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Applying Task-Technology-Fit Theory to Explore Users' Behavior Effect of Fitness App Feature Design: A Case of Keep App

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ABSTRACT:
Health information technology, such as fitness application(APP), enable consumers adopt healthy behaviors and improve health outcomes. To best serve exercisers and assist IS designers that are developing and promoting fitness technologies, we need a better understanding of how individuals' exercise motivations influence their fitness technology feature set use and how these features and motivations combined would affect the wellness outcome. However, we have limited insight into what drives the use of fitness technologies or how they may contribute to wellness outcomes. To address this gap, our study examines how exercise goals are related to fitness technology feature set use and how the use is associated with a measure of the exercisers' psychological well‐being. We take a closer look at use concepts to understand how fitness APP use facilitates behavior change by taking both task-technology fit theory (TTF) and self-determined theory (SDT) perspectives to test the configuration relationship between exercise motivation, fitness technology feature use and wellness outcome. The results shows that user with different exercise motivation have different pattern of fitness feature use and that would lead to different wellness outcome. Moreover, our findings also suggest that data management features is the core function of the fitness APP, and that social interaction feature may not always have the positive influence on the wellness outcome. As a higher level goals than the instrumental pursuit, perfect user experience had a more strict condition asked for the self-determined exercise motivation and sufficient familiarity and frequency of all fitness feature use. This leads us to suggest that providing every type of exerciser the motivational support that best fits their motivational profile may not be a trivial task, but it ultimately may be necessary for fitness technologies to be universally useful in supporting wellness outcomes.
KEY WORD: *fitness APP; wellness outcome; technological feature support; motivation theory;*

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I. INTRODUCTION

With the rapid development and diffusion of mobile technologies, mobile health applications such as the fitness APP, have become a prevalent type of health information technology among consumers. Fitness apps offer a novel and powerful channel to deliver behavioral interventions at a massive scale. In the endeavor to promote healthier behavior, fitness apps aim to enhance physical competencies –people's abilities to perform and to achieve physical activity goals– that are essential for motivation, behavior change, and sustained engagement. The ultimate goal of such technologies is to help people change their behaviors. However, because they are emerging technologies, research is only beginning to examine the impact of early generations of fitness technologies and what may drive user preferences for the different features they offer. So far, much of the available literature examined fitness apps as a 'whole' so that the actual role each fitness tech feature plays is not well understood.

By reviewing the fitness APP literature in IS journals ,it's surprising to find that superficial fitness APP use concepts (e.g. adoption intention and duration of use) dominate this literature stream(Rockmann and Gewald 2019). Research on features use care more about the IS design and focused on particular factors that enable or hinder adoption or usage of APP while ignore consumers' characteristic like exercise motivation or intention. Much of the available literature examined fitness apps as a whole so that the actual role each fitness tech feature plays is not well understood. For example, we'd like to investigate whether user with high intrinsic exercise motivation will use the social interaction functions in a fitness APP rather than whether they will adopt a fitness technology (wearable device and mobile application).

Current studies, however, cannot explain well how individuals with different exercise motivations use them and how these features may contribute to improving human wellness outcomes. Therefore, we are looking for some rich and theoretically-driven concepts of fitness APP use that can help to better understand what users do with fitness APP and how this affects relevant health outcomes.

Our study contributes to this conversation by examining how fitness goals drive use at a feature set level and how these goals and technology feature use are associated with the wellness outcome—instrumental and experiential outcome, a measure of meaningful engagement in fitness activity. Specifically, we examine how

intrinsic and extrinsic exercise goals drive fitness technology feature use. In addition, we examine the associations between exercise motivation, fitness technology feature use, and desirable wellness outcome (both instrumental and experiential). The theory framework of our study is provided in Figure 4. In the following sections, we provide further details of our guiding theories, which frame our overarching model, and then we test the collective effect between the exercise motivation, fitness feature use and wellness outcome. Based on the fsQCA results, we put 4 propositions and discuss the contribution and limitation.

Our results are useful to practitioners because they provide insight into how exercise goals drive feature use and what, if any, association use has with well‐being. Thus, we provide details that can help explain how people are using fitness technologies, which can be used to inform the design and development of usage suggestions for subsequent generations.

II. THEROETICAL BACKGROUND

2.1 The Impact of Fitness APP

Our work is related to prior literature on the impact of adopting fitness APP. Recently, with the rapid development of healthcare IT technologies and digital platforms, many researchers have looked into the digital transformation of healthcare including fitness. As the main type of healthcare IT, fitness APP represent an emerging type of information system making use of newer fitness technologies to lead to both experiential and instrumental outcomes. Fitness APPs grant users more control over their health by providing them with the continuous tracking of personal health information, through which users can obtain more functional independence like social support, more exercise guideline, and better training. A study by Liu et al (Liu et al. 2017) for example indicated that instrumental outcome and experiential outcome is the proxy of meaningful engagement, suggested that the IS designer should not only design an meaningful information system for user to enhance instrumental task outcomes to better achieve their goal but also help user gain enjoyable experiences and foster engagement which is beneficial for health improvement form a long term view. In the content of fitness APP developing, we should take both the technology feature use and personal exercise motivation into consideration so that we could have a better understanding for what, how and why user choose the fitness APP features and how does their motivation and the feature choosing would affect their final wellness. The personal instrument outcome and experience outcome are not only the indicator to evaluate a fitness IS but also the key measurement for users' wellness outcome.

However, additional outcomes such as attention, arousal, and cognitive effort could also represent experiential outcomes for tasks such as learning, online shopping, and decision making, because these can be seen as representing engagement levels of the user (Bui et al. 2015; Deng and Poole 2010). Whatever the choice of experiential outcomes, the key is to identify them along with the intended instrumental outcomes and design accordingly. Therefore, we took the concept of absorption as the proxy of experiential outcome.

Using these insights as a starting point, we turn to the emerging literature on use of fitness APPs to suggest that the different use pattern of fitness technology feature would lead different wellness outcome.

2.2 Self-Determined Theory

Motivation theory, specifically self-determination theory (SDT) posits that all individuals have natural, innate and constructive tendencies to develop themselves. However, whether these potentials are to be realize decided by social context. SDT propose a continuum of motivational regulations from intrinsic motivation to extrinsic motivation and amotivation that is, these types of motivation are not distinct, but lie on a continuum of self-determination or autonomy.

Each of these motivations, considering the rate of autonomy, is placed on a continuum limit ranged from low autonomous (external motivation) to high autonomous (intrinsic motivation). Intrinsic motivation, where an individual performs an activity for the pure enjoyment or satisfaction derived from its performance, is autonomous or self-determined. Alternatively, extrinsic motivation, where an individual performs an activity due to perceived external pressure to do so and in order to attain some separate outcome, is controlled or non–self-determined.

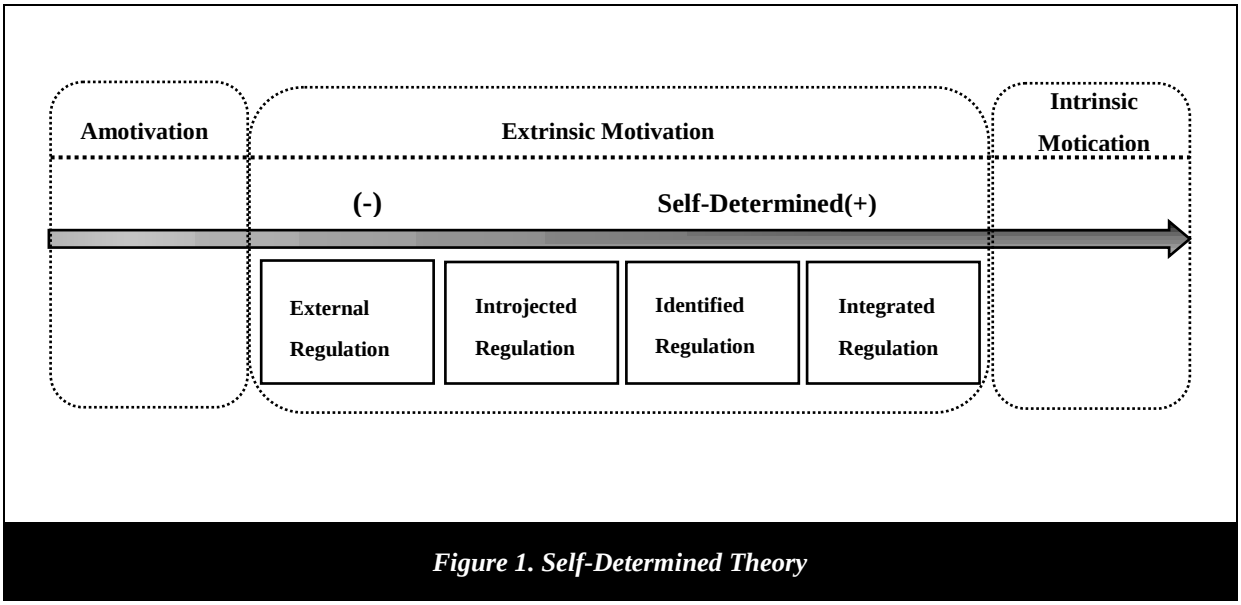

Figure 1. Self-Determined Theory

SDT also suggests that exercisers may have different types of motivation toward exercise, but unlike many contexts in which SDT has been studied, exercisers with varying motivations can choose their own selection of environmental motivational supports that is they may choose some fitness technology features to support their fitness training but do not adopt a fitness application fully for the reason that some technology features could not only support but also hurt the motivation so they are more likely use those features

2.3 Task Technology Fit Theory

Fitness apps such as KEEP aim to motivate people towards physical activity by providing the fitness technology features supporting exercise.Through these features, fitness apps provide a set of 'motivational affordances' to the user (Stragier et al. 2018).The concept of 'affordances' generally refers to the potential ways of using information technology in support of one's goals (Markus and Silver 2008). These technology affordances suggested that individuals, and here refers to fitness app users, hold different exercise motivations and goals for physical activity and that the personal environment like the fitness APP features needs to be aligned with such individual motivations and goals for optimal motivational effects.

Task Technology Fit (TTF) theory points a clearer framework for understanding the relationship between users exercise motivation, fitness APP feature and wellness outcomes. The TTF model was first developed in 1995 by which researchers evaluate how information technology leads to performance, assess usage impacts, and judge the match between the task and technology characteristics (Goodhue and Thompson 1995) that is, how a system technology provides features and support that "fit" the requirements of a task. In contrast with models predicting acceptance and use, TTF attempts to explain user performance with information systems. The premise of the theory is that individual performance can be enhanced when the functionality provided by the technology meets the user's needs, i.e., fits the task on hand. It provides a minor lens that allowed us to go deeper with the characteristic of both IS and individual so that it could contribute to illustrating the mechanism of producing high level outcomes.

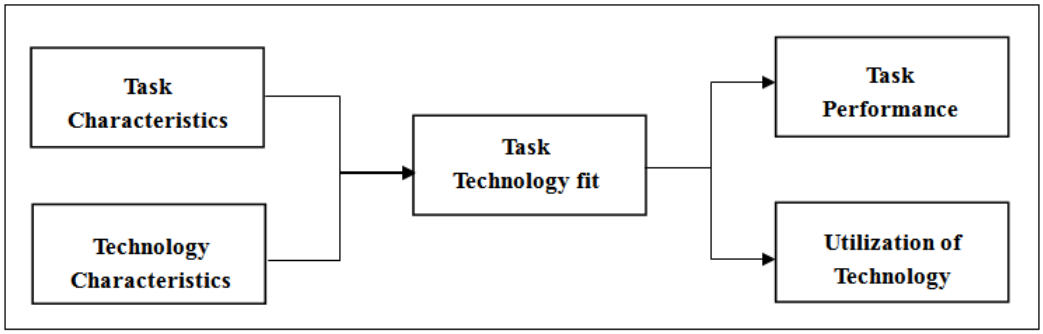

Figure 2 The task-technology fit (TTF) model.

Technologies are viewed as tools used by individuals in carrying out their tasks. In the context of IS discipline, technology refers to computer systems and user support services provided to assist users in their tasks. Here in this study it mainly refers to the fitness APP tech features (i.e. social interaction, exercise control and data management) that individual use to better exercise.

Grounded at the framework of TTF, it draws a clear research outline for this study. SDT suggests that exercisers may have different types of motivation toward exercise that is while taking paring in a fitness activity, users' motivation is a kind of nature characteristic that encourage them to choose different fitness technology features. Fitness technologies provide features such as the data management, social interaction and exercise control that exercisers choose to support their exercise task and in turn these features are the technology characteristics provided by the fitness APP that user chose. Hence, when interpreting the motivational affordances as the personal environment of fitness app users, SDT appears to be a suitable theoretical perspective to better understand the role of motivational affordances in causing positive and adverse motivational consequences.

Tasks means the actions carried out by individuals in turning inputs into outputs. In the content of exercise, the task here is the exercise goals (i.e. weight losing, good figure, or health improvement) and the task characteristic is more like the motivation that motivated themselves to exercise.

Task-technology fit is the degree to which a technology assists an individual in performing his or her portfolio of tasks, that is the relationship between the exercise motivation and fitness APP tech features selection in this investigate we hope figure it out.

Performance refers to the accomplishment of a portfolio of tasks by an individual. Higher performance implies some mix of improved efficiency, improved effectiveness, and/or higher quality. With the motivation theory framework and research background, individual go for fitness with different motivations aiming to obtain some wellness outcomes (good figure, or flow experience etc.) Therefore, we took the wellness outcomes as the proxy of task performance within the content of exercise.

The TTF model also suggests that users will gain higher positive outcomes based not only on technology characteristics, but also on the extent to which that technology meets users' task needs and their individual abilities (i.e., task-technology fit)(Thompson 1995). SDT provides the framework of users' motivation toward fitness and the TTF guide us to bridge the fitness APP tech features to exercisers' motivation. Therefore, what kind of fitness APP tech features will users with different exercise motivations are more likely to use and how they use it is the key issue of this study. Following the logic of the task technology fit theory, we argue that different SDT subtypes of exercisers will choose different fitness APP tech features.

III. RESEARCH MODEL

While fitness technologies are becoming increasingly popular, little is known about how individuals use them and how that use may contribute to wellness outcomes. Grounding this study in both SDT & TTF theory, we start this study with the premise that individuals go for exercise with some extend self-determined motivation and that different exercise motivation will drive the different selection of fitness tech feature use. Table Ⅰ describe the interest construct of this study.

Table Ⅰ: Main Construct (DV & IV)

Antecedent / IV	Definition	Reference
Amotivation	State of lacking the intention to act.	Markland & Tobin 2004; Wilson et al. 2006
Extrinsic Motivation	Doing an activity responds to external pressure.	
Intrinsic Motivation	Doing an activity for the inherent satisfaction of the activity itself.	Richard M. Ryan and Edward L. Deci.2000
Social Interaction Features	Features that allow the exerciser to interact with other people. The SIFs enable social interaction for the purposes of data sharing, encouragement, competition, comparison, and coaching.	
Sport Control Features	Features offer rewards and reminders that prompt a user to exercise, and goal management allows the user to create and manage the goals (i.e., rule set) the fitness technology uses to determine when the rewards and reminders are triggered.	Tabitha L. James et al. 2019
Data Management Features	Features collect, analyze, and feed data from the app to the users regarding their exercise activity as well as provide data from other sources (e.g., maps of running and walking routes)..	

Outcome/ DV	Definition	
Instrument Outcome	Depends on the work context for which the IS was developed. In the content of fitness APP, it should involve the goal achievement (weight loss, improved fitness),vitality(stress reducing and better toning) and vital behavior change(continual intention to exercise)	Liu et al. 2017;
Vitality	A feeling of personal energy associated with agency, which can be diminished by factors that block or hinder autonomy or competence.	Bostic et al. 2000; Ryan & Frederick 1997
Goals Achievement	Improvements of health behaviors.	
Continue Intention to Exercise	Users' intention to continue exercise.	Hamari et al.2015
Experience Outcome	Enjoyable experiences and foster engagement.	Liu et al. 2017;
Engagement	A positive and fulfilling of mind that is characterized by vigor, dedication, and absorption	Ayoung Suh et al.2018; Schaufeli et al. 2009

How could individual achieve high wellness outcome when doing exercise through a fitness APP? What kind of exercise motivation will the individual comes with and what kind of the tech features will they more likely to use? How does the motivation toward exercise affect the fitness APP tech features selection and vice versa?

Motivation toward exercise as a type of dynamic state can be viewed as a type of individual elements and also a configuration of the final wellness outcomes. So does the feature selection. There is little efficient theory evidence shows that the exercise motivation has a linear relationship with the fitness APP feature selection, while these two factor do contribute to the wellness outcomes according to the self-determined theory and task technology fit theory. Thus, a configurational approach might support this view of organizational strategic competitiveness by explaining how the motivational and technological feature elements combine into bundles to make the outcome of interest. Figure 3 depicts the nomological network of our research.

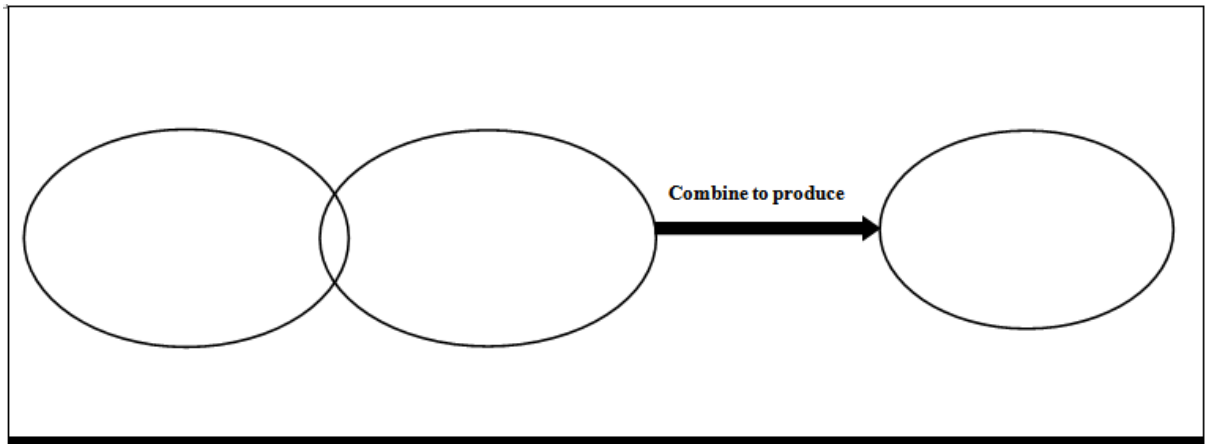

Figure 3. Nomological Network of Configurations Producing Wellness Outcome

IV. DATA & METHOD

4.1 Data collection

The data used in this study were collected through an online survey using a questionnaire. We used some high-validity scales existing in previous research, in which the dimensions of wellness outcomes were come up with (Liu et al. 2017) ; MPAM- R items were adopted to observe motivation(Wilson et al. 2008) and the items to measure the use of fitness technology features were developed by prior study(James et al. 2019). All constructs in this study were measured by a 5-point Likert scale. Followed the translation method outlined in (Lonner and Berry 1986),the questionnaires used were translated from English scales into Chinese version.

James et al developed 3 constructs named social interaction features, exercise control features and data manage features to describe the features of fitness APP after observing more than 72 fitness wearable devices in (James et al. 2019). The social interaction features(SIF) means it enable social interaction for the purposes of data sharing, encouragement, competition, comparison, and coaching. The exercise control features (ECF) offer rewards and reminders that prompt a user to exercise, and goal management allows the user to create and manage

the goals (i.e., rule set) the fitness technology uses to determine when the rewards and reminders are triggered. And the data manage features (DMF) are used to collect, analyze, and feed data from thedevice/app to the users regarding their exercise activity aswell as provide data from other sources.

As a popular application in China, KEEP has more than 1.6million users proving fitness service including SIF, ECF and DME we discussed before. In this study, therefore we adopted a purposive sampling method to administer an online questionnaire survey to KEEP users from March to June 2019.The questionnaires was recovered from the KEEP WEIBO fan page andWenjuanxing[1] online survey platform provider.

By filtering the question posed at the beginning of the survey asking respondents to indicate if they met this requirement and the easy calculation question posed in middle of the survey to ensure the right response. Those that were not current or past users of KEEP and error respondents were ejected from the survey. After data cleaning, the resulting sample included 329 responses.

4.2 Measurement

In this study, the statistical software packages Smartpls 3.2.8[2] and fsQCA3.0[3] were used for the analysis, in which the Smartpls was used totest reliability and 2 stage factor analysis of part constructs, the fsQCA was adopted for wellness case analysis calibration. Table Ⅲ(Appendix2) presents the descriptive statistics and correlations for all constructs. Composite reliabilities were greater than 0.8 for all constructs, which indicates sufficient internal consistency. All Cronbach alpha values were greater than 0.8, which evidences reliability. The average variance extracted (AVE) values for individual constructs were greater than their correlations with other constructs and greater than 0.7. Further, all standardized-item loadings resulting from a factor analysis were greater than 0.7 (vitality 5 was removed due to its low factor loadings) and loaded on their corresponding factor (see detail in Appendix Table C3). Thus, all these validity tests confirmed that our constructs have discriminant and convergent validity.

4.3 Set-theoretic Analysis with fsQCA

In line with our research question, SEM analysis was adopted to test how the antecedents would affect the wellness outcomes (both instrumental and experiential).The results indicate a significant positive effect and that the part of the path coefficients support that assumption that high scores for self-determined motivation, and fitness APP tech feature use would drive high scores for wellness outcome.

However, little evidence had been found that there is the configuration between exercise motivation and technology feature leading good wellness outcome(James et al. 2019), because the typical quantitative consider the research situations that normally call for the use of variable-oriented, quantitative methods as opposed to go deeper into the sample cases. The fuzzy-set qualitative comparative analysis (fsQCA) provides several uniquebenefits for effectively describing the complex relationships between multiple elements that stem from its using set theory, based on boolean methods of logical comparison which represents each case as a combination of causal and outcome conditions. The fsQCA can handle the complex multi-way relationships in which all elements theoretically relevant to the outcome participate, which reduces concern that unobserved heterogeneitymay cause.

4.3.1 Calibration

As discussed before, personal exercise motivation and fitness APP technology features using are the antecedent conditions to explain wellness outcome. Notably, second factor scores were adopted in condition data processing.

Table Ⅱ: Calibration

Causal Conditions	Descriptive Statistics				Calibration rules		
	M	SD	Min	Max	FM	CP	FNM
Outcome conditions							
Instrument Outcomes	0	1	-0.71	3.86	2	0	-2
Experience Outcomes	0	1	-2.70	2.41	2	0	-4
Antecedent conditions							

[1] https://www.wjx.cn/

[2] SmartPLS: Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

[3] Ragin, Charles C. and Sean Davey. 2016. Fuzzy-Set/Qualitative Comparative Analysis 3.0. Irvine, California: Department of Sociology, University of California.

Amotivation	0	1	-3.49	1.36	4	0	-1
Extrinsic Motivation	0	1	-2.27	2.02	3	0	-3
Intrinsic Motivation	0	1	-4.25	1.88	1.5	0	-4
Social Interaction Features	0	1	-2.22	2.21	2.5	0	-2.5
Exercise Control Features	0	1	-3.28	2.02	2	0	-3
Data management Features	0	1	-3.05	1.76	2	0	-3

Note: mean, SD standard deviation, Min minimum, Max maximum, FM full membership in the set, CP crossover point, FNM full non-membership in the set.

4.3.2 Construction of the Truth Tables

The next step of the calibration is the analysis of the truth table indicating the consistency score that explains how reliably a combination results in the outcome. The report contains 2 kind of consistency : raw consistency, proportional reduction in inconsistency (PRI) consistency; According to the experience rules(Ragin, 2008), we set 0.85 as cutoff for raw consistency and 0.75 for PRI consistency, which means that we considered only combinations with a raw consistency of at least 0.85 and a PRI consistency of at least 0.75 as reliably resulting in agility. It worth noting that the necessary is a kind of core condition.

4.3.3 Analysis of the Truth Tables

FsQCA reports three types of solutions (i.e., a complex, a parsimonious, and an intermediate solution). Each of these solutions displays pathways to the particular outcome in question. However, the solutions differ to the extent in which logical remainders have been considered(Ragin 2008a). Logical remainders are configurations that lack sufficient empirical manifestation (i.e., they are either unobserved or they do not show enough empirical observations to pass the frequency threshold). The complex solution does not consider any logical remainder and thus produces the most complicated result. The parsimonious solution considers any logical remainder that will help generate a logically simpler solution and thus produces the most concise result. The intermediate solution disregards fewer causal conditions than the parsimonious solution but more causal conditions than the complex solution. The intermediate solution thus reports results that represent a compromise between inclusions of no or any logical reminder in the counterfactual analysis. (Fiss 2011)suggests focusing on the parsimonious and the intermediate solutions when interpreting the results. Inspection of these solutions provides vision for core and peripheral conditions or an outcome in question.

Table Ⅲ: Configurations for Achieving High Wellness Outcome

	Instrument Outcome					Experience outcome
	1	2	3	4	5	1
Amotivation		U		U	U	
Extrinsic Motivation		●	●	●		●
Intrinsic Motivation			●	●	●	●
Social Interaction Features	●			●	U	●
Exercise Control Features	●	●	●			●
Data Management Features	●	●	●	●	●	●
Raw coverage	0.70	0.61	0.67	0.57	0.51	0.63
Unique coverage	0.05	0.01	0.01	0.02	0.05	0.63
Consistency	0.95	0.97	0.97	0.98	0.97	0.91
Overall solution coverage	0.83					0.63
Overall solution consistency	0.94					0.91

‘‘●” indicates the presence and ‘‘U’’ indicates the negation of an antecedent condition; big circles indicate core conditions and small circles indicate peripheral conditions; blank spaces indicate conditions with a subordinate role.

V. RESULTS

Table Ⅱ shows configurations of the multiple antecedent conditions that are consistently sufficient for user wellness outcome. The results are summarized using the notation developed by Ragin (Ragin 2008b) . According to this notation, black circles indicate the presence of an antecedent condition and empty circles indicates its negation. Large circles symbolize core conditions, and small circles denote peripheral conditions. Blank spaces in Table Ⅱ indicate conditions that have a minor role for a solution. That is, these antecedent conditions may be either present or absent and thus have a subordinate role.

The fsQCA method integrates the advantage of quantitative and qualitative research. This set-membership relationship allows multiple paths to be chosen to achieve the same result, that is, the existence of multiple concurrent conditions is acknowledged. The results reveal that different types of exercisers may perceive the utility of or use fitness technologies differently. There are different kinds of conditions leading high level health outcome. The results point to five configurational models for a favorable instrument outcome and one configurational model for a favorable experience outcome.

5.1 Instrument Outcome

Regarding the high instrumental outcome, the overall solution consistency score is 0.94. The five configurations have consistency scores of 0.95 (for configuration 1), 0.97 (for configuration 2), 0.97 (for configuration 3), 0.98 (for configuration 4) and 0.97 (for configuration 5). Thus, the results indicate five consistently sufficient configurational causes for obtaining high instrumental outcome. The overall solution coverage index is 0.83.

According to Table2, one can achieve high instrument outcome through following five configurations : (1) SIF * ECF * DMF; (2) ~Amot * IntMot *~SIF * DMF; (3) ~Amot * ExtMot *ECF * DMF; (4) IntMot* ExtMot *ECF * DMF; (5) ~Amot * ExtMot * IntMot * SIF * DMF.

Proposition 1：High frequency using all features will contribute to instrumental outcome.

Of five configuration leading instrumental outcome, configuration 1 achieves a highest raw coverage index (values 0.70). To illustrate the interpretation of the findings, configuration 1 is discussed in greater detail. This configuration covers user using SIF, ECF and DMF frequently with a clear motivation. Surprisingly, these individuals perceive a high instrumental outcome—but they did not show any exercise motivation including amotivation. In addition, DMF is core conditions, whereas the remaining antecedent conditions are peripheral factors indicating that the data management is relatively attractive to most user.

Configuration1 shows us that user with high frequency use of all the fitness tech features would achieve high instrument outcome no matter what motivation they may have. Instrumental outcome in fitness APPs describes practical goals for using these APPs such as the improvements of health behaviors, inducing their continual exercise and better vitality. All feature using frequently in fitness APPs indicate that people would spend quite time participating in fitness activity because the SIF, ECF and DMF are on the basis of their exercise data or information producing by the fitness activities. Time investment in fitness activity is significant for health improvement and the satisfaction of training(Penedo and Dahn 2005).

For those user with amotivation, usually new users, it's easy for them to perceive the body change from short time use of fitness APP possibly leading high continual exercise intention as they might think it's easy to make achievement in next short time. As the same, exerciser with extrinsic motivation may internalize their motivation as these kinds of physical activity bring them change to better health condition or figure decrease their pressure of external criticism to some extent. It's rational for intrinsic exerciser to get high instrumental outcome when having frequent use of all these features because the more fitness features, they used to mean they would take more time training which is in line with their natural ego.

Proposition 2：For the user who present some extent self-determined motivation, the more self-determined the user is, the less technology features are needed.

Configuration 2,3, and 4 revealthat exercisers with different exercise motivation would choose fitness technology features differently. Reviewing the SDT, it draws a continuum of motivational regulations according to the self-determined extent. With the increasing of self-determination, user's motivation would change from amotivation or extrinsic motivation into intrinsic motivation, in which this process is called internalization. With the extent of internalization go deeper, the feature choosing would be simpler. That means when user become more and more self-determined they would choose less feature and trend to choose the core feature only. Configuration 2 covers extrinsic exercisers with frequent use of ECF and DMF; Configuration 3 covers extrinsic and intrinsic exercisers with frequent use of ECF and DMF; Configuration 4 covers extrinsic and intrinsic exercisers with frequent use of SIF and DMF; Configuration 5 covers non-extrinsic and intrinsic exercisers with frequent use of DMF. The non-amotivation means one go for any activity with some extent motivation at least, therefore, user included in configuration 2 would have lower self-determined motivation than configuration 3 and so do the configuration 4 and 5. Based on SDT, user groups with intrinsic motivation should have higher

self-determined extent than groups with both extrinsic and intrinsic motivation. Drawing from configuration2-5, the self-motivated level is increasing step by step, whereas the high frequent use of feature type is decreasing gradually. As the internalization continues, the fitness activity become a kind of inner need that would satisfied their ego suggesting that they would be more familiar with those fitness APP due to continual used(Matt et al. 2019). What surprises us is that the more intrinsic motivation they have the less features they need. According to SDT, both intrinsic and extrinsic motivation are highly influential determinants of our behavior, and both drive us to meet the three basic needs identified by the SDT model: autonomy, competence and relatedness, of which autonomy describes that the people have a need to feel that they are the masters of their own destiny and that they have at least some control over their lives; most importantly, people have a need to feel that they are in control of their own behavior. To this extent, some fitness features like the exercise control would hurt their sense of control, and though social interaction support their needs to relatedness, it hinders their enjoyment of the activity itself and distract their exercise attention to comparison.

Proposition3 : For intrinsic motivation user, social interaction in a fitness APP is not core condition when achieving instrument outcome.

Although the role of social influence in enhancing IT adoption has already been tested in the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003), some study indicates that social interaction have negative effect to personal motivation(Maier et al. 2015a; Maier et al. 2015b; Reissmann et al. 2018).Evidence in social media research provides indications that competence need thwarting lowers continuance intentions. For example, when perceiving others as more successful than oneself, users feel frustrated and exhausted leading to higher discontinuance intentions (Laumer et al. 2015).

Therefore, for those users with pure intrinsic motivation the SIF might hurt their competence and autonomy need to some extent though it gives the social support in relatedness they might not care too much. However, for the user with extrinsic motivation that participating in fitness activity due to guilty or pressure, SIF can result good benefit because even individuals who do not like to exercise might be enticed to do so more often if they find the social interaction enjoyable. We contend that our findings could be a result of exercisers who have a social extrinsic exercise goal perceiving the SIF to afford entertainment possibilities whereas SIF would be a burdens for exercisers with only intrinsic motivation.

5.2 Experience Outcome

Regarding the desirable experience outcome, the results show only one configurational model with an overall consistency score of 0.91. The overall solution coverage index is 0.63.

Proposition4: Self-determined motivations and high frequency use for all fitness features are core condition to achieve experience outcome.

There is only one configuration for gaining high experiential outcome that covers user group with self-determined motivation and high frequency of all fitness APP technology features. There is now a growing recognition of experiential values of IS such as the engagement. For IS designer, the experience outcome should be viewed as an important construct to be evaluated because this is a kind of perceived satisfaction reflected in IS research. Therefor for the user pursing the high experience outcome, he or she should be having a higher frequency use of each fitness features with some self-determined motivation.

The strict configuration is rational because the experience outcome is the higher outcome on the basis of instrumental outcome due to the nature of a fitness APP. The fitness APP is some kind of tool application help user better exercise or tracking their exercise or physical data suggested that the IS designer would like to pursue the instrumental goal to fulfill the basic need of exerciser instead of a long term goal to encourage the perfect experience during training. Thus it's would have more conditions to achieve a good result than simple instrumental needs. From this perspective, the self-determined motivation would push the exercisers to start a fitness training on their own initiative so they would more focus on the process instead of the figure change or health improvement that hard to observe in a short time. And the sufficient familiarity and frequency of those feature support would be more helpful for the exerciser to get better user experience.

VI. DICUSSION

Fitness technologies may be attractive to individuals looking for a way to increase their exercise. This may be especially true for exercisers with extrinsic goals who do not enjoy exercise but want to improve their appearance or health (i.e., exercisers who have body‐focused extrinsic exercise goals) or like to socialize exercise. However, fitness technologies may be providing features that are not fully supportive of the basic psychological needs that promote intrinsic motivation, which may reduce their effectiveness. The reminders, rewards, and goal management features are often defaulted on and thus are the easiest to use. However, motivation theory advises that such features are autonomy‐thwarting, which means that they may not facilitate intrinsic

motivation.

Thus, the most promoted fitness technology features are likely to be the least attractive feature set for many exercisers. This indicates that as fitness technologies advance, the focus should be on enhancing features that are supportive of the basic psychological needs of autonomy, competence, and relatedness. The DMF is the core condition for all the higher health outcome that used by exercisers with both intrinsic and body‐focused extrinsic goals towards exercise. Motivation theory like the SDT tells us that competence‐supporting feedback facilitates intrinsic motivation, and training users on the most effective uses of the DMFs may be a worthwhile approach to help support more types of exercisers. Designers of future generations of fitness technologies may also want to consider expanding the DMFs to include features that provide insightful analytics on progress towards body‐focused goals, as well as advancing the presentations of the common fitness and health analytics.

The SIFs are used by exercisers with social goals. Notably, the SIFs present in few configuration leading high instrumental outcome. Taken together, these results indicate there is promise in using the fitness technologies to socialize exercise for some individuals and that doing so could potentially have positive ramifications on well‐being. However, exercisers with body‐focused goals are less likely to use the SIFs. One explanation may be found in the suggestion that such exercisers may be more self‐conscious (Sebire et al. 2013). Hence, guidance on how to best use these features should be provided for the users who may need to employ them differently to benefit.

6.1 Theoretical Contribution

This paper contributes to IS research in 3 key ways.

First, we review fitness APP literature and identify the fitness APP technology features selection that have been employed to explain effects on wellness outcomes. Second, we provide a theoretically driven fitness APP deep structure use concept from a TTF perspective. Third, we offer a conceptual lens that captures how fitness APP deep structure use facilitates behavior change.

Results from qualitative and quantitative approaches have implications for further research. The domain of technology research has relied for long on the assumption of linear symmetric relationships. This paper shows that this assumption may limit the identification of underlying behaviors. Evidence on the motivation state is mixed. Using solely PLS would have led to the conclusion of non-significant effects. However, by mixing two different approaches, the hypothesis tested in SEM are mostly insignificantly while the configuration relationship are well supported in fsQCA. Researchers need to be aware of this issue so that they can pursue studies with mixed method to gain deeper knowledge.

6.2 Practical Contribution

This study could be adapted to study other personal technologies that have motivational elements. Technologies intended to help people better manage aspects of their lives are becoming increasingly prevalent.

The design of future generations of fitness technologies may also want to consider the addition of SIFs that make social comparisons more difficult. For example, providing users the ability to run challenges or be "friends" with other exercisers without displaying their overall step count to the other users (e.g., an option to opt out of displaying step counts) may be better for users who are sensitive to unfavorable social comparisons.

The core feature, data management features, should be strengthen and design in a funnier interface so that the user would achieve the experience outcome more easily.

6.3 Limitation and Future Research

The classical SDT model relies on the personal motivation and outcomes, not given that the technology feature use could also influence the both motivations and final outcomes, which is the key finding in our research. Adding more variables to a model definitely adds explanatory power, but the cases oriented effect is diminished; there is always a trade-off among theories. This study expects to make this trade-off clearer.

Specifically, we test a model within a configuration relationship background that explains how exercisers with different goals use fitness technologies and derive (or not) benefit from that use.

Our study is not without limitations. Fitness technologies are relatively new, and thus, their development and use are still in the early stages. As such, fitness technology makers and consumers are learning about what works and what does not in order to inform future generations of products. This research provides one snapshot of early use that indicates that there are complex use issues at play when employing such novel technologies.

Longitudinal studies may add much value to our understanding of fitness technology use. Our results indicate that different exercise goals lead to differing patterns of use of fitness technologies. Future longitudinal research could provide a structured use pattern for exercisers and see how such guidance impacts exercise and well‐being outcomes. A longitudinal study could also be employed to examine changes in exercise patterns (e.g., whether the amount of exercise increased with various uses of the fitness technologies), which we were unable to

do with cross‐sectional data. Future research may also want to consider more instrument and experience outcomes, as well as technological outcomes.

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