A configurational view on technology acceptance: the example of highly integrated collaboration platforms

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Abstract

Highly integrated software environments for various routine and non-routine tasks promise productivity gains for organizations. To fulfill this promise, users need to be willing to employ the new technology. A combined perspective of sufficient and necessary conditions in the form of fuzzy-set qualitative comparative analysis (fsQCA) and, necessary condition analysis (NCA) is used to examine the technology acceptance of workstream collaboration tools, advancing examinations from a multivariate perspective to a more holistic view. One hundred thirty participants were trained in the software application Slack for three months. Following the training period, configurational analysis using fsQCA and NCA based on a unified theory of acceptance and use of technology (UTAUT) framework was conducted based on 116 qualified questionnaires. Necessity assessment shows that all influence factors exhibit necessity properties, with facilitating conditions and effort expectancy most substantially constraining an individual's intention to use. Sufficiency evaluation confirms UTAUT's variable choice and identifies social influence as a key condition that enables intention to use. Segmentation according to gender further reveals that effort expectancy and facilitating conditions are necessary conditions for female users but not for males.

Keywords: Workstream collaboration, technology acceptance, collaboration software, fsQCA, NCA.

1 Introduction

Previous work has examined collaboration technology, employing the word as an umbrella term for individual technologies such as group decision support systems (DeSanctis & Gallupe, 1987), e-mail and videoconferencing (Bajwa et al., 2005), instant messaging (Lou et al., 2005), and even SMS (Brown et al., 2010). Research has further noted that in many cases, the adoption and use of multiple technologies aiming at fostering collaboration may be the most fruitful approach (Bajwa et al., 2005; DeSanctis et al., 2001). A novel type of application named Workstream Collaboration Tools (WCT) advance this notion by providing access to a variety of functions that have been carried out by distinct tools, integrating them in a single place and making them accessible through one dashboard and syntax (Gartner, 2018; Kopplin & Baier, 2020; Reynolds). WCT target improving communication and collaboration by the grouping of different communication channels, enabling automation such as embedding artificial intelligence and allowing deep integration of third-party tools to provide a substantial degree of tool customization (Gartner, 2018; Reynolds, 2018). In this regard, they allow easy access to business intelligence and analytics, which is particularly relevant to organizations that lack experience or budget, such as SMEs (Wee et al., 2022), and provide the opportunity for continuous modification and improvement, catering to the notion of Digital Kaizen (Dang-Pham et al., 2022). WCT provide an extensive set of functionalities and are inherently designed for the multi-purpose application, and many of their design features users

are already familiar with from the consumer context (Koch et al., 2019). In sum, they promise support for productivity, innovation, and growth (Verma et al., 2022). Predominant applications are Slack, which offers features that range from mere scheduling and file sharing to operating external software tools, and Microsoft Teams, which recently surpassed Slack in numbers of users and is now in the first place regarding size (Microsoft, 2020; Novet, 2019; Slack, 2020).

Hence, alongside the technological progress, in general, collaboration technology also advances, becoming more versatile, mobile (i.e., supporting inter-device compatibility encompassing laptop computers, smartphones, tablets, and even car interfaces such as Android Auto and Apple CarPlay), and complex. The range of features inherent to WCT may be considered highly congruent with the notion of the umbrella term collaboration technology as specified by Brown et al. (2010, p. 12):

> *"Collaboration technology is a package of hardware and software that can provide one or more of the following: (1) support for communication among participants, such as electronic communication to augment or replace verbal communication; (2) information-processing support, such as mathematical modeling or voting tools; and (3) support to help participants adopt and use the technology, such as agenda tools or real-time training […]."*

WCT seek to offer solutions for all three aspects within a single integrative digital environment, hence condensing the 'package of hardware and software' into a clear and simple operating dashboard. Consequently, WCT may be framed as aiming for an optimal endpoint of collaboration technology evolution: providing barely limited access to functions and third-party applications offering communication, information-processing support, and help and training options. Besides, drastic events such as the COVID-19 pandemic have stressed the criticality of being able to react quickly to substantial changes in the work environment such as switching to work-at-home (Conger, 2020), which requires the availability of reliable software solutions for daily business. Indeed, organizations were found to rapidly adopt individual applications such as video conferencing tools and social media-based software (Dey et al., 2020). WCT can help integrate these various applications and provide an accessible infrastructure for users' different tools and functionalities.

To provide consistency with previous findings in the field, the unified theory of acceptance and use of technology (UTAUT, Venkatesh et al., 2003) is employed as a guiding framework. UTAUT has been used in thousands of studies and has been compiled and is implemented by means of regression-based procedures. Hence, there is a substantial lack of methodological plurality to assess the model's power, and the net effect perspective of regression-based analyses omits potential interactions between influence factors (Woodside, 2013). Hedonic motivation is added to take the notion of dual-purpose information systems (IS) into account (Wu & Lu, 2013). One-hundred and thirty participants were trained in using Slack for three months and subsequently answered a UTAUT-based questionnaire. Insights into actual usage behaviour are gained through observations of installed integrations, exchanged messages, and dedicated survey questions.

Taking into account the complexity of WCT, the study at hand employs fuzzy-set qualitative comparative analysis (fsQCA), which allows the identification of so-called causal recipes, i.e., combinations of conditions that are sufficient to elicit the outcome of interest (Ragin, 2009). This approach allows the detection of distinct yet equifinal causal paths evoking the phenomenon under investigation, i.e., intention to use a WCT, and thus incorporates potential

heterogeneity in user perceptions. Further, in contrast to the majority of the extant empirical findings that substantially rely on regression-based methods, fsQCA can depict interactions among predictors. In addition to sufficient conditions, set theory also enables the researcher to find must-haves, i.e., necessary conditions that need to be present for the outcome to occur. For this purpose, necessary condition analysis (NCA) has been proposed as an advancement of fsQCA's necessity assessment (Dul, 2016a, 2016b). Thus, the study at hand seeks to (1) shed light on the causal combinations that lead to individuals' intention to use WCT, and (2) identify necessary conditions that must be present to allow the intention to use to occur.

The remainder of the paper is structured as follows: Section 2 provides an overview of the literature and offers a brief insight into WCT's history. The research model is constituted in section 3, followed by results in section 4, and a discussion in section 5. The last two sections conclude the study's findings, address its limitations, and propose future research paths.

2 Related Work

2.1 Workstream Collaboration Tools

Communication and collaboration are central and interconnected elements of organizations and yield multiple impacts on subjects such as work efficiency (Tjosvold and Tsao, 1989), problem-solving (Gray, 1985), information and knowledge sharing (Cabrera & Cabrera, 2002; Hendriks, 1999; Inkpen, 1996), and innovation (Cooper, 2019; Cooper & Kleinschmidt, 1987). In fact, communication may be the underlying factor creating and sustaining organizations (Schoeneborn et al., 2019). Since the introduction of information technology, organizations have employed several cycles of software applications that seek to facilitate exchange among employees (Bloom et al., 2014; Hinds & Kiesler, 1995; Nunamaker et al., 1991).

The extant literature has emphasized the importance of building trust in these virtual teams collaborating via digital applications (Hacker et al., 2019), and WCT serve three main challenges of establishing trust (Pearlson et al., 2016): communication, technology, and team diversity. WCT provide different but standardized communication channels, allowing simple meeting scheduling across time zones and calendar applications, and videochat functionality as well as the use of emojis facilitate dynamic communication. The opportunity to use integrations, either stand-alone or as connections to pre-existing applications, such as e-mail services, offer a standard set of tools, facilitating learning and support among team members. Finally, many WCTs implement influences from consumer-context software, such as WhatsApp, Discord, and Facebook Messenger, and include emojis, stickers, GIFs, and other functions to establish team identity.

Recent WCT developments are characterized by the integration of instant messaging, primarily consisting of text-chat functionality and presence information, and voice-based communications, and increasingly comprise additional channels (Riemer & Frößler, 2007). The demand for such highly integrated tools is fuelled by a number of workplace developments, such as the rising importance of virtual, locally dispersed teams that are composed according to knowledge and skills rather than place (Tuma, 1998). Attempts to provide communication in real-time date back to the 1990s (Riemer & Frößler, 2007), and have become ubiquity due to the omnipresence of online-compatible devices such as laptops, tablets, and smartphones (Ladd et al., 2010). The advent of mobile and inter-device computing with its specific requirements regarding input and output modes has also influenced organizational IS through consumerization (Harris et al., 2012; Jarrahi et al., 2017). A significant precondition for

multiplexed platforms is the convergence of infrastructure and "interoperable applications and services on an integrated machine" (Riemer & Frößler, 2007, p. 286). These characteristics have sparked a multiplicity of denominations, such as real-time communication and real-time collaboration systems (Riemer & Frößler, 2007), enterprise communication and collaboration (Kryvinska et al., 2009), unified communications and collaboration (Alias et al., 2017; Chung & Shin, 2011), unified communications (Riemer & Taing, 2009), and unified messaging (Lai et al., 2002), which share many commonalities and are often used interchangeably.

WCT are referred to as the next development stage of integrated communication and collaboration platforms (Gartner, 2018). They gained traction when global player Microsoft entered the market in 2017 and presented their own platform solution called Teams (Unify Square, 2019). Other well-established companies contributed their respective applications, such as IBM, Cisco, or Google (Gartner, 2018). Figure 1 gives an overview of a prototypical application. Reynolds (2018) puts their functionality in a nutshell: they bring "messaging, notifications, files, bots, tools and people together to create a private, persistent and searchable digital workspace that teams can use to do their work in a transparent, effective and efficient manner".

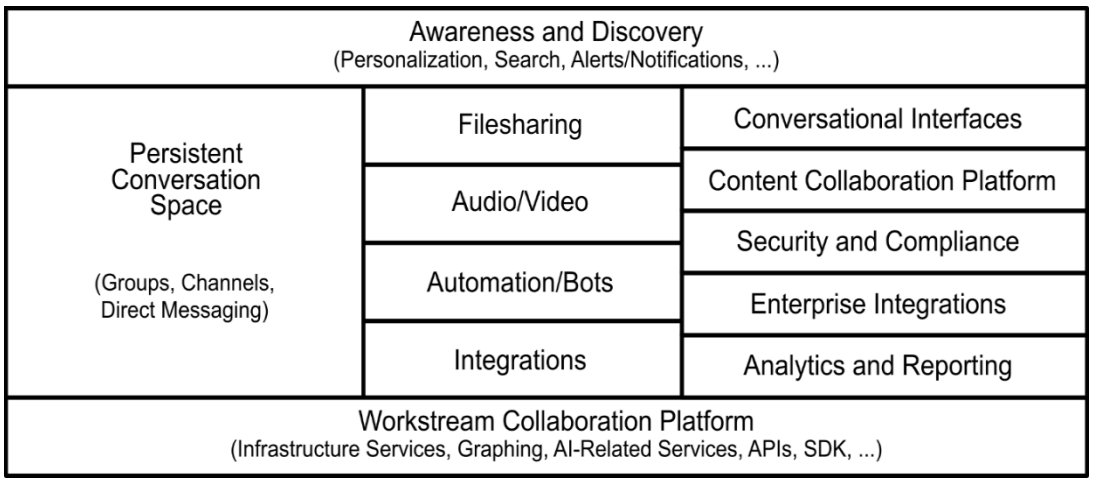

Figure 1. Scope of WCT, based on Gartner (2018)

In essence, WCT combine popular features such as text messaging in group and direct channels with novel instruments such as chatbots and automation, allowing faster and more efficient execution of tasks. However, their real excellence is achieved by a strong focus on facilitating third-party integrations. In this vein, the workflow using bots and automation can be transferred to existing tools such as project management in Trello and Asana or social media curation on Twitter and Facebook. However, organizations may also write their own extensions. Due to this flexibility and variety of development, WCT not only provide a starting point to implement the continuous improvement philosophy of Digital Kaizen (Dang-Pham et al., 2022), but also facilitate taking on novel tasks (from the organization's perspective) such as diving into business intelligence and analysis, which is frequently challenging particularly for SMEs (Wee et al., 2022).

Taken together, what differentiates WCT from predecessors is their substantial support of non-routine tasks, adding to daily business routines that could already be handled by existing tools (Reynolds, 2018). Regarding device compatibility, WCT focus on a combination of laptop and smartphone/tablet support (Microsoft, 2020; Slack, 2020) but also cover recent

technological advancements such as smartwatches (Circuit, 2020) and in-vehicle information systems via Android Auto and Apple CarPlay (Unify, 2020). Table 1 provides an overview of relevant WCT for an impression of the segment's development.

Application	Vendor	Launch	Segment
Azendoo	Azendoo	2012	BU, new player
Chanty	Chanty	2017	BU, new player
Circuit	Unify Software and Solutions	2014	BU, new player
Flock	Flock	2014	BU, new player
CA Flowdock	CA Technologies	2010	BU, new player
eXo Platform	eXo platform	2014	BU, new player
Fuze	Fuze	2016	BU, new player
Glip	RingCentral	2015	BU, new player
Hive	Hive	2016	BU, new player
Jandi	Toss Lab	2015	BU, new player
Jostle	Jostle Corporation	2011	BU, new player
Keybase Teams	Keybase	2017	BU, new player
Mattermost	Mattermost	2015	BU, new player
Microsoft Teams	Microsoft	2017	TD, incumbent
Moxtra	Moxtra	2013	BU, new player
Rocket.Chat	Rocket.Chat	2018	BU, new player
Ryver	Ryver	2015	BU, new player
Samepage	Samepage Labs	2013	BU, new player
Symphony	Symphony Communication Services	2015	BU, new player
Slack	Slack	2013	BU, new player
Stackfield	Stackfield	2014	BU, new player
Twist	Doist	2017	BU, new player
Webex Teams	Cisco WebEx	2018 (rebrand of Spark, 2014)	BU, new player
Wickr Pro	Wickr	2016	BU, new player
Wimi	Wimi	2011	BU, new player
Workplace by Facebook	Facebook	2016	TD, incumbent
Quip	Salesforce (acquisition)	2013	TD, incumbent
Zoho Cliq	Zoho Corporation	2017	BU, new player
Zulip	Dropbox (acquisition)	2015	TD, incumbent

Table 1. WCT market overview
Note. TD = top-down, BU = bottom-up

As the application and vendor columns indicate, the market is split into two segments: major companies from originally different backgrounds, such as Microsoft and Cisco, and specialized single-product companies. Two main business models prevail: dissemination of proprietary software (e.g., Chanty, Circuit, Slack, Teams) and provision of open-source applications (e.g., eXo Platform, Mattermost, Rocket.Chat, Zulip). Single-product companies' backgrounds share many commonalities: in many cases, internal communication solutions were needed while working on a different project, so a solution was created in-house (Mattermost, 2015; Slack, 2019). In essence, two approaches to the market can be observed: a bottom-up approach driven by client needs, frequently realized through startup foundation, and a top-down approach that is propelled by market growth, which is a strategy preferably employed by incumbents.

2.2 Technology Acceptance of Workstream Collaboration Tools

Technology acceptance research investigation collaborative technology has a long history and follows the trajectory of technological advancement. Hence, the variety of examined technologies is rather large: early work studied group decision support systems (DeSanctis & Gallupe, 1987), later followed by e-mail and videoconferencing systems (Bajwa et al., 2005), SMS (Brown et al., 2010), and their multi-/omni-platform predecessor instant messaging (Lou et al., 2005). Although varying in their functional range, collaboration technologies seek to provide communication, which can either augment or replace verbal communication, employ tools for information processing, and offer easy-access functionality, e.g., in the form of real-time training (Brown et al., 2010). While not all of these aspects need to be fulfilled by a technology to be considered a collaboration technology (Brown et al., 2010), recent platform- or dashboard-based applications offer a wide range of features that covers these three pillars, as Figure 1 shows.

Hence, novel collaboration technology, such as WCT, exceed their predecessors in functional diversity and platform compatibility, making them more complex than previous applications. Even more, WCT may implement other collaboration technology such as instant messaging, videoconferencing, and e-mail. While the former two are standard features of WCTs, such as Slack or Microsoft Teams, the latter is sometimes presented as outdated and to be replaced with instant messaging but is also supported through WCT integrations if the user wishes to continue using e-mail. Against the backdrop of the conceptualization by Brown et al. (2010), it appears that what sets WCT apart from earlier collaboration technology is that all three aspects are indeed included in their features, instead of being optional. Due to this substantial difference in scope and accessibility, it is necessary to update our knowledge on user perception and evaluation of modern-day collaboration technology.

Extant research on WCT is scarce and fragmented, focusing on divergent topics such as their potential to provide an e-learning platform (Pal and Vanijja, 2020), their impact on knowledge work (Lansmann et al., 2019), chatbot-based emotion management for distributed teams (Benke et al., 2020), and chatbot-mediated task management (Toxtli et al., 2018). In general, WCTs' chatbot functionalities appear to be their most investigated aspect. This narrow focus appears to omit their overall, complex quality, which is considered to both constitute a distinct new form of application and to change social structures established through the usage of previous collaboration technology (Stoeckli et al., 2020).

3 Conceptual model

WCT in their function to support communication and collaboration likely represent dual-purpose information systems (Wu & Lu, 2013), meaning that users emphasize both utilitarian and hedonic outcomes of their use behaviour. Further, taking one of the three main characteristics of collaboration technology into account (Brown et al., 2010), a supportive environment should be required, providing information and help with navigation, software failure, customization, and the like. Further, as effective communication and collaboration demand that the involved individuals share some sort of communication channels, it is expected that social influence plays a role in the usage intention of WCT. As set-theoretic procedures, such as fsQCA, allow for theoretical and configurational multiplicity (Park et al., 2020), it appears fruitful to start with a well-established framework in order to explore potential paths for examining multiplicity. One of the most dominant frameworks is UTAUT

(Venkatesh et al., 2003), suggesting the explanation of an individual's intention to use a particular technology as the result of a number of perceived properties, which will be detailed below. UTAUT has been cited in almost 45,000 studies, rendering it a seminal model for the study of technology acceptance, and offering insights into the acceptance of hundreds of technologies.

It is important to note that the model is usually employed using regression-based methods, which have been criticized to omit important insights into causality (Woodside, 2013). Particularly, the results of a typical UTAUT study will present an effect size or a related measure for each of the independent variables, showing their isolated contribution considering the value of the dependent variable. This net effect perspective neglects potential interactions between influence factors, and only one generalized model is estimated and proposed for the whole dataset. On the other hand, fsQCA allows the identification of several different configurations of influence factors, catering to the idea of equifinality (e.g., Pappas & Woodside, 2021). Hence, examining the well-established UTAUT framework using fsQCA allows more detailed insights into the factors' relationships, potential interactions between influence factors, and different yet equifinal configurations of influence factors.

Due to WCT's strong influences from consumerization – a notion that postulates current organizational technology is heavily influenced by mechanisms and devices that employees already know from the consumer context (Gewald et al., 2017; Harris et al., 2012; Jarrahi et al., 2017) – it is deemed reasonable to include notions of hedonic motivation for contextualization (Venkatesh et al., 2016).

Hence, utilitarian aspects are captured in the form of performance expectancy and effort expectancy, denoting the productivity gains and ease of use of the application. Hedonic factors are implemented through the variable hedonic motivation from UTAUT2. The notion of a supportive environment is depicted as facilitating conditions, and social influence serves as a measure of a user's social surroundings and its influence on the individual regarding the use of the respective application. Table 2 provides an overview of the factors and their conceptualizations. Besides, moderating effects of age, gender, experience with the technology, and voluntariness of use are postulated (Venkatesh et al., 2003).

Factor	**Conceptualization**	**Adapted from**
Performance expectancy	Individuals' beliefs that the technology will help to increase work-related performance	Perceived usefulness, extrinsic motivation, job-fit, relative advantage, outcome expectations
Effort expectancy	Individual's beliefs of a technology's operability effort	Perceived ease of use, complexity, ease of use
Social influence	Individuals' beliefs that other persons would like them to use the technology	Subjective norm, social factors, image
Facilitating conditions	Individuals' beliefs that technical and organizational support is provided	Perceived behavioral control, facilitating conditions, compatibility
Hedonic motivation	Individuals' beliefs that using the technology is entertaining	Perceived enjoyment

Table 2.UTAUT and UTAUT2 factors used for the study

Items for performance expectancy, effort expectancy, social influence, and facilitating conditions were adopted from Venkatesh et al. (2003). Hedonic motivation was captured using

the wording suggested by Venkatesh et al. (2012). All items were measured on a 5-point Likert-type scale and are attached in Appendix A. Figure 2 displays the final framework.

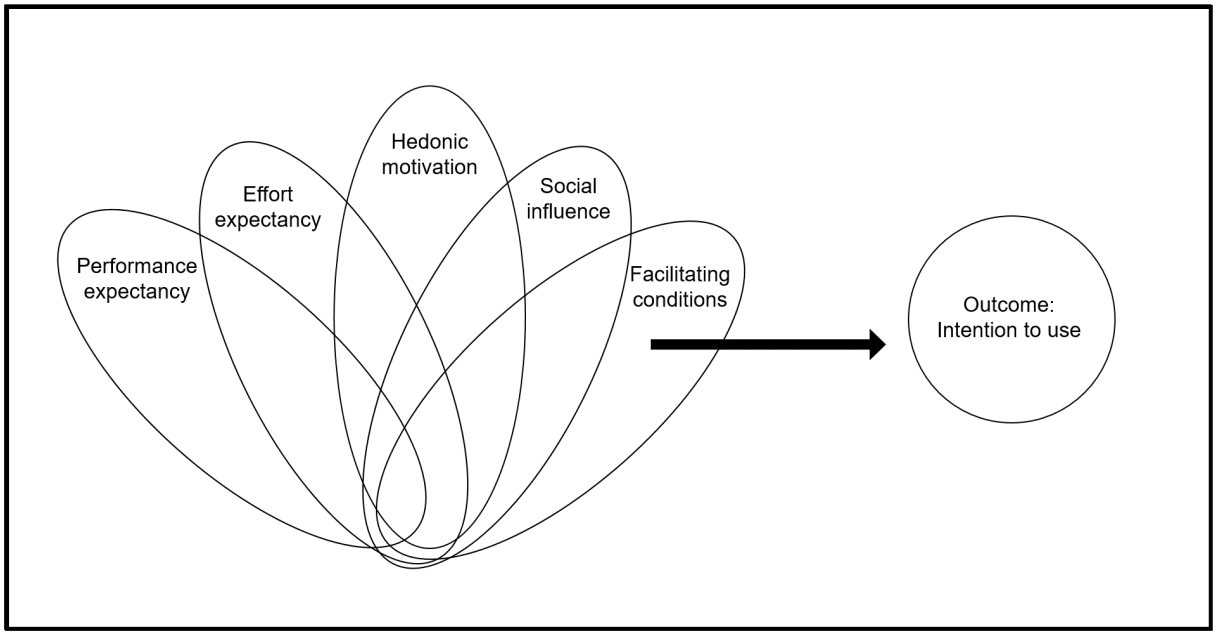

Figure 2. Adapted UTAUT framework based on Venkatesh et al. (2003)
Note. Representation layout adopted from Pappas (2018)

Further, age, gender, experience, and voluntariness of use are included as moderator variables in UTAUT (Venkatesh et al., 2003). As individuals are trained for a limited amount of time, experience cannot be measured reasonably. Besides, participation was voluntary; hence voluntariness of use cannot be adequately depicted as it would be the case in a real-world organizational setting. Thus, age and gender are kept for analysis. In the following, names of latent variables are abbreviated as follows: performance expectancy PE, effort expectancy EE, social influence SI, facilitating conditions FC, hedonic motivation HM, and behavioural intention to use BI.

In order to assess the adapted framework displayed in Figure 2, an appropriate analysis requires the capability to map interactions between influence factors. For this end, fsQCA is used (Ragin, 2009). This procedure allows the inclusion of equifinality, i.e., examining whether different combinations of influence factors (so called conditions) are capable of producing the outcome. Consequently, instead of providing isolated effect sizes for the conditions, condition combinations that are sufficient to elicit the outcome under investigation are being detected. In fsQCA methodology, it is possible that several different combinations, or configurations, are able to evoke the outcome. These different causal paths that all lead to the same result are described by the term equifinality.

Another intriguing property of fsQCA is the notion of an ecology of configurations (Park et al., 2020). This term denotes the idea that multiple theoretical explanations may overlap in the examination of a particular dataset. After retrieving the different configurations eliciting the outcome of interest, some of these configurations may be explained be the same theoretical perspective, while others may reflect a different theory, or lack an explanation altogether, termed theoretical multiplicity. On the other hand, as Park et al. (2020) put it: "[…] a given phenomenon may be accounted for by three, or k configurations […]" (p. 1500) called configurational multiplicity. Thus, fsQCA helps shed new light on technology acceptance of

WCT and the UTAUT framework by giving insights into these two classes of plurality, potentially opening new research paths for a well-established field of study.

In contrast to its predecessor, which was denoted crisp-set QCA or csQCA for differentiation, non-dichotomized membership scores ranging between 0 and 1 are employed (Mendel & Korjani, 2012; Ragin, 2009; Schneider & Wagemann, 2010). Due to its foundations in set theory and fuzzy logic, the method allows the identification of interactions between conditions (which roughly correspond to factors in multivariate analysis) and explicitly stresses the configurational nature of phenomena, i.e., the existence of multiple different condition combinations leading to equivalent outcomes is expected (Ragin, 2009, 1987). The UTAUT model serves as a theoretical baseline for condition identification in the study's context; hence, the next step requires the calibration of each condition's measures into fuzzy sets to determine membership scores (Schneider & Wagemann, 2010).

The calibration procedure is crucial for the results of any fsQCA applications, and several methods for the calculation of membership scores have been proposed. Empirical calibration methods exist, such as employing the median as the cross-over point and the 5 % and 95 % quantiles as thresholds for full non-membership and full membership, respectively (Woodside, 2013). However, due to the (quasi-)symmetrical nature of Likert-type scales, which are frequently used, a theoretical calibration using the scale points as anchors is deemed more representative of the measures (see, e.g., Ordanini et al., 2014).

Besides, in contrast to multivariate methods, fsQCA does not make assumptions of symmetrical effects (Woodside, 2013). Commonly, models are interpreted in the way that a postulated relationship between two measures can be inverted, i.e., when the extant literature suggests that the presence of an influence factor should lead to the presence of an outcome, researchers often expect that the absence of this influence factor should be linked to the absence of the outcome. However, implicit in this expectation is the assumption of symmetrical effects. Instead, two separate analyses are conducted for the absence and the presence of the outcome variable in fsQCA, respectively (Ragin, 1987). Consequently, differences in condition interactions eliciting the outcome and the negation of the outcome are identified.

4 Methodology

4.1 Sample Strategy and Training

Over three months, 130 participants were recruited from university students and trained in operating Slack. More advanced techniques such as using chatbot automation were rehearsed after familiarizing with the tool's essential features. At the end of the three-month period, a survey was scheduled for all 130 users. Training in software usage was designed to cover all relevant aspects of daily operation in business. This approach is consistent with the literature, which seeks to explain and predict acceptance "after a brief period of interaction with the systems" (Szajna, 1996, p. 85). Two exercise sheets were composed, drawing on literature on software utilization in office environments, WCT vendor sites, and blogs dealing with the topic, as well as informal interviews with experienced Slack users for task definition.

At the beginning of the training period, all participants received e-mails with invitations to a dedicated Slack workspace. Two channels were set up, one for posting answers to the exercise sheets and one for general usage. After all participants had joined the workspace, an

introductory face-to-face presentation was given, briefly explaining the application and the study's course. Two weeks were scheduled for informal tool exploration to get familiar with its user interface and basic functionality. Participants were asked to use the desktop version. At the end of this period, the first exercise sheet was presented in a second lecture. Tasks comprised using 'slash commands' (commands beginning with a forward slash, Slack's standard syntax) and interacting with Slackbot, a pre-installed chatbot in every workspace. Three weeks later, the second sheet was introduced in the same manner. Participants had been using the application for about a month, giving insights into everyday operations. Exercises from the second sheet covered the personalization of channels and the workspace as a whole, focusing on customizing information flow and embedding third-party integration. After familiarizing with the application's desktop version, the smartphone app was introduced to take flexibility in workplace selection into account. All tasks were completed using the app as well. The final survey was launched at the end of the three months. In the questionnaire, respondents were shown a list of prototypical business tasks and asked to indicate which of these Slack is deemed an adequate solution for. Tasks were selected drawing on literature in the field, practitioner blogs and websites, vendor information on WCT, and subsequent focus group evaluation (N = 8), on the lines of material construction for substitution-in-use as carried out in Ratneshwar and Shocker (1991).

4.2 Descriptive Statistics

The training period was set from June to August 2019. In total, 116 questionnaires were collected. 14 participants dropped out at the end of the training period. The sample size satisfies recommendations for the condition/case proportion, which should range below 0.20 for five conditions in a medium- to large-N setting (Maggetti & Levi-Faur, 2013; Marx, 2010). Respondents were between 22 and 29 years old (mean 24.34, median 24, SD 1.50). Male and female respondents were balanced, yielding 58 participants in each group. Respondents were asked if they were willing to initiate Slack's introduction in their workplace, given that no alternative application is already in use. 66.4 % answered yes, while 33.6 % negated. They were also asked for preferences in implementation: 83.6 % favor automation, such as Slackbot. 32.8 % like to see an augmented reality version, allowing integrating the digital and the physical realm through smart glasses. Virtual reality, implemented through headsets that fade out an individual's environment, is labelled desirable by 28.4 %. Eventually, respondents were asked for experience with Slack. Unsurprisingly, most respondents stated the training period (mean 3.33, median 2, SD 4.94, values in months). One respondent was treated as an outlier and excluded from analysis as he indicated 36 months, which was over half a year more than the next highest value. Assessment of BI resulted in a mean of 2.56 (SD = 1.01), exhibiting a relatively low disposition to use the technology.

Participants also indicated whether they prefer the desktop or the mobile version of Slack, yielding a surprisingly clear majority for the desktop version (96 %). Scanning and trying out integrations were also part of the training. Table 3 gives an overview of the top integrations that were stated to be helpful. Although one of WSCs' inherent features is providing a persistent space for files and conversation, four cloud storage solutions can be found among the top eight implementations.

Implementation	Mentions (%)	Top Integrations	Field	Mentions (%)
Desktop	96	Google Drive	Cloud storage	58.5
App	4	Dropbox	Cloud storage	40.6
		Skype	Communications	31.1
		Trello	Project management	29.2
		Google Calendar	Calendar	15.1
		GitHub	Cloud storage	7.5
		WeTransfer	File sharing	7.5
		Microsoft OneDrive	Cloud storage	6.6

Table 3. Most popular Slack integrations

4.3 Measurement Evaluation

Membership calibration is a critical step in fsQCA. Hence, an assessment of the employed measures is carried out beforehand to ensure that valid and reliable information is used for calibration. Internal consistency is checked using factor analysis, Cronbach's α, and the average variance extracted (AVE). Sufficient values are above 0.50 for AVE and above 0.70 for CR and Cronbach's α (Hair et al., 2019). For one item (FC4), the loading was very low (0.577), and it was removed from further analysis. A summary of all latent variables is provided in Appendix C. Table 4 summarizes the measurement evaluation results.

Variable	Indicators	Mean (SD)	Cronbach's Alpha	AVE
PE	4	2.67 (0.84)	0.855	0.701
EE	4	3.97 (0.74)	0.893	0.761
HM	3	0.887	0.873	0.807
SI	4	2.07 (0.95)	0.881	0.745
FC	4 (3)	4.05 (0.65)	0.672	0.608
BI	3	2.56 (1.09)	0.935	

Table 4. Measurement assessment
Note. SD = standard deviance, AVE = average variance extracted

For assessment of discriminant validity, a triad of the Fornell-Larcker criterion (Fornell et al., 1981), an examination of cross-loadings (Hair et al., 2019a), and the heterotrait-monotrait ratio (Henseler et al. 2015) is used. Appendices C and D exhibit tables for Fornell-Larcker and HTMT, indicating discriminant validity. $HTMT_{inference}$ is calculated, corroborating discriminant validity as the null value of 1 is excluded from the 95 percent and 99 percent confidence intervals, respectively (Henseler et al., 2015). For cross-loadings, all indicators load highest on their respective variable, corroborating discriminant validity.

After establishing the validity and reliability of the employed measures, calibration into fuzzy sets was conducted. As all conditions were measured on a five-point Likert-type scale, the value 3 may naturally serve as the point of maximum ambiguity (i.e., cross-over), while 1 is employed as the threshold for full non-membership, and 5 is used for full membership (see also Ordanini et al., 2014).

5 Findings

5.1 Necessary conditions analysis using fsQCA and NCA

Necessary conditions analysis using fsQCA

In the first step, XY plots are used to get an overview of the conditions, and a necessary condition analysis is performed. A condition is necessary when (1) the absence of the condition corresponds to the absence of the outcome, and (2) the presence of the outcome corresponds to the presence of the condition (Braumoeller & Goertz, 2000; Dul, 2016a). Contrary to a sufficient condition, the presence of a necessary condition may occur when the outcome is absent (Vis & Dul, 2018). To assess the pool of conditions for necessity, each condition is analysed for the degree to which it constitutes a superset of the outcome (i.e., consistency). The coverage values imply the empirical relevance of the relation and help identify conditions that are necessary but irrelevant (Ragin, 2006). Table 5 summarizes the findings. Note that in all cases, BI is the outcome (i.e., Y), and high values correspond to consistency, while the lower values can be interpreted as coverage (Ragin, 2009).

Condition (X)	Consistency X ← Y (Coverage)	Consistency X → Y (Consistency)
PE	0.676	0.905
EE	0.469	0.974
HM	0.646	0.922
SI*	0.825	0.583
FC	0.455	0.978

Table 5. Necessary condition analysis in kind using fsQCA
Note. *The consistency/coverage interpretation is reversed for SI

Following the logic of fuzzy sets, a condition is necessary when membership scores in the outcome are lower or equal to membership scores in the condition (Dul, 2016a; Schneider & Wagemann, 2010; Vis & Dul, 2018). This subset relation can be observed using XY plots, depicting membership in the condition on the horizontal axis and membership in the outcome on the vertical axis. In the complementary case, i.e., when membership scores for the outcome are higher than membership scores for the condition, indications for a sufficient condition have been found. The ideal XY plot then shows a triangular case distribution (Braumoeller, 2017; Ragin, 2006). The graphical displays provide a more detailed picture of the summary in Table 5; however, scores from the table give an impression of the set relations: for PE, EE, HM, and FC, consistency scores pass the recommended threshold of 0.90 (Dul, 2016a; Schneider & Wagemann, 2012). However, an even more conservative value of 0.95 has been proposed, particularly for settings that aim at hypothesis testing (see, e.g., Maggetti & Levi-Faur, 2013). As UTAUT and its respective path relations is an established model, the strict threshold is employed for the study at hand, revealing EE and FC as necessary conditions *in kind*.

Consequently, empirical evidence for EE and FC being necessary conditions could be established (see also the XY plots in Appendix E, where most cases are below the linear slope). Assessment of their empirical relevance, i.e., their coverage scores, yields particularly high values, accounting for about two-thirds of each case. Consequently, EE and FC are identified to be necessary and empirically relevant (Ragin, 2006). All graphs are also plotted for the inverse cases of the conditions being absent and the outcome being absent. Figure 3 illustrates both variants for FC, displaying substantial evidence for FC being a necessary condition for BI (left-hand plot) and ~FC being a sufficient condition for ~BI (right-hand plot).

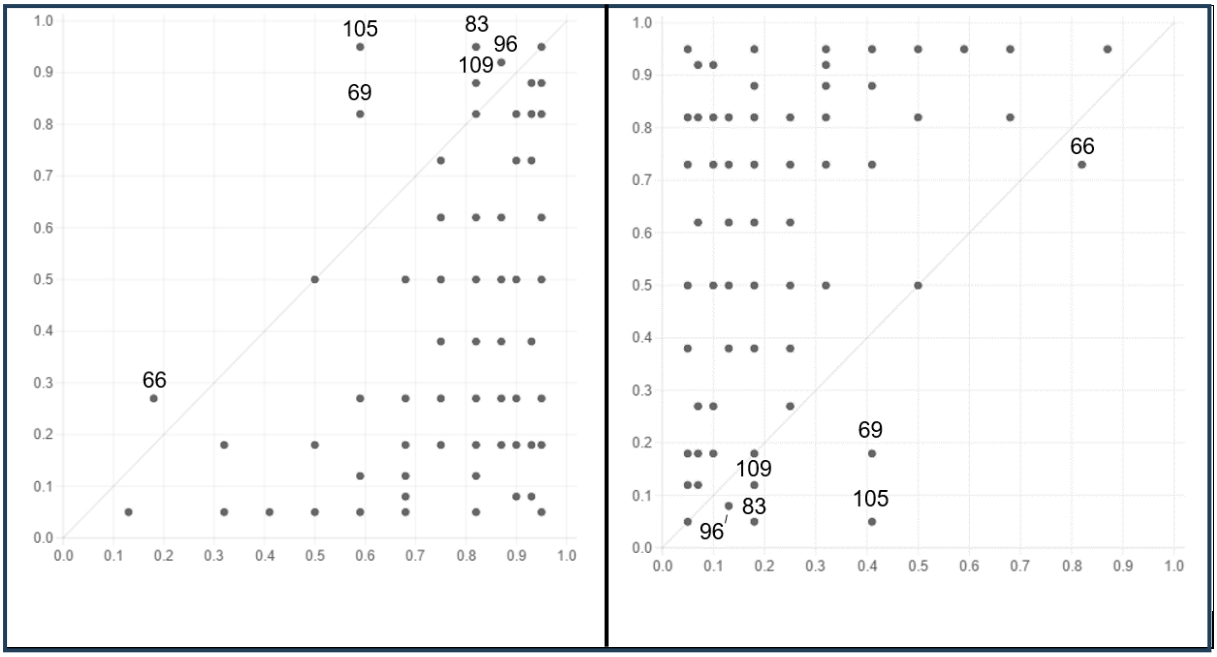

Figure 3. XY plots for FC and BI, and ~FC and ~BI
Note. Values indicate case IDs

However, in the case of SI, an inverse result is found: as can be observed from the XY plots, most cases are located above the linear slope. Hence, strong evidence for a sufficient condition was found, i.e., SI → BI. The consistency score is 0.825, and the corresponding coverage is 0.583, indicating substantial empirical relevance. In consequence, SI appears to be a sufficient condition for BI. Analyses of sufficiency will be conducted in more detail after the complementing NCA.

Necessary condition analysis using NCA

Although fsQCA provides guidance on the identification of necessary conditions, its primary aim is to detect sufficient conditions (Bol & Luppi, 2013). Consequently, a second approach, namely NCA, is employed for analysis. A ceiling regression with free disposal hull (CR-FDH) is used (Dul, 2016b). NCA's idea is that necessary conditions put constraints on the outcome so that a certain level of the necessary condition is required to elicit the outcome's presence. Drawing on XY plots (with the horizontal axis corresponding to the condition and the vertical axis depicting the outcome), the ceiling line ascertained by NCA separates the 'full' space of observations from the 'empty' space in the upper left corner. The larger this empty space is, the stronger the constraint that is put on the outcome. The results are summarized in Table 6. A bootstrapping procedure drawing 10,000 subsamples was used to assess statistical significance. All conditions were found to exhibit significant effects on a 0.05 level. Following Dul's (2016b) recommendations, the effect size of SI can be considered small, the effects of PE, EE, and HM are medium, and FC yields a large effect. NCA provides substantial evidence for the necessity of all five conditions. Thus, in the next step, a more fine-grained evaluation is conducted.

Condition (X)	Ceiling zone	Observations	Accuracy	d	p
PE	0.184	2	0.983	0.227	< 0.001
EE	0.164	1	0.991	0.236	0.018
HM	0.216	3	0.974	0.267	< 0.001
SI	0.012	2	0.983	0.015	0.003
FC	0.232	3	0.974	0.314	0.045

Table 6 .NCA results

Note. Observations refer to cases that are located above the ceiling line, d = effect size, p = p-value derived from a bootstrapping procedure with 10,000 draws.

For this purpose, a bottleneck table was crafted (Table 7). A can be seen, a very low level of the outcome (10 %) already requires small values of HM and FC. Considering that a relatively high level of BI needs to be achieved to elicit a regular usage pattern for WCT, four out of the five conditions need to be taken into account (PE, EE, HM, and FC; considering the range of the outcome up to 90 %). The observation that for low outcome levels, most (or even all) conditions are not necessary, but become critical for higher levels of Y, is a typical finding for necessary conditions (Dul, 2016b). For the data at hand, the most substantial constraint emanates from FC. Altogether, findings from fsQCA (i.e., necessity *in kind*) and NCA (i.e., necessity *in degree*) are asymptotically equivalent, as Table 7 shows. For the full range of Y, EE and FC exhibit the highest requirements, and fsQCA identified EE and FC as necessary. Also, SI was not detected as necessary *in kind*, and necessity *in degree* yields a minimal effect (d = 0.015). Table 7 displays that SI, for most target values of Y, does not exhibit constraints. Hence, we may conclude that in this case, fsQCA and NCA both agree on the minor role of SI. However, it becomes apparent that a mere analysis of kind would have neglected NCA's granular insights.

Y	PE	EE	HM	SI	FC
0	NN	NN	NN	NN	NN
10	NN	NN	3.2	NN	3.2
20	NN	NN	9.0	NN	10.3
30	3.3	3.1	14.9	NN	17.3
40	11.6	11.9	20.8	NN	24.3
50	19.9	20.6	26.6	NN	31.3
60	28.2	29.3	32.5	NN	38.3
70	36.6	38.1	38.4	NN	45.4
80	44.9	46.8	44.2	NN	52.4
90	53.2	55.5	50.1	NN	59.4
100	61.5	64.3	55.9	38.2	66.4

Table 7: Bottleneck for NCA

Note. Y is stated in percent of the observed values, e.g., Y = 100 corresponds to the highest empirical outcome

5.2 Truth table construction and minimization

A truth table is constructed (Ragin, 2009, 1987; Schneider & Wagemann, 2010). Before collapsing it to receive solution terms, thresholds for consistency and frequency (i.e., the minimum number of cases) need to be specified (Krogslund et al., 2015). Regarding the frequency threshold, a minimum case number of two was chosen to derive fine-grained results. Necessary conditions have been maintained to provide a complete picture of the results. Although a consistency threshold of 0.75 had been originally proposed (Rihoux & Ragin, 2009), a higher value was aimed for. Following the recommendation by Pappas and

Woodside (2021), the truth table was inspected for a natural breaking point, i.e., a relatively large gap in the sorted list of consistency values. The first large gap occurred between 0.805163 and 0.764102, indicating a breaking point. Consistent with this empirical result and the recent literature (e.g., Bacon et al., 2019), a consistency threshold of 0.8 was chosen.

The truth table is collapsed, drawing on the Quine-McCluskey algorithm. Besides, the introduction of simplifying assumptions allows to find a balance between complexity and parsimony and is commonly carried out in two steps: usage of all possible assumptions leads to the parsimonious solution, while the intermediate one includes only theoretically substantiated simplifying assumptions (Schneider & Wagemann, 2013; Thomann & Maggetti, 2020). Drawing on the extant literature employing UTAUT, the presence of each condition is supposed to contribute to the presence of BI for the derivation of the intermediate solution.

Intermediate solution	**M1**	**M2**	**M3**
PE	●		●
EE	⊗	⊗	
HM		●	●
SI			●
FC	●	●	●
Consistency	0.833	0.810	0.857
Raw coverage	0.394	0.396	0.565
Unique coverage	0.006	0.009	0.272
Solution consistency	0.782		
Solution coverage	0.675		

Table 8. Intermediate fsQCA solution

Note. Consistency threshold = 0.80, frequency threshold = 2, simplifying assumptions for the intermediate solutions: the presence of PE, EE, SI, HM, and FC should contribute to BI, Large circles = core condition, small circles = peripheral condition

A fundamental value of any crafted model is its consistency, indicating the proportion of cases for a particular combination of conditions that agree in the outcome, which should be at least 0.75 to assume the existence of a subset relation (Ragin, 2006). Commonly deviating from the perfect value of 1.0, consistency is interpreted as the approximation of a subset relation (Maggetti & Levi-Faur, 2013; Veri, 2018). Coverage indicates a consistent subset's empirical relevance, i.e., only consistent subsets can be meaningfully interpreted. Table 8 displays the findings, marking core and peripheral conditions, respectively.

Three solutions were identified (M1, M2, and M3), yielding a satisfying overall consistency of 0.782. Two distinct coverage measures can be used to assess the empirical relevance of a given solution (Schneider & Wagemann, 2010): the raw coverage details the share of the outcome that the solution covers in total, while the unique coverage refers to the share uniquely covered by this particular solution. In a similar manner, the overall coverage of the term including M1, M2, and M3 explains "to what extent the outcomes of interest can be determined based on the extracted set of solutions" (Mikalef & Krogstie, 2020, p. 272).

The first solution term, M1, exhibits the presence of PE and FC combined with the absence of EE, where FC is a peripheral conditions. M1 both yields a high level of consistency (0.833) as well as a substantial coverage value (0.394), i.e., it explains a relevant number of cases. Although sharing the absence of EE, M2 shows the presence of HM and FC. Again, FC is a

peripheral condition. Thus, in contrast to M1, PE is replaced with HM. This solution also exhibits a high consistency (0.810) and explains a relevant number of cases (coverage = 0.396). M3, again a consistent solution (consistency = 0.857) and the solution term with the highest unique coverage (0.272), integrates the presence of PE, HM, SI, and FC, albeit treating EE as indifferent. Importantly, the presence of SI is the only core condition in this solution. In total, M1 and M2 reflect similar notions of low effort being an important condition but present different nuances in the WCT's main benefit: M1 emphasizes the importance of utilitarian aspects (in the form of PE), and M2 focuses on hedonic facets (in the form of HM). Facilitating conditions, such as dedicated team members, software support, and internal documentation, play a peripheral role.

M3 is an interesting solution in the way that it largely differs from the very similar models M1 and M2. Here, the influence of an individual's social surroundings is sufficient to evoke the intention to use the WCT, as marked by the core condition SI. In stark contrast to the other solutions, the absence of EE is not required, and even more, EE is treated indifferently. Rather, the presence of all remaining conditions – PE, HM, and FC – are identified as peripheral conditions. In terms of raw coverage and unique coverage, it can be concluded that M3 yields the most substantial explanatory power of the three solutions. Thus, the presence of SI appears to be a good predictor for BI of WCT, while PE, HM, and FC play peripheral roles.

5.3 Inclusion of gender

In line with the UTAUT framework, the effect of gender is assessed. For this purpose, two different streams of analyses are conducted. For the first series of runs, the dataset is split into subgroups for men and women, i.e., no dummy coding was used but separate datasets. For an overview, fsQCA is used to identify necessary conditions in kind. Table 9 summarizes the results. On a qualitative level, both subgroups yield similar results. For men and women, SI exhibits properties of a sufficient condition. Employing the conservative threshold of 0.95 for consistency, PE, EE, HM, and FC are identified as necessary in kind for the female segment, while EE and FC are detected for the male segment. In the case of FC, the female subgroup yields a striking consistency of 1.000. Consequently, a perfect subset relation was found. Interestingly, a switch from the 0.95 consistency threshold to the initially suggested value of 0.90 would not lead to different results, although HM's consistency is reasonably close for the male subgroup (0.894). The findings, thus, are treated as reliable.

Condition (X)	**Consistency X ← Y (Coverage)**		**Consistency X → Y (Consistency)**	
	Men	Women	Men	Women
PE	0.694	0.657	0.863	0.954
EE	0.484	0.452	0.971	0.978
HM	0.683	0.609	0.894	0.955
SI*	0.804	0.846	0.524	0.652
FC	0.468	0.441	0.960	1.000

Table 9. Necessary condition analysis in kind using fsQCA
Note. *The consistency/coverage interpretation is reversed for SI

NCA is employed to gain insights into a necessity *in degree*. For the female subgroup, significant constraints could be found for all conditions. However, consistent with the overall dataset, SI's effect size appears negligible (d = 0.070). For the male segment, PE, HM, and SI exhibit significant effects. Again, SI's influence is minimal (d = 0.025) and may be neglected. Compared side to side, the most striking difference is found for FC: while for women, the

condition yields a large effect, men are not affected at all (p = 0.597). In the case of PE, a large effect is found for women, while for men, it is medium. HM's results are equivalent. EE has a large effect for women but no convincing influence for men (p = 0.073). Table 10 displays the findings.

Condition (X)	Ceiling zone	Observations	Accuracy	d	p
Subgroup: women					
PE	0.270	2	0.966	0.361	< 0.001
EE	0.258	3	0.948	0.372	0.009
HM	0.302	3	0.948	0.385	< 0.001
SI	0.052	1	0.983	0.070	0.028
FC	0.373	4	0.931	0.506	0.002
Subgroup: men					
PE	0.184	1	0.983	0.227	< 0.001
EE	0.230	3	0.948	0.332	0.073
HM	0.189	2	0.966	0.234	0.001
SI	0.020	1	0.983	0.025	0.003
FC	0.139	0	1.000	0.201	0.597

Table 10. NCA results

Note. Observations refer to cases that are located above the ceiling line, d = effect size, p = p-value derived from a bootstrapping procedure with 10,000 draws

For a more detailed picture of the segmentation, the bottleneck technique is used, as displayed in Table 11. Starting with SI, the condition does not impose constraints for the most part for both segments. While in the female subgroup, effects become apparent for moderate values of Y (i.e., 70 %), the male subgroup does not show restrictions until the full range of the outcome (i.e., 100 %). However, this constraint is twice as large as for women. In the cases of PE and FC, restrictions become visible earlier for women than for men; however, in contrast to SI, they are also higher than for men.

Y	PE		EE		HM		SI		FC	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
0	NN	NN	NN	NN	NN	NN	NN	NN	2.3	NN
10	4.5	NN	NN	NN	NN	2.5	NN	NN	12.0	NN
20	12.4	NN	0.2	3.8	6.3	7.7	NN	NN	21.6	NN
30	20.3	3.3	11.7	13.2	16.7	12.9	NN	NN	31.3	3.9
40	28.2	11.6	23.3	22.6	27.1	18.1	NN	NN	40.9	11.0
50	36.1	19.9	34.9	32.0	37.5	23.3	NN	NN	50.6	18.0
60	44.0	28.2	46.5	41.4	47.9	28.5	NN	NN	60.2	25.1
70	51.8	36.6	58.1	50.8	58.3	33.7	7.9	NN	69.9	32.1
80	59.7	44.9	69.7	60.3	68.7	38.9	17.5	NN	79.5	39.2
90	67.6	53.2	81.3	69.7	79.1	44.1	27.1	NN	89.2	46.2
100	75.5	61.5	92.9	79.1	89.5	49.3	36.7	71.4	98.8	53.2

Table 11. Bottleneck for NCA

Note. Y is stated in percent of the observed values; e.g., Y = 100 corresponds to the highest empirical outcome

For FC, the differences are striking: depending on the desired level of the outcome, the female subgroup requirements are about twice as high in total, considering favourable outcome levels above 50 %. Below this point, the disparities are more extreme. For PE, the factor is about 1.3 for high outcome values and considerably larger for low levels. EE shows similar patterns for both segments, albeit the constraints are somewhat divergent for the highest outcome levels. Demands put on HM are higher for females than for males: while for men, moderate values

are satisfactory to achieve the full outcome range (about 50 % of HM), fairly desirable outcome levels may only be achieved through above-average condition values for women (i.e., more than 50 % of HM).

The subsets yield 58 observations each. Table 12 summarizes the results. The solutions yield satisfying consistencies (M4 = 0.882, M5 = 0.844). Consistency and coverage values are higher for the female segment than for males; still, all measures indicate empirical relevance. Coverage values show that both solutions explain a substantial number of cases: M4 exhibits a value of 0.639, and M5 yields a coverage value of 0.501. As for both subsets, only one solution is identified each, raw coverage values are equivalent to unique coverage. In contrast to necessity *in kind*, the sufficiency examination could not find striking differences considering gender. Nevertheless, the variation in coverage implies that the solution terms' empirical relevance is slightly higher for women than men. Both solutions, however, emphasize the role of SI. This finding has been shown in M3, which was the solution with the largest coverage values for the full dataset. Still, M3 differs from these subset solutions in the way that EE is not treated as an indifferent condition but as a peripheral one. M4 and M5 are striking as they show less parsimonious models than the solutions for the full dataset albeit presenting identical terms.

Subgroup: women		**Subgroup: men**	
Intermediate solution	M4	Parsimonious solution	M5
PE	●	PE	●
EE	●	EE	●
HM	●	HM	●
SI	●	SI	●
FC	●	FC	●
Consistency	0.882	Consistency	0.844
Raw coverage	0.639	Raw coverage	0.501
Unique coverage	0.639	Unique coverage	0.501
Solution consistency	0.882	Solution consistency	0.844
Solution coverage	0.639	Solution coverage	0.501

Table 12. fsQCA solutions for the gender-specific subgroups
Note. Females n = 58, males n = 58

5.4 Predictive validity and sensitivity analysis

In order to complete data analysis, an assessment of the model's predictive validity was conducted. The sample is randomly divided into a training and a holdout partition to erect the model and predict the remaining observations (Pappas & Woodside, 2021). A 50/50 split is used, calculating a consistency of 0.883 and a coverage of 0.771 for the training sample. Next, the solutions M1, M2, and M3 are coded as conditions in the holdout sample, using fuzzy logic. In the final step, these conditions can be plotted against the outcome, BI, in the holdout sample. M1 shows a consistency of 0.860 and a coverage of 0.413, indicating that the argument that M1 is a subset of BI is consistent with the data, and the model accounts for 41.3 % of the sum of the memberships in BI. Similarly, M2 exhibits a consistency of 0.781, and a coverage of 0.416, and M3 achieves a consistency of 0.819, and a coverage of 0.516, yielding the same interpretation. In sum, it can be concluded that the identified solutions are able to make meaningful predictions for new samples, and predictive validity could be established.

Finally, sensitivity analyses were conducted to evaluate the adequacy of the calibration (see, e.g., Mikalef and Krogstie (2020). To do so, the thresholds for full set membership and full non-membership were slightly changed. As symmetric Likert-type scales were used, the cross-over point was maintained, because no meaningful threshold outside the middle of the scale should exist. Qualitatively, the identified solutions did not vastly change, maintaining the core conditions and the overall pattern of the peripheral ones. Hence, it can be concluded that the calibration into fuzzy sets was appropriate and did not elicit patterns on its own.

5.5 Specific propositions

The application of fsQCA allows researchers to test specific propositions (Pappas and Woodside, 2021). To do so, a new model is calculated, including the relevant conditions, and the model is plotted against the proposed outcome. For the context of technology acceptance, two propositions are assessed to gain further insights into user perception: (P1) WCT yield a dual-use property, i.e., a combination of PE and HM should be linked to BI. Wu and Lu (2013) show that many applications, particularly communication-related ones, exhibit a dual-purpose role, i.e., users seek both utilitarian and hedonic gratifications from them. This dual role can be tested using PE and HM from the UTAUT2 framework. (P2) WCTs as collaboration and communication platforms may serve a *social hedonic* role, i.e., a combination of HM and SI should be linked to BI. WCTs provide various different communication channels such as text and video and are influenced by application from the consumer context, such as WhatsApp, Discord, and Facebook messenger. These applications have witnessed the inclusion of increasingly playful content, such as GIFs, stickers, and emoji reactions to previous messages. In addition to sending information, they allow for an entertaining mode of operation.

In the case of P1, a consistency of 0.867 and a coverage of 0.752 support the dual role of WCTs, indicating that PE and HM considerations alone may inform the decision for or against a particular application. P2 saw the combination of HM and SI, yielding a consistency of 0.846 and a coverage of 0.567. Again, support for the proposition could be established, suggesting that WCT acceptance is informed by social considerations and the opportunity to maintain entertaining communications, which is enabled by a vast array of emojis, GIFs, stickers, and other features.

5.6 Use behavior

Participants were asked about their actual usage behaviour besides the mandatory exercise sheets. A six-item ordinal scale was used, ranging from 'I do not use Slack' to 'I use Slack several times a day'. 69.0% do not use Slack while 31.0% do. Next, participants were shown 18 use scenarios. They were asked to indicate which of the following are part of their consideration set (not using the specific term) for each of the tasks: Slack, a dedicated, stand-alone application, or an "offline" tool (such as a phone). Table 13 summarizes the results.

The first two columns of Table 13 can also be thought of as a transposed partition-by-use matrix, with two data rows (one for the data headers and one for Slack evaluated over all known partitions) and 18 columns indicating use scenarios, i.e., intended purposes. One-sample χ^2-testing could not find evidence to reject the null hypothesis (i.e., all responses are equally likely) for use scenarios 1, 10, and 11. Overall, evaluations follow a pattern, indicating the presence of preferences.

Use Scenario	Slack	Stand-Alone	Offline	χ^2	p (df = 2)
1 Meet for lunch / coffee breaks	27.6	33.6	38.8	2.190	0.335
2 Create polls°	66.4	31.0	2.6	71.086	< 0.001
3 Read email	8.6	88.8	2.6	161.190	< 0.001
4 Send email	7.8	89.7	2.6	166.052	< 0.001
5 Read social media	5.2	87.9	6.9	155.655	< 0.001
6 Write social media	3.4	90.5	6.0	170.810	< 0.001
7 Share files°	62.9	34.5	2.6	63.431	< 0.001
8 Phone colleagues	12.9	32.8	54.3	29.810	< 0.001
9 Phone externals	3.4	38.8	57.8	52.879	< 0.001
10 Hold meetings°	44.8	25.9	29.3	7.103	0.029
11 Take quick notes°	44.0	31.0	25.0	6.534	0.038
12 Manage calendar	28.4	62.1	9.5	49.362	< 0.001
13 Support customers	25.0	66.4	8.6	61.672	< 0.001
14 Analyze website statistics	26.7	71.6	1.7	87.121	< 0.001
15 Socialize (in-house)°	57.8	15.5	26.7	33.328	< 0.001
16 Find support for current challenges°	56.0	24.1	19.8	27.224	< 0.001
17 Track and manage projects°	49.1	45.7	5.2	41.603	< 0.001
18 Manage documentation	26.7	67.2	6.0	67.466	< 0.001

Table 13. Use scenario evaluation
Note. Values in %, slack is preferred for this use scenario

The first two columns of Table 13 can also be thought of as a transposed partition-by-use matrix, with two data rows (one for the data headers and one for Slack evaluated over all known partitions) and 18 columns indicating use scenarios, i.e., intended purposes. One-sample χ^2-testing could not find evidence to reject the null hypothesis (i.e., all responses are equally likely) for use scenarios 1, 10, and 11. Overall, evaluations follow a pattern, indicating the presence of preferences.

6 Discussion

6.1 Summary

The findings shed new light on technology acceptance of collaboration technology. In total, three solutions (M1, M2, and M3) were identified that explain the presence of BI. Two of these – M1 and M2 – share a similar pattern, emphasizing the absence of EE as a core condition and the presence of FC as a peripheral one. They differ, however, in their presence of either PE (M1) or HM (M2). Thus, one model stresses WCTs' utilitarian aspects, while the other includes their hedonic dimension. M3, on the other hand, yields SI as a core condition and treats the remaining UTAUT variables as peripheral ones, except for EE, which is detected as an indifferent condition. What is particularly intriguing about this solution is the fact that it yields the highest coverage, i.e., explains the most substantial number of cases. Dataset segmentation according to gender corroborates the importance of M3: gender-specific solutions show the same pattern, however also include the presence of EE as a peripheral condition.

Surprisingly, PE was not a necessary condition for the male subset, contradicting existing work on necessary conditions in technology acceptance (Kopplin et al., 2021) but also questioning the variable's predominant position in technology acceptance frameworks. Commonly, multivariate analyses identify PE as a major factor (Im et al., 2011; Venkatesh et al., 2003; Zhou et al., 2010). Its role may be limited to that of a sufficient condition, depending on the setting, which corroborates demands for contextualization (Venkatesh et al., 2016). Regarding HM, the results provide convincing evidence of the relevance of including hedonic concepts in work-

related settings. This importance has been stressed in the literature by the notions of dual-purpose IS and consumerization (Harris et al., 2012; Jarrahi et al., 2017; Wu & Lu, 2013). For WCT, in particular, the main functionalities are common to the user from consumer settings: a persistent text-based communication channel is at the core of a WCT application, which resembles the look and feel of SMS, online chatrooms, and smartphone-based instant messaging. Audio and video calls are part of most mobile devices' standard equipment, such as the FaceTime App provided by Apple (Apple, 2020). A similar case can be made for third-party integrations, which are a significant characteristic of WCT (Gartner, 2018). From the consumer context, many IS users are familiar with searching, installing, and utilizing third-party apps for various tasks. Consequently, gaining the opportunity to upgrade a work-related platform may appear ergonomic; although, for software applications in the organizational context, this operation mode is rather uncommon.

6.2 Theoretical implications

Findings for the total sample, i.e., M1 and M2, reflect the dyadic nature of dual-purpose information systems (Wu & Lu, 2013). Both configuration explain about the same proportion of cases; however, M1 emphasizes the utilitarian nature of WCT, while M2 focuses on their hedonic dimension. Consequently, WCT may be treated as dual-purpose information systems. The presence of FC as a peripheral condition indicates that individuals include their environmental resources regarding the technology in their decision-making: facilitating conditions may manifest in the form of a dedicated software support, a power user helping others, rich documentation, or professional training. Thus, technology acceptance, at least in the context of WCT, does not merely reflect user perception of the technology's properties but considers the surroundings in which the target technology is to be implemented. The parsimonious nature of solutions M1 and M2, treating about half of the UTAUT variables as indifferent, suggests that the extensive framework may not be required in its full range to explain technology acceptance.

M3 exhibits the most substantial empirical relevance considering its coverage values. Here, SI is the only core condition, extended by peripheral ones except for EE. Thus, technology acceptance may be significantly shaped through social consent, which would imply a less important role of the WCTs' characteristics. As research on technology acceptance, adoption, and user experience advances, it appears likely that competing applications converge in their perceived qualities such as PE, EE, and HM. Consequently, the final decision for or against technology acceptance in an industry offering similar solutions may be shifted to other considerations, such as the social environment in which the application is planned to be used.

From a necessity perspective, fsQCA necessity analysis results showed that low perceived effort (i.e., EE) is a critical condition. This finding corroborates existing necessity results for technology acceptance models (Kopplin et al., 2021) and provides an important supplement to the existing insights into the role of effort. The majority of findings on technology acceptance uses structural equation modeling, which frequently identifies perceptions of low effort as exerting a small impact or being not significant as an independent variable (see, e.g., King & He, 2006). Besides EE, FC was detected as a necessary condition both by fsQCA and NCA, yielding a large effect (Dul, 2016b). FC emphasizes the perceived compatibility of the technology with the individual's environment and denotes a user's "belief related to one's control over the use of IS" (Venkatesh et al., 2011, p. 534). Thus, it is relatively unsurprising that environmental conditions have a crucial impact on usage intention regarding a highly

integrated, pervasive collaboration platform. These substantial constraints suggest that users require a supportive environment, which may be attributed to the WCT's feature range itself in the form of training, documentation, and helpful navigation tutorials, confirming that the collaboration technology qualities proposed by Brown et al. (2010) also apply to WCT. Even more, FC is demanded to allow use behaviour. Drawing on the bottleneck technique (Dul, 2016b), FC was identified as a chokepoint for any level of BI and thus needs to be included in managerial decisions.

Summarizing the necessity assessment, two approaches were used to identify necessary conditions: an fsQCA procedure and NCA. At first glance, results appear contradictory: fsQCA identifies EE and FC as necessary conditions, while NCA finds statistically significant constraints for all five conditions. Here, it is important to note that the consistency thresholds for fsQCA were set to a very high value (0.95). A more liberal threshold of 0.90 may have been used (Dul, 2016a; Schneider & Wagemann, 2012). In this case, fsQCA and NCA yield similar results: PE, EE, HM, and FC pass the fsQCA threshold and are identified as necessary. Both analyses differ in their assessment of SI: fsQCA offers evidence for a sufficient condition. NCA, by its nature, can only provide insights into a potential necessity, and thus does not establish sufficiency for SI. On the other hand, while the bootstrapping procedure finds a statistical significance for SI's ceiling zone, the effect size is very small (d = 0.015). Thus, the constraints imposed by SI seem negligible, and its role is best described as a sufficient condition in the context at hand and its potential role as a weak necessary condition may not play a major role in practice.

6.3 Practical implications

Considering the sufficient solutions M1 through M3, it appears plausible that utilitarian and hedonic aspects are important for the field of WCT. However, the empirically most relevant solution M3 suggests a focus on social influence, i.e., what tips the scale may be the agreement between prospective users on which application to implement. In an industry with highly similar tools, such as WCT, this means that vendors need to leverage their first-mover advantage and prioritize user count over financial gain in order to gain market traction. Commonly, WCT applications offer free versions that can be upgraded (i.e., a freemium model). This strategy is consistent with the results at hand and should be strengthened by leveraging an organization's social connections. For example, employees holding a lighthouse position, such as project managers and team leaders, may be incentivized with free premium versions of the software to expose their surroundings to a particular solution. Similarly, SMEs may be provided scalable packages that grow in their functionality range as the business expands. Here, WCT vendors may focus on the accessibility of business intelligence for SMEs.

Low perceived effort was identified as a necessity from the users' perspective. As this quality is inherent in the chosen software application, organizations seeking to implement a WCT solution need to thoroughly assess their demands and available providers to find a suitable match. It appears unfeasible to select a well-known application merely for the sake of its popularity without considering the organization's individual characteristics. Further, facilitating conditions, which may be formed by the organization, have been found to be necessary for usage intentions. This demand may be met in the form of customized chatbot support (e.g., in the case of Slack's Slackbot), dedicated onboarding and help depositories, and within-application documentation. However, it is possible for organizations to provide assistance outside of the WCT's digital sphere, e.g., by means of workshops and introductory

courses. Still, these may be either conducted via the WCT's functionalities, such as videoconferencing, or recorded and made available for on-the-fly access during usage.

Examining use scenarios, it becomes evident that integrated platforms are not favoured for all kinds of tasks. Stand-alone applications are preferred in the areas of e-mail and social media, both of which are scenarios with quite a long history of dedicated software. For tasks that require a rather high degree of specialization, as in the cases of website analytics, customer support, and documentation, participants also indicated a preference for dedicated, stand-alone software. Interestingly, voice calls were stated to be made using phones, i.e., neither an integrated WCT nor well-known applications such as Skype or Google Hangouts. WCT were found to be attractive for productivity-related tasks such as polls, file sharing, note-taking, and project management, but also for socializing. This is also consistent with the most used integrations: cloud storage and project management. While the others fit the utilitarian assessment, socializing likely corresponds to the instant messaging-based, somewhat playful environment that many WCT exhibit. Furthermore, various integrations (such as Donut for Slack) are solely dedicated to onboarding and socializing. Indeed, participants' evaluation of hedonic aspects suggests the relevance of a joyful component, which may be implemented in the form of a dedicated third-party integration or customized chatbot information that reflects the organization's culture.

6.4 Limitations and future research

As for all scientific studies, some limitations need to be addressed. First and most important, while the study's Slack workspace was continuously updated with content both by participants and supervisors and may be considered realistic in amount and type of information, respondents might have been well aware that many contributions did not demand a personal response. This may contrast real-world digital workspaces, where any content could require a reaction. Further, participation was voluntary, and all respondents were students with varying degrees of work experience. Concerning use scenarios, these were compiled drawing on earlier research, practitioner data sources such as blogs, a focus group consisting of eight individuals, and followed the lines of Ratneshwar and Shocker (1991). However, these scenarios may differ across contexts and environmental settings and may only serve as a first indication. Further, all participants were located in Germany, and the investigation took place before the impact of the COVID-19 pandemic.

Overall, BI was assessed rather indifferent. This poses the question of why users might prefer other solutions even when confronted with an all-around tool. Findings in related areas, such as provided by Amoroso and Lim (2017), Gefen (2003), Venkatesh, Thong, and Xu (2012), and Polites and Karahanna (2012) propose that mere habit may be highly influential.

Future research might focus on the inter-device nature of WCT that allows a ubiquity of work processes and work-related communication. This "'always available' work culture" (Jarrahi et al., 2017, p. 570) of consumerization blurs the boundaries between work and private settings (Mazmanian et al., 2013). Extant research suggests that this kind of interference elicits feelings of technology-induced stress (Ayyagari et al., 2011; Tarafdar et al., 2007; Weil & Rosen, 1997). Consequently, it is essential to understand the nature of these stress effects, and particularly examine whether they are positive (i.e., eustress) or negative (i.e., distress) in their impact on employees (Tarafdar et al., 2019).

The study was conducted shortly before the outbreak of the COVID-19 pandemic. This p.emic strikingly displayed the importance of remote work and, thus, also emphasizes the role of WCT. Future research might investigate changes in user perception and organizational commitment to this type of tool in the post-COVID period. For example, organizations increasing their involvement in digital collaboration are expected to invest in facilitating conditions, and the achieved normality of home-office and remote work during the pandemic – although rather forced – may have altered user perceptions of collaboration tools. Thus, it appears important for the field to examine whether these impacts yield a favourable or an adverse effect on future WCT usage.

7 Conclusion

Using the established UTAUT model with a supplementary measure for hedonic motivation as a framework, both fsQCA and NCA corroborated the relevance of the model's variable set from a novel perspective. On a large scale, i.e., when the full range of BI is considered, FC yields the most substantial impact, followed by EE. This result stresses the paramountcy of creating a supportive, technologically compatible software environment when introducing a WCT. This environment may comprise standardized manuals and help guides that users can access at any time, as well as dedicated personnel administrating the workspace. Particularly the vast amount of available third-party integrations requires organizations to establish rules and guidelines on mandatory and voluntary expansions, the degree of autonomy each end-user has when it comes to personalization, and the mode of operation these integrations require. For many integrations are connectors to full-size stand-alone applications, individuals should also be informed about whether the standard mode of operation is from within the WCT or direct access to the application to reduce friction and prevent misunderstandings.

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Appendix A

Items (retranslated from German) and outer loadings

Construct	Items	Loadings	Reference
Performance expectancy	PE1. I find Slack useful in my daily life.	0.808	Venkatesh et al. (2003), Venkatesh et al. (2012)
	PE2. Using Slack increases my chances of achieving things that are important to me.	0.843	
	PE3. Using Slack helps me accomplish things more quickly.	0.884	
	PE4. Using Slack increases my productivity.	0.811	
Effort expectancy	EE1. Learning how to use Slack is easy for me.	0.876	Venkatesh et al. (2003), Venkatesh et al. (2012)
	EE2. My interaction with Slack is clear and understandable.	0.866	
	EE3. I find Slack easy to use.	0.883	
	EE4. It is easy for me to become skillful at using Slack.	0.864	
Social influence	SI1. People who are important to me think that I should use Slack.	0.857	Venkatesh et al. (2003), Venkatesh et al. (2012)
	SI2. People who influence my behavior think that I should use Slack.	0.915	
	SI3. People whose opinions I value prefer that I use Slack.	0.908	
	SI4. Colleagues think that I should use Slack.	0.769	
Facilitating conditions	FC1. I have the resources necessary to use Slack.	0.706	Venkatesh et al. (2003), Venkatesh et al. (2012)
	FC2. I have the knowledge necessary to use Slack.	0.799	

	FC3. Slack is compatible with other technologies I use.	0.744	
	FC4. I can get help from others when I have difficulties using Slack	0.577	(dropped)
Hedonic motivation	HM1. Using Slack is fun.	0.924	Venkatesh et al. (2012)
	HM2. Using Slack is enjoyable.	0.912	
	HM3. Using Slack is very entertaining.	0.857	
	IN3. I feel constantly connected to work.	0.447	
Behavioral intention	BI1. I intend to continue using Slack in the future.	0.947	Venkatesh et al. (2012)
	BI2. I will always try to use Slack in my daily life.	0.926	
	BI3. I plan to continue to use Slack frequently.	0.952	

Appendix B

Indicator covariance matrix

	BI_1	BI_2	BI_3	EE_1	EE_2	EE_3	EE_4	FC_1	FC_2	FC_3	HM_1	HM_2	HM_3	PE_1	PE_2	PE_3	PE_4	SI_1	SI_2	SI_3	SI_4
BI_1	1.252																				
BI_2	0.936	1.087																			
BI_3	1.011	0.884	1.078																		
EE_1	0.262	0.255	0.214	0.648																	
EE_2	0.214	0.187	0.212	0.460	0.709																
EE_3	0.273	0.179	0.185	0.470	0.450	0.646															
EE_4	0.312	0.258	0.278	0.489	0.536	0.514	0.871														
FC_1	0.161	0.050	0.069	0.220	0.230	0.211	0.186	0.611													
FC_2	0.336	0.221	0.249	0.369	0.359	0.378	0.368	0.300	0.737												
FC_3	0.440	0.307	0.319	0.221	0.135	0.199	0.208	0.277	0.347	0.930											
HM_1	0.530	0.516	0.442	0.274	0.165	0.253	0.272	0.093	0.243	0.215	0.696										
HM_2	0.560	0.526	0.440	0.259	0.181	0.198	0.250	0.129	0.353	0.190	0.595	0.793									
HM_3	0.573	0.582	0.465	0.302	0.211	0.223	0.312	0.076	0.272	0.174	0.574	0.586	1.032								
PE_1	0.665	0.658	0.564	0.264	0.161	0.170	0.206	0.063	0.202	0.279	0.508	0.526	0.505	0.916							
PE_2	0.469	0.461	0.385	0.160	0.157	0.134	0.123	0.070	0.109	0.286	0.348	0.414	0.321	0.490	0.797						
PE_3	0.596	0.589	0.495	0.238	0.178	0.248	0.275	0.028	0.184	0.356	0.456	0.483	0.479	0.597	0.671	1.123					
PE_4	0.643	0.536	0.509	0.186	0.166	0.218	0.180	0.054	0.230	0.342	0.408	0.422	0.392	0.576	0.509	0.731	1.165				
SI_1	0.339	0.398	0.333	0.141	0.111	0.150	0.197	-0.018	0.173	0.177	0.323	0.328	0.386	0.424	0.362	0.467	0.454	0.837			
SI_2	0.499	0.584	0.464	0.197	0.151	0.151	0.243	-0.013	0.143	0.247	0.356	0.440	0.422	0.573	0.517	0.668	0.661	0.746	1.246		
SI_3	0.496	0.562	0.417	0.190	0.142	0.203	0.206	-0.009	0.204	0.230	0.410	0.440	0.397	0.565	0.481	0.634	0.635	0.659	0.998	1.137	
SI_4	0.644	0.561	0.627	0.193	0.128	0.216	0.237	-0.025	0.229	0.364	0.462	0.448	0.424	0.545	0.449	0.588	0.673	0.592	0.740	0.751	1.386

Appendix C

Fornell-Larcker assessment

	BI	**EE**	**FC**	**HM**	**PE**	**SI**
BI	0.942					
EE	0.320	0.872				
FC	0.408	0.538	0.749			
HM	0.630	0.406	0.419	0.898		
PE	0.665	0.316	0.408	0.659	0.836	
SI	0.536	0.265	0.357	0.538	0.707	0.863

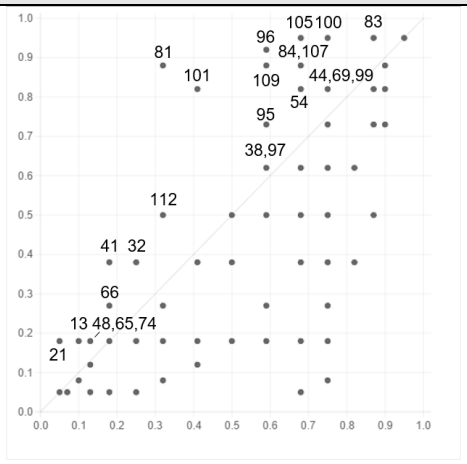
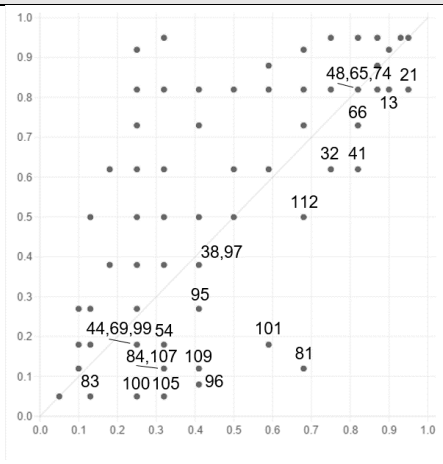
Appendix D

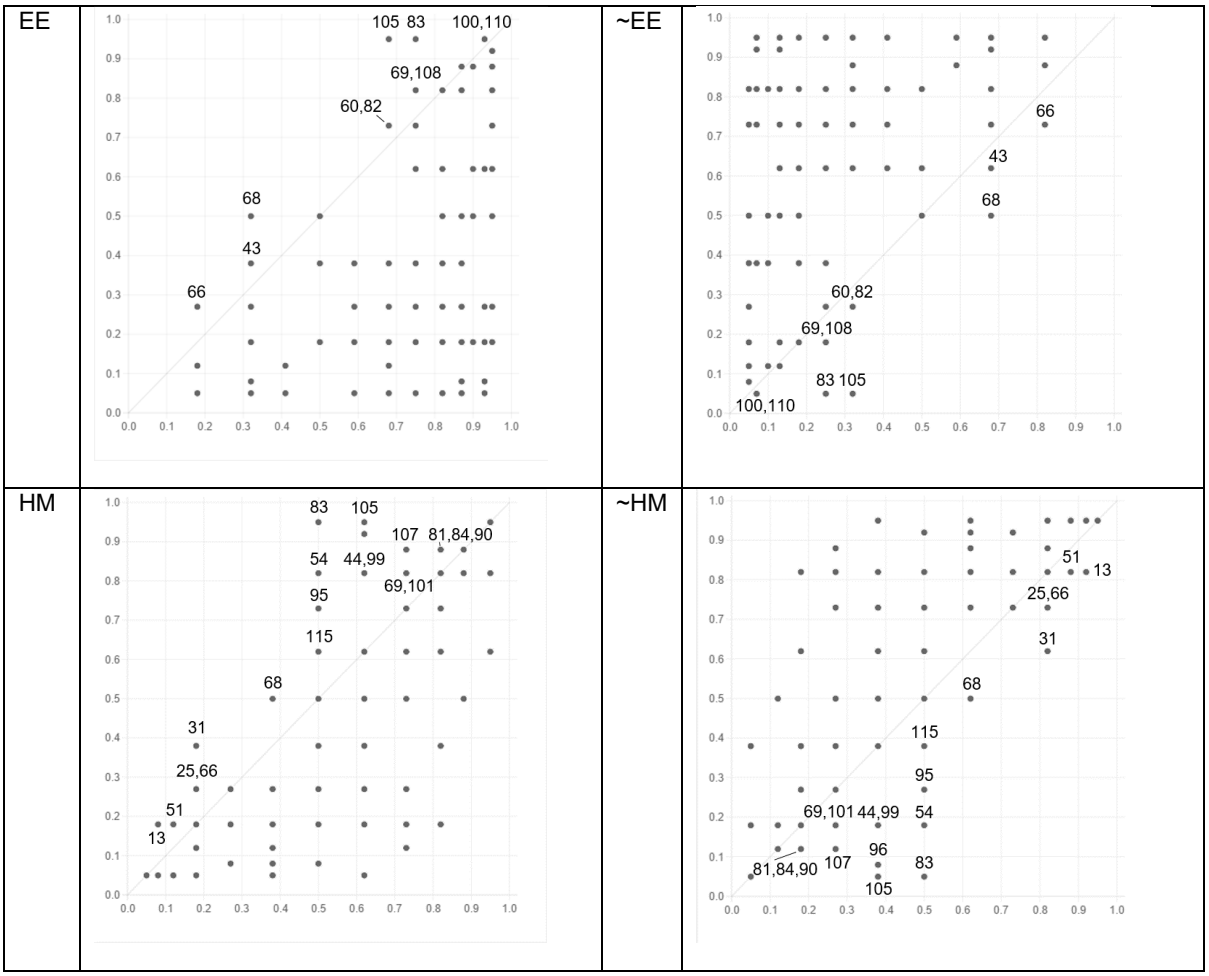
Heterotrait-monotrait ratio

	BI	**EE**	**FC**	**HM**	**PE**	**SI**
BI						
EE	0.346					
FC	0.449	0.738				
HM	0.691	0.452	0.515			
PE	0.730	0.356	0.460	0.746		
SI	0.581	0.294	0.381	0.607	0.808	

Appendix E

XY plots, Values indicate case IDs

	BI		**~BI**
PE		~PE	



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