-0.50	0.29	-1.20	0.20	.252
		Older	0.23	0.28	-0.45	0.91	1.00
	Middle-aged	Younger	0.50	0.29	-0.20	1.20	.252
		Older	0.73	0.29	0.03	1.44	.039*
	Older	Younger	-0.23	0.28	-0.91	0.45	1.00
		Middle-aged	-0.73	0.29	-1.44	-0.03	.039*
Satisfaction	Younger	Middle-aged	-0.08	0.24	-0.67	0.51	1.00
		Older	0.56	0.24	-0.01	1.13	.059
	Middle-aged	Younger	0.08	0.24	-0.51	0.67	1.00
		Older	0.64	0.25	0.05	1.24	.029*
	Older	Younger	-0.56	0.24	-1.13	0.01	.059

Preference	Younger	Middle-aged	-0.64	0.25	-1.24	-0.05	.029*
		Older	0.26	0.19	-0.19	0.71	.501
	Middle-aged	Younger	0.33	0.19	-0.13	0.79	.242
		Older	0.59	0.19	0.13	1.06	.007**
	Older	Younger	-0.26	0.19	-0.71	0.19	.501
		Middle-aged	-0.59	0.19	-1.06	-0.13	.007**

* $p < .05$. ** $p < .01$. *** $p < .001$.

Note. Age groups are classified as the following: Younger employees (21-27 years), Middle-aged employees (28-48 years), Older employees (49-63 years).

Table G7

Descriptive Statistics of Dependent Variables for Different Age Groups

Dependent Variable	Young (N=56)		Middle-aged (N=49)		Older (N=54)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Acceptance	4.65	0.78	4.91	0.86	4.31	0.81
Attitude	5.07	0.90	5.13	1.17	4.52	0.90
Motivation	5.11	1.12	5.20	1.38	4.44	1.27
Commitment	4.13	1.49	4.27	1.68	3.06	1.64
Willingness	4.80	1.55	5.31	1.36	4.57	1.50
Satisfaction	4.88	1.14	4.96	1.24	4.31	1.34
Preference	3.05	0.94	3.39	1.00	2.80	0.98

Note. Preference is evaluated with a different scale than the other variables.

Motivation, acceptance, attitude, commitment, willingness, and satisfaction are assessed on a 7-point Likert scale, whereas Preference is examined on a 5-point Likert scale.

Table G8

Age Predicting Innovative Technology Adoption

Dependent Variable	Effect	SE	<i>t</i>	<i>p</i>	LLCI	ULCI
Acceptance	-0.02	0.01	-2.34	.020*	-0.04	-0.00
Attitude	-0.02	0.01	-1.96	.051	-0.04	0.00
Motivation	-0.01	0.01	-1.07	.288	-0.04	0.01
Willingness	0.00	0.02	0.07	.943	-0.03	0.03
Commitment	-0.04	0.02	-2.22	.028*	-0.07	-0.00
Satisfaction	-0.02	0.01	-1.21	.229	-0.04	0.01
Preference	-0.02	0.01	-1.86	.065	-0.04	0.00

* $p < .05$.

Table G9

Moderated Regression Analysis of Age Predicting Acceptance, Attitude, Motivation, Commitment, Willingness, Satisfaction, Preference

DV	Interaction Effects Nudge ^a x Age	Effect	SE	t	95% CI		p
					LL	UL	
Acceptance	Default	0.02	0.01	1.69	-0.00	0.05	.094
	Social Influence	0.02	0.01	1.24	-0.01	0.04	.217
	Feedback	-0.00	0.01	-0.18	-0.03	0.02	.855
Attitude	Default	0.03	0.02	1.81	-0.00	0.06	.072
	Social Influence	0.00	0.02	0.19	-0.03	0.03	.847
	Feedback	-0.01	0.02	-0.88	-0.04	0.02	.380
Motivation	Default	0.01	0.02	0.70	-0.02	0.05	.488
	Social Influence	-0.01	0.02	-0.53	-0.05	0.03	.594
	Feedback	-0.03	0.02	-1.83	-0.07	0.00	.069
Commitment	Default	0.01	0.03	0.41	-0.04	0.06	.681
	Social Influence	0.01	0.03	0.30	-0.04	0.06	.767
	Feedback	-0.00	0.03	-0.05	-0.05	0.05	.958
Willingness	Default	0.03	0.02	1.50	-0.01	0.08	.137
	Social Influence	-0.03	0.02	-1.26	-0.08	0.02	.209
	Feedback	-0.05	0.02	-2.15	-0.09	-0.00	.033*
Satisfaction	Default	0.02	0.02	0.94	-0.02	0.06	.349
	Social Influence	0.00	0.02	0.10	-0.04	0.04	.920
	Feedback	-0.03	0.02	-1.71	-0.07	0.01	.090
Preference	Default	0.03	0.02	2.04	0.00	0.06	.043*
	Social Influence	0.01	0.02	0.68	-0.02	0.04	.496
	Feedback	0.00	0.02	0.06	-0.03	0.03	.952

Note. N = 159. CI = confidence interval; LL = lower limit; UL = upper limit. *p < .05. **p < 0.01. ***p < 0.001.

^a Nudge conditions compared to Control Condition

Table G10*Conditional Effects of Different Age Levels on Dependent Variables*

DV	Age level	Interaction Effects (Nudge vs. Control)	Effect	SE	t	95% CI		p
						LL	UL	
Acceptance	Low	Default	-0.07	0.25	-0.28	-0.57	0.43	.783
		Social Influence	0.02	0.27	0.09	-0.50	0.55	.932
		Feedback	0.14	0.26	0.55	-0.38	0.66	.586
	Medium	Default	0.24	0.19	1.29	-0.13	0.61	.201
		Social Influence	0.26	0.19	1.38	-0.11	0.62	.170
		Feedback	0.11	0.18	0.60	-0.25	0.47	.547
	High	Default	0.55	0.27	2.03	0.02	1.09	.044*
		Social Influence	0.49	0.26	1.87	-0.03	1.00	.064
		Feedback	0.08	0.25	0.31	-0.42	0.57	.757
Attitude	Low	Default	-0.10	0.30	-0.32	-0.70	0.50	.747
		Social Influence	0.17	0.32	0.52	-0.46	0.79	.601
		Feedback	0.37	0.31	1.18	-0.25	0.99	.240
	Medium	Default	0.30	0.22	1.35	-0.14	0.74	.180
		Social Influence	0.21	0.22	0.95	-0.23	0.65	.344
		Feedback	0.18	0.22	0.82	-0.25	0.61	.411
	High	Default	0.70	0.32	2.16	0.06	1.34	.032*
		Social Influence	0.25	0.31	0.81	-0.36	0.87	.419
		Feedback	-0.01	0.30	-0.03	-0.60	0.58	.976
Motivation	Low	Default	1.15	0.36	3.21	0.44	1.85	.002**
		Social Influence	1.11	0.37	2.96	0.37	1.84	.004**
		Feedback	1.25	0.37	3.38	0.52	1.98	.001***
	Medium	Default	1.33	0.26	5.04	0.81	1.84	.000***
		Social Influence	0.96	0.26	3.71	0.45	1.48	.000***
		Feedback	0.79	0.26	3.05	0.28	1.30	.003**
	High	Default	1.51	0.38	3.96	0.75	2.26	.0001***
		Social Influence	0.82	0.37	2.24	0.10	1.55	.027*
		Feedback	0.32	0.35	0.92	-0.37	1.02	.362
Commitment	Low	Default	0.39	0.50	0.78	-0.60	1.38	.434
		Social Influence	0.11	0.52	0.20	-0.93	1.14	.841
		Feedback	0.36	0.52	0.69	-0.66	1.38	.491
	Medium	Default	0.54	0.37	1.47	-0.19	1.27	.143
		Social Influence	0.22	0.36	0.59	-0.51	0.94	.556
		Feedback	0.34	0.36	0.94	-0.37	1.05	.349
	High	Default	0.69	0.53	1.30	-0.36	1.75	.197
		Social Influence	0.32	0.51	0.63	-0.69	1.34	.529

Willingness	Low	Feedback	0.32	0.49	0.65	-0.66	1.30	.519
		Default	0.04	0.44	0.10	-0.83	0.92	.921
		Social Influence	0.89	0.46	1.91	-0.03	1.81	.058
	Medium	Feedback	1.20	0.46	2.61	0.30	2.10	.010*
		Default	0.53	0.33	1.61	-0.12	1.17	.110
		Social Influence	0.47	0.32	1.46	-0.17	1.11	.145
	High	Feedback	0.52	0.32	1.63	-0.11	1.15	.106
		Default	1.01	0.47	2.13	0.07	1.94	.035*
		Social Influence	0.06	0.46	0.13	-0.84	0.96	.896
Satisfaction	Low	Feedback	-0.16	0.44	-0.36	-1.02	0.71	.722
		Default	0.26	0.38	0.69	-0.49	1.00	.493
		Social Influence	0.23	0.39	0.59	-0.55	1.01	.557
	Medium	Feedback	0.66	0.39	1.70	-0.11	1.43	.093
		Default	0.52	0.28	1.86	-0.03	1.06	.065
		Social Influence	0.26	0.27	0.95	-0.28	0.80	.345
	High	Feedback	0.20	0.27	0.75	-0.33	0.74	.454
		Default	0.77	0.40	1.92	-0.02	1.56	.056
		Social Influence	0.29	0.39	0.74	-0.48	1.05	.459
Preference	Low	Feedback	-0.25	0.37	-0.68	-0.99	0.48	.500
		Default	-0.30	0.30	-0.97	-0.90	0.30	.331
		Social Influence	-0.12	0.32	-0.39	-0.75	0.50	.695
	Medium	Feedback	0.03	0.31	0.10	-0.59	0.65	.917
		Default	0.15	0.22	0.69	-0.29	0.60	.494
		Social Influence	0.03	0.22	0.13	-0.41	0.47	.898
	High	Feedback	0.05	0.22	0.21	-0.39	0.48	.835
		Default	0.60	0.32	1.86	-0.04	1.24	.065
		Social Influence	0.18	0.31	0.58	-0.44	0.80	.562
		Feedback	0.06	0.30	0.20	-0.53	0.65	.845

Note. $N = 159$. CI = confidence interval; LL = lower limit; UL = upper limit. * $p < .05$. ** $p < .01$. *** $p < .001$. Medium, high, and low levels are corresponding to the mean and $\pm SD$.

Appendix H – Hypotheses Support

<i>Hypothesis</i>	<i>Supported</i>
Hypothesis 1: Nudges (vs. control) will have a positive effect on employees' adoption of innovative technologies.	<i>Partially</i>
H1a: Nudges (vs. control) will increase the employees' acceptance to use innovative technologies.	✘
H1b: Nudges (vs. control) will increase the employees' motivation to explore innovative technologies.	✓
H1c: Nudges (vs. control) will positively influence employees' attitude towards innovative technologies.	✘
H1d: Nudges (vs. control) will increase the employees' commitment to an innovative technology.	✘
H1e: Nudges (vs. control) will increase the employees' willingness to adopt innovative technologies.	✘
H1f: Nudges (vs. control) will increase the employees' satisfaction with adopting innovative technologies.	✘
H1g: Nudges (vs. control) will increase the employees' preference to adopt innovative technologies.	✘
Hypothesis 2: Resistance to change will moderate the relationship between any nudge (vs. control) and the adoption of innovative technologies. Nudges will positively impact the adoption of innovative technologies for employees with high dispositional resistance to change compared to lower dispositional resistance to change.	<i>Just accepted for all nudges on motivation, and the social influence nudge on acceptance, attitude, satisfaction, willingness</i>
Hypothesis 3: Age will moderate the relationship between any nudge (vs. control) and the adoption of innovative technologies. Nudges will positively impact the adoption of innovative technologies particularly for younger employees (vs. older).	<i>Just accepted for feedback nudge on willingness, and default nudge on preference. No discernible trend suggesting that younger employees were more responsive to nudges.</i>

Appendix I - Power Calculation

