Exploring the Working Mechanisms of Digital Shadow Work in Chinese Music Streaming Application Use: A Longitudinal Approach Using the Grounded Theory Method

Haoxi Wu[a], Joon Koh[b,*]

[a] Ph.D. Candidate, Interdisciplinary Program of Digital Future Convergence Service, Chonnam National University, Korea
[b] Professor, Department of Business Administration, Chonnam National University, Korea

A B S T R A C T

Through Information and Communication Technology (ICT), the growth of music streaming platforms has revolutionized music consumption. "Digital Shadow Work" (DSW) refers to unpaid labor in digital spaces, with some prior research on its aspects. However, a comprehensive understanding is hindered by limitations in existing studies such as a lack of universality and dynamic exploration. To address these gaps and enable a comprehensive investigation into the role of DSW within highly versatile digital applications such as digital streaming platforms, this study employs a grounded theory methodology, a qualitative approach well-suited for exploring the intricacies of DSW among users of Chinese music streaming applications over a two-month period, involving longitudinal interviews with nine participants. The study findings elucidate the dynamic nature of DSW perceptions, which fluctuate across different stages of use and change in intensity over time. This study uncovers mixed attitudes towards DSW tasks, and observes a waning enthusiasm for social features over time, prompting some users to consider switching platforms. This study highlights the importance of thoughtful and user-centric feature development to enhance user satisfaction and the understanding of DSW, providing practical design and enhancement implications for music streaming applications.

Keywords: Consumer Labor, Digital Shadow Work, Grounded Theory, Music Applications

Ⅰ. Introduction

The advent of Information and Communication Technology (ICT) has dramatically transformed how music is enjoyed. It has provided access to music via various channels such as the Internet, digital music platforms, and online music services. This advancement has greatly increased the convenience of obtain-

ing and appreciating music by breaking down geographical and cultural barriers. As evidence of this shift, it is projected that the global music streaming market will experience a compound annual growth rate (CAGR) of 14.7% from 2022 to 2030 (Grand View Research, 2022). In the United States, music streaming has become the dominant music format, generating 83% of total music market revenue (Statista, 2023). Remarkably, despite coming relatively late to the game compared with other global players, Chinese platforms such as Tencent and NetEase have quickly made their mark, accumulating over 800 million active users (Statista, 2023).

Despite the booming industry, a closer look at the existing body of research on music streaming applications reveals a narrow focus. Barata and Coelho (2021) and Brost et al. (2020) primarily focused on outcomes related to users' final behaviors, such as purchase intent or actions. This leaves a noticeable gap in the examination of the detailed user processes, particularly "labor" behaviors that may trigger complex perceptions such as fatigue. Noteworthy in this context are the studies of Qu et al. (2023) and Jansson (2021), which explored labor behaviors on music streaming platforms. However, their scope was also limited—Qu et al. (2023) focused on digital labor from the creator's standpoint, while Jansson (2021) only explored the music playlist usage process. This highlights the need for a more comprehensive investigation of other labor processes, particularly those related to "music information search" during the use of music streaming applications.

In response to this research gap, this study embraces the theory of Digital Shadow Work (DSW), conceptualized by Park et al. (2020). This study explores the rationale behind "labor" behaviors during music streaming application use. Building on Ivan

Illich (1981)'s research, Park (2019) and Lee (2021) define DSW as a form of shadow work in a digital context or environment in which additional labor is performed without receiving any benefits or rewards.

DSW encompasses characteristics of digital environments that involve mundane and repetitive tasks such as application installation, membership registration, system updates, and password resets (Lambert, 2015; Park et al., 2020). Interestingly, this labor can reduce the costs, time, and effort that users would otherwise expend in a traditional labor market, thereby creating unique user experiences within the digital landscape.

Lee (2021) categorized DSW into "chore," "make-up," "routine," and "quest," elucidating the connections among them. This framework was further developed by Song et al. (2022), who introduced time as a DSW classification factor and conducted longitudinal research to track the evolution and interplay among the four categories over time. However, the study of Song et al. (2022) was limited to a specific application, and its emphasis on security raised concerns about insufficient participant autonomy and the limited generalizability of results.

The application of the DSW theory to music streaming services arises from the need to thoroughly explore labor behaviors and processes that often go unnoticed, yet significantly influence users' interactions with these platforms. While music streaming primarily focuses on consuming audio content, users engage in various ancillary tasks while navigating these digital environments (Wang and Fu, 2020). These tasks, such as app installation, registration, and updates, contribute to shaping the overall user experience beyond direct music consumption.

By applying the DSW theory to music streaming, this study aims to uncover and emphasize the multi-

faceted nature of user engagement. Incorporating tasks not immediately associated with music consumption but integral to the digital environment reveals a more holistic user journey. Through this exploration, researchers seek insights into how user behaviors evolve over time, how these non-music-related actions impact user satisfaction, and how they collectively contribute to the overall user experience.

Expanding on the work of Song et al. (2022), this study aims to provide users of streaming music applications primarily designed for entertainment, with the opportunity to autonomously choose their preferred application. This research conducts a two-month longitudinal study to examine user experiences and perceptions over an extended period.

There has been a surge in the Chinese music streaming market in recent years, leading to a corresponding increase in related scholarly research. Among the numerous studies on this subject, a notable contribution came from Kim (2023), who suggested that the inclusion of unique "social" features within Chinese music streaming applications played a critical role in the dramatic expansion of their user base. These platforms provide more than music appreciation capabilities; they have integrated elements reminiscent of social networking sites. For instance, NetEase Cloud Music's "Cloud Village" and "Music Friends" are exemplary of such innovative additions. These extra features significantly boost user engagement, a subject that has been largely overlooked in previous studies

Based on these findings, this study uniquely focuses on Chinese music streaming application users. Employing the grounded theory research methodology, it has three key objectives: (1) determine the users' perception level of DSW during application use, (2) track the temporal evolution of the types of DSW experienced by users, and (3) derive academic

and practical insights based on the findings of this study. Therefore, this study attempts to enrich academic discussions and offer viable solutions within this rapidly developing digital domain.

Ⅱ. Theoretical Background

2.1. Music Streaming Applications

Digital technology has stimulated a profound transformation in the music industry, primarily due to the development of music streaming applications. These applications have played a pivotal role in molding music consumption patterns and distribution in the 21st century. In the realm of music streaming applications, numerous studies have primarily focused on exploring their impact, practicality, business models, and user behaviors (Aguiar, 2017; Christopher and Brian, 2020; Dougal and Camille, 2021). For instance, a study by Aguiar (2017) focused on analyzing the effects of free streaming, while an investigation by Christopher and Brian (2020) delved into the role of public service mandates in music production and distribution. Moreover, Dougal and Camille (2021) conducted a thorough exploration of user behavior on streaming platforms.

Previous research in the field has also focused on the disruptive effects of digital technology on the music industry (Leyshon, 2009; Wikstrom, 2010). These studies primarily examined the shift from physical to digital distribution of music and how the industry's business models adapted accordingly. Additionally, scholars delved into the specific roles of music streaming services. Datta et al. (2018) analyzed the role of these services in reducing illegal downloads and found that legal streaming platforms significantly reduced piracy and increased overall in-

dustry revenues. Furthermore, Aguiar and Martens (2016) confirmed these findings and identified a positive correlation between music streaming and live concert attendance.

Alongside industry-focused studies, researchers have also examined user behaviors and perceptions associated with music streaming applications. Hagen (2015) explored how users navigate vast music libraries, and the role of curated playlists in music discovery, and highlighted the significance of algorithmic curation and its influence on music consumption behaviors.

Notably, Chinese music streaming services are quickly gaining momentum despite being late entrants into the global music streaming market. According to Company Data's 2022 global music streaming market user number data, Chinese music streaming giants such as Tencent and NetEase Cloud Music boast a user base of 800 million. This study selects Chinese music streaming applications as the research subject for two key reasons beyond their impressive performance in the global music streaming market. First, Chinese music streaming applications share many primary functionality similarities with apps in other parts of the world. However, they have unique "social" attributes that provide an intriguing distinctiveness. Kim (2023) noted that the "sociality" of music with China's NetEase company is considerably greater than that in overseas apps like YouTube and Spotify. For instance, NetEase Cloud Music features social networking-like functions such as "Cloud Village" and "Music Friends," attracting a wide range of users beyond traditional music audiences.

Second, these "additional features" with "social" attributes have allowed Chinese music streaming applications to move beyond traditional subscription-based revenue models. Tencent's QQ Music, for example, earns more revenue from features like "live broadcast rewards" than traditional subscription services (Wang and Fu, 2020). Therefore, this study diverges from previous research by incorporating other functionalities with unique attributes like "sociality" in Chinese music streaming applications. The aim is to elucidate their role and working mechanisms through the grounded theory methodology.

2.2. Digital Shadow Work (DSW)

The term "shadow work" was coined by Ivan Illich (1980) to describe informal work, such as housework, that goes unrecognized, remains invisible, and is uncompensated. It is used to refer to hidden labor in emerging industries, including commuting, childcare, education, as well as housework (Lee and Koh, 2022). The service industry has been transformed by technological advancements, such as self-service machines (Lambert, 2015). The rise of digital technology has further increased the volume of shadow work, resulting in a reduction in individuals' leisure time. Lambert (2015) proposed the DSW concept as labor transferred to individuals without compensation within a technological usage context. Amid the COVID-19 pandemic and the spread of non-contact societies, the "shadow work" of the digital age has become an integral part of people's daily consumption.

Moreover, Park and Lee (2019) introduced the concept of DSW by using mixed-methods which combine literature analysis with grounded theory. They defined DSW as hidden labor voluntarily undertaken by users utilizing digital technology, and established connections between DSW and concepts such as "self-service technology," "consumer effort," and "user participation." Their study also recognized the

necessity of changing website passwords as a dimension of DSW, albeit an annoyance to users. Expanding on this, Park et al. (2020) more comprehensively defined DSW as "shadow labor related to digital services."

In summary, DSW refers to the hidden labor that individuals undertake within the realm of digital technology, often voluntarily, but without receiving compensation (Lee and Koh, 2022; Park and Lee, 2019; Park et al., 2020). This concept has gained prominence in various sectors, impacting people's leisure time and daily consumption patterns (Lambert, 2015).

2.3. Classification of DSW

Lee (2021) classified DSW into four categories: "chore," "make-up," "routine," and "quest," based on Park and Lee's (2019) theoretical foundation. The horizontal axis encompasses "operator type" and "manager type," while the vertical axis is divided into "should" and "want." The "manager type" focuses on "chore" and "make-up" as core elements of "should" and "want," respectively. "Chore" represents tedious and monotonous DSW tasks, such as member registration and login, while "make-up" refers to the final form achieved after a series of user-initiated repetitive behaviors. These include editing personal resumes, photos, or videos. Furthermore, the "operator type" of DSW comprises "routine" and "quest" as core elements and represent "should" and "want," respectively. "Routine" refers to predetermined procedures or repetitive tasks in DSW, such as intelligence gathering, product searches, and activities on social networking sites which may lead to fatigue after repeated use. Conversely, "quest" represents situations where users derive new knowledge or joy through digital technology, such as online gaming. In "quest" situations, users often experience more

joy and may overlook their own fatigue (Lee, 2021). Furthermore, in their study investigating the mechanisms that underlie shadow labor in digital environments, Park et al. (2020) delineated the concept of Digital Shadow Work (DSW) as a sequence of processes encompassing the recognition of necessity, decision-making, and active engagement in tasks within the digital domain. Moreover, during the evolution of DSW, decisions might diverge based on factors like the "perceived significance level of tasks," the "cognitive effort required to comprehend digital shadow labor," and the "extent of adherence to practices associated with managing digital technology." Importantly, resistance towards embracing these decisions could potentially give rise to a pessimistic outlook regarding the execution of digital shadow labor (Park et al., 2020).

Recent research on DSW, as shown in <Table 1>, has primarily utilized qualitative methods due to the nascent theoretical development of DSW. The predominant focus has been on the "routine" and "make-up" categories. Prior studies, such as those by Liu and Koh (2021) or Ryoo and Park (2021), have explored the negative impacts of "routine" activities on consumer behavior in contexts including unmanned stores and mobile payments. In contrast, Lee and Cho (2022) examined the "make-up" category within the DSW framework and investigated the psychological and behavioral mechanisms associated with the management of personal profile pictures on social networking services and tablet beautification behaviors. Interestingly, they discovered that tablet beautification behaviors exhibit a cyclical pattern, and can trigger the emergence of other forms of DSW. This significant finding by Lee and Cho (2022) elucidates the dynamic interplay and interconnectedness of various forms of DSW.

In addition to a few studies such as Park and

<Table 1> Recent Studies on DSW

Authors (Year)	Research Content	Research Subject	Approach	DSW Role
Park (2019)	Analyzing password change behavior to understand the causes and outcomes of DSW.	Password Management	Grounded Theory	Central Phenomenon
Park and Lee (2019)	Conceptualizing DSW based on a literature review of self-service.	Related Literature	Grounded Theory	-
Lee (2021)	Classifying DSW types and providing future research directions and characteristics for each type.	-	Concept Presentation	-
Park and Kim (2021)	Examining the relationship between DSW in online grocery consumers and shopping avoidance and conversion behaviors.	Online Shopping	Survey	Independent Variable
Ryoo and Park (2021)	Investigating the impact of information load and system functionality load as independent variables on DSW, fatigue, and discontinuance.	Mobile Shopping	Survey	Parameter
Song et al. (2022)	Analyzing changes in DSW types based on the duration of app service usage using a longitudinal approach.	App Service	Grounded Theory	Central Phenomenon
Lee and Koh (2022)	Analyzing stress and problems among call center employees from DSW and organizational citizenship behavior perspectives.	Call Center Staff	Grounded Theory	Central Phenomenon
Lee and Cho (2022)	Analyzing the formation and perception process of DSW in profile picture management.	Profile Picture Management	Grounded Theory	Action/ Interaction Strategy
Bu and Koh (2022)	Investigating the impact of compulsion and cost-effectiveness on DSW and its consequences in sharing economy services.	Self-Service (Sharing Economy)	Grounded Theory	Central Phenomenon

Kim (2021) and Ryoo and Park (2021) that directly treat DSW as a variable in quantitative research, the early qualitative studies primarily employ grounded theory research methods, which are based on Strauss and Corbin (1990)'s approach. These studies have predominantly culminated in identifying specific operational mechanisms of DSW. As a result, the qualitative studies in <Table 1> often emphasize the central phenomenon or the reaction to it as the key focus in exploring the operational mechanisms or effects of DSW on decision-making and actions by digital technology users. For instance, Lee and Koh (2022)'s investigation into the impact of DSW on call center employees underscores how DSW and

organizational citizenship behavior (OCB) serve as central elements in the overall operational framework. This joint influence of DSW and OCB shapes employees' responses to workplace pressures to varying degrees. On the contrary, in the study conducted by Lee and Cho (2022), the alteration of personal profile pictures by users during the DSW process is considered a strategy or response to the core phenomenon of modifying personal profile pictures.

In conclusion, prior DSW research has extensively covered all DSW types but has not fully accounted for their dynamic nature. Cross-sectional studies, such as Lee and Cho (2022)'s, encountered limitations

in deriving multidimensional results, while longitudinal studies, such as Song et al. (2022)'s, have been criticized for excessively relying on a single research medium. The present study uniquely incorporates the perception of "labor" encountered during the use of additional features, such as "live streaming" and "music friends," in music streaming applications. Hence, it utilizes a two-month longitudinal study of users of entertainment-oriented music applications, allowing them freedom in their app usage choices, and leverages the grounded theory method to identify more dynamic interconnections across various types of DSW.

Ⅲ. Research Methodology

3.1. Grounded Theory Methodology

In 1967, Barney Glaser and Anselm Strauss introduced "grounded theory" (Strauss and Glaser, 1967), which originated from their analysis of the dying process. Over time, grounded theory has evolved and been widely applied. Additionally, Charmaz (2006) provided a concise summary of the foundational principles that guide this methodology. According to Charmaz (2006), it involves a systematic yet flexible approach and highlights the importance of collating and examining qualitative data to build a theory that is intrinsically tied to the observed data. Grounded theory is a research methodology that entails collecting a substantial amount of raw data, analyzing and synthesizing it, and deriving a theory with universal applicability. The process begins by identifying the core object and research problem, then outlines the data collection process accordingly. This is followed by data coding, which involves open first-level coding, associative sec-

ond-level coding (axis coding), and core conclusion third-level coding (select coding). Based on this process, theories can be established and final recommendations and conclusions proposed (Strauss and Corbin, 1998).

While some foundational theoretical models have been developed in DSW research, the exploration of the correlations between various types of DSW remains in its early stages, and related theories are relatively limited. Therefore, it is essential to employ qualitative research methods such as grounded theory to construct new theories and frameworks.

3.2. Research Design

As mentioned in the Introduction, music apps have surged in popularity, offering a wide range of features including music information search capability. However, these search functions, such as the "Music Recognition" feature in Chinese music apps, can have difficulties in noisy environments or when dealing with similar melodies or lyrics, potentially posing user challenges (Lu, 2019).

According to Lee (2021), information search is categorized as "routine" behavior within the context of DSW. Users may experience fatigue from repeatedly engaging in similar information search behaviors which could potentially lead to discontinued usage of a particular application or digital program. Thus, the existing features of music apps align with the objectives of this study.

Regarding methodology, this study adopts a qualitative research approach that employs a semi-structured interview framework. Over two months, from 21 March 2023 to 25 May 2023, two in-depth interviews were conducted with each of the nine participants. <Table 2> illustrates the participant demographics, which considered factors such as theo-

<Table 2> General Interviewee Demographics

No.	Gender	Age	Job/Position	Selected App
1	Male	24	Graduate student	Xiami Music
2	Female	26	Graduate student	QQ Music
3	Female	24	Graduate student	KuGou Music
4	Female	25	Graduate student	NetEase Cloud Music
5	Male	24	Graduate student	MiGu Music
6	Male	21	College student	NetEase Cloud Music
7	Male	20	College student	QQ Music
8	Female	29	Office worker	KuWo Music
9	Female	30	Office worker	Qishui Music

retical saturation and gender diversity. To achieve theoretical saturation, participants were selected from various demographics, including five graduate students from a national university, two undergraduates, and two office workers. Additionally, to maintain gender balance, the participant pool consisted of four males and five females. This gender diversity enhances the generalizability and applicability of the study results while minimizing potential biases in the findings.

Differing from Song et al. (2022)'s approach, this study initiated the interview process by explaining the procedure to the participants and introducing them to a mobile app store interface. Participants were instructed to select their preferred music app and use it according to their habits and moods over the following two days prior to their first interview. The nine participants chose seven different Chinese music streaming applications, including "Xiami Music," "QQ Music," and "KuGou Music," among others. To comprehensively explore how participants' perceptions and attitudes towards DSW evolve over time within the context of music streaming applications, this study employed the core principle of Grounded Theory, guiding the adoption of a longitudinal research design. By tracing dynamic shifts in participants' interactions with mobile music app stores and their evolving cognitive processes regarding DSW, the research aimed to uncover emergent patterns, avoiding the imposition of preconceived hypotheses. This approach was pivotal for capturing the authentic evolution of participants' experiences.

To achieve this, a second interview was deliberately scheduled two months after the initial interaction. This intentional time gap allowed participants to progressively develop proficiency and familiarity with their chosen music apps, consequently affecting their interactions with DSW. As participants continued to integrate their preferred apps into their daily lives, it was anticipated that their cognitive and behavioral patterns would naturally refine and transform. Conducting the second interview following this period aimed to capture the organic progression of changes in participants' perceptions of DSW.

The interview questions, elaborated in <Table 3>, followed a semi-structured and semi-open questions format. This methodology resonates with Grounded Theory's principles, encouraging participants to articulate their evolving perceptions of DSW using their own expressions. By employing this approach, unexpected nuances that might not have been foreseen could be uncovered. These questions sought to delve

<Table 3> Questionnaire Contents

Types of Questions		Interview Questions
App Selection Motivation and Usage Status		What music app did you choose and why did you choose it?
		How often do you currently use the app and during what times of day?
Awareness of DSW	Chore Types	Did you feel any fatigue during the pre-usage routine tasks, (downloading, registration, etc.) before using the main functionalities of the music app?
	Routine Type	Did you feel any fatigue while using the app's functions?
		How do you deal with the fatigue or difficulties associated with these functions?

into participants' evolving perspectives, preferences, habits, and their modes of engaging with DSW within the realm of their selected music apps. Facilitating open-ended responses, the study aimed to generate a comprehensive dataset for analysis, thereby identifying recurring themes and novel insights.

Ⅳ. Results

4.1. Open Coding

During the open coding phase, each data point was carefully analyzed to identify concepts supported by evidence. These concepts were then compared to identify similarities and differences, allowing for the grouping of similar concepts while also capturing the unique attributes of each category (Strauss and Corbin, 1990). In this context, evidence-based concepts referred to the words, explanations, and analytical findings identified within the data. Categorization involved organizing lower-level concepts based on their properties to form higher-level concepts (Wiesche et al., 2017). In the open coding stage of this study, 36 concepts and 15 subcodes were identified, as shown in <Table 4>.

4.2. Axis Coding

In the grounded theory research methodology, the

<Table 4> Results of Open Coding

Subcode	Concept	Explanation/Source
Appreciate music	The healing power of music	Seeking escapism when enjoying music
Sociability and freshness	Driven by curiosity	Curiosity about additional features in selected apps
	Preference for virtual communities	Using "companion" feature for social needs
External advantages	Popular among youths	Youth-favored popular apps
	High download numbers and ratings	High store rankings and ratings
	Lightweight applications	Smaller apps, often under 100MB
Internal advantages	Trendy UI and functionality design	Live streaming and short videos
	Convenient login method	Convenient login via SNS integration (e.g., WeChat, Weibo)
	Usefulness of main functions	Valuing music identification and recommendations
Recognition in DSW of the "Chore" type	Slight fatigue during download and registration	Mild fatigue from recognition and passwords
	Entertainment and personalization in profile editing	Enjoyment through profile editing

<Table 4> Results of Open Coding (Cont.)

Subcode	Concept	Explanation/Source
Recognition in DSW of the "Chore" type	Clear fatigue in password management and update processes	Password annoyance and complexity
Recognition in DSW of the "Routine" type	Fatigue and anticipation in the selection process	Tiredness with fake ranks
	Clear fatigue when searching for music	Fatigue grows with repetition
	Enjoyment during the appreciation process	Pure joy in music's beauty
	Frustration with information overload	Complex features overwhelm
Changes with elapsed usage time	Subtle changes in fatigue	Less fatigue in search, none in music identification
	Awareness of the app straying from its primary purpose	Commercial clashes with music's essence
External limitations	Physical limitations	Annoyed by slow downloads and inability to get local songs abroad
Functional limitations	Limitations in music recognition	Recognition accuracy drops due to surroundings
	Mandatory functionality	Ads and fixed features bother
Importance of privacy protection	Company's social image	More trust in big companies guarding personal information
	Time limit for information retention	Brief data retention, re-login needed
Frequency of use	Weariness and fatigue from excessive use	Less interest in additional features over time
	Initial adaptation period for recommendations	Recommended songs vary based on user listening habits
Technical intervention	Facial recognition utilization	Skipping password input while ensuring personal account safety
	VPN technology intervention	Ability to use domestic apps overseas through VPN
	Search method optimization	Clear search instructions using formats like "singer + song title"
	Playlist utilization	Playlists help recommendations
	Dependence on recommendations	Music suggestions as daily norm
	Additional security measures	Recording relevant passwords in notes
User attitude and purchase intention	Negative attitude toward additional functions	Feeling of uselessness and resentment towards additional features
	Tendency to purchase membership services	Becoming a member for more benefits (e.g., reduced ads)
	Non-purchasing tendency of membership services	Focusing on key functions and ignoring others
Continuous use	Increase in loyalty and satisfaction	Forming app usage habits over time
Intention to switch	Seeking more suitable applications	Growing discontent with current app, considering reverting to previous app

open coding stage involves the initial definition and identification of categories. Subsequently, the process of connecting these previously defined categories is referred to as axis coding. During this phase, the relationships between categories are established by integrating the attributes of categorized features, guided by Strauss and Corbin (1990)'s paradigm model. This model, grounded in theory, encompasses various elements including casual conditions, contextual conditions, core phenomena, intervening conditions, action/interaction strategies, and consequences. The present study adopted this theoretical paradigm model as a foundation, and clustered and integrated the elements accordingly. As a result, as shown in <Table 5>, the axis coding stage yielded an interlinked set of coded categories centered around casual conditions, contextual conditions, core phenomena, intervening conditions, action/interaction strategies, and consequences.

4.2.1. Casual Conditions

Casual Conditions, a core component of the grounded theory methodology, serves as a foundation for researchers to understand and explain the causes and conditions that contribute to specific phenomena (Strauss and Corbin, 1990). This study identified "Appreciate music" and "Sociability and freshness" as Casual Conditions because they are closely associated with motivational factors that drive users to use music apps.

4.2.1.1. Appreciate Music

"I use NetEase Cloud Music just to enjoy some music after a busy day. It's my chill-out routine, my way to

<Table 5> Results of Axis Coding

Upper code	Subcode	Explanation/Source
Casual Conditions	Appreciate music	Seeking escapism when enjoying music
	Sociability and freshness	Curiosity about intriguing additional features piquing users' interest
Contextual Conditions	External advantages	Clear advantages compared to competing products (e.g., popularity)
	Internal advantages	App's distinct characteristic advantages (e.g., UI design)
Core Phenomenon	Recognition in DSW of the "Chore" type	Fatigue perception during "chore" type DSW processes like downloading, logging in, and editing personal information
	Recognition in DSW of the "Routine" type	Fatigue perception during "routine" type DSW processes involving main and additional features
	Changes with elapsed usage time	Subtle yet noticeable changes in fatigue levels
Intervening Conditions	External limitations	Constraints from physical conditions (e.g., internet speed)
	Functional limitations	Limitations inherent in the app's functionality
	Importance of privacy protection	User's relatively high emphasis on privacy protection
	Frequency of use	Fatigue or dependency developed with increased usage frequency
Actions/Interactions	Technical intervention	Strategies employed to address DSW arising during usage
	User attitude and purchase intention	Reactions taken in response to DSW encountered during usage
Consequences	Continuous use	Forming usage habits for the application
	Intention to switch	Intention to switch due to intolerable shortcomings of the app

relax and forget about daily stress." *(Participant 4)*
"I listen to tunes on QQ Music every night before sleeping. Even if I fall asleep with it on, it takes me to a different world, providing a great escape." *(Participant 2)*

Participants 2 and 4 emphasized the use of music apps as ways to relax and unwind and highlighted the healing power of music. They described how listening to music acts as a soothing tonic, helping them escape the daily exhaustions of life. It provides them with a sense of detachment, transports them to a different world, and creates a pleasant and immersive experience. During the interview, Participant 4 specifically mentioned the healing power of music and emphasized its ability to comfort and alleviate stress.

4.2.1.2. Sociability and Freshness

"I used to see MiGu Music ads at music events and it sparked my curiosity···" *(Participant 5)*
"I chose Xiami Music because of its unique features such as short videos, live streams, and audio novels. It seemed fresh and I wanted to try it." *(Participant 1)*
"I heard NetEase Cloud Music had an active online community. I like social apps, so I thought I'd try to find people with the same tastes in music." *(Participant 6)*

Participant 5 expressed interest in the MiGu Music ads observed during music events, indicating curiosity to explore the offerings of the app. Participant 1 came across Xiami Music, which caught their attention with innovative features like short videos, live streaming, and audio novels, motivating them to try it. Additionally, Participant 6 showed an interest in NetEase Cloud Music's active virtual community and expressed a desire to connect with like-minded individuals who shared similar musical tastes. These

instances highlight a combination of curiosity-driven exploration and preference for virtual communities associated with the selection of music apps.

4.2.2. Contextual Conditions

Contextual Conditions are those that are specifically associated with the core phenomenon and have an influence on it, resulting in nuanced variations in categorical characteristics (Strauss and Corbin, 1990). These conditions serve as a contextual backdrop that shapes and influences the manifestation of the core phenomenon. Therefore, in this study, distinct from Casual Conditions, the findings identify Contextual Conditions that are specifically related to users' motivations for using their current music app as "External Advantages" and "Internal Advantages".

4.2.2.1. External Advantage

"NetEase Cloud Music is popular among young people. Even before I used it, I'd heard about it from friends, and it's highly ranked on the app store." *(Participant 4)*
"Qishui Music is lighter than other apps, only about 100 MB, compared to the usual 400 or 500 MB ones···" *(Participant 9)*

According to Participant 4, NetEase Cloud Music has gained significant popularity among young adults in their twenties. They frequently hear about the app and see it being mentioned within their friends' circles, indicating its widespread use and influence. Furthermore, NetEase Cloud Music is ranked second on the app store and maintains an adequate rating, further highlighting its appeal and recognition. In contrast, Participant 9 appreciated Qishui Music for its surprisingly lightweight form. With a download size of only approximately 100 MB, it stands out

relative to larger apps that require 400–500 MB of storage space. This smaller download size offers convenience and efficiency for users, making it an advantageous feature of the Qishui Music app.

4.2.2.2. Internal Advantage

"Signing up for music apps is easy. Usually, you just link your WeChat or Weibo account, and you're in…" *(Participant 2)*

"KuGou Music is famous for its music recognition feature. It works really well." *(Participant 3)*

"NetEase Cloud Music has a trendy interface you can customize. It's not just about music; it also has short videos and live streams…" *(Participant 6)*

"I don't search for songs. I just open MiGu Music, see what it suggests (like the daily seven songs), and it's usually right about my tastes." *(Participant 5)*

The participants shared various internal advantages of the music apps they use. Participant 2 mentioned convenient registration, as most apps offer easy login options through platforms like WeChat or Weibo. Participant 3 highlighted the very accurate music recognition function of KuGou Music. Additionally, Participant 6 praised the trendy and customizable interface design of NetEase Cloud Music, which also provides additional features like the ability to watch short videos and live streaming. Lastly, Participant 5 expressed their reliance on the song recommendations provided by MiGu Music, which consistently aligned with their tastes. These internal advantages encompass trendy UI and features, a convenient login process, and useful main functions, all of which enhance the overall user experience of these music apps.

4.2.3. Core Phenomenon

In the context of the grounded theory methodology, the core phenomenon refers to significant events, ideas, or phenomena observed throughout the research process that can potentially impact actions, interactions, and various other processes (Strauss and Corbin, 1990). The core phenomenon can be understood as the concepts that emerge most frequently within the collected data.

Through the in-depth interviews with music app users, combined with the research conducted by Lee (2021) on the categorization of DSW, the present study identified three core phenomena: "Recognized fatigue in DSW of the "Chore" type," "Recognized fatigue in DSW of the "Routine" type," and "Changes based on elapsed usage time." During the interviews, it became evident that users experienced varying levels of fatigue associated with different types of DSW, particularly "Chore" and "Routine". These perceptions were observed at different stages of the respondents' music app usage. Furthermore, as this study followed a longitudinal approach design, changes in users' perceptions were recorded over a two-month period.

4.2.3.1. Recognition in DSW of the "Chore" Type

"I didn't notice the WeChat login option during registration, just the 'Phone Number Login'. It was a bit annoying." *(Participant 2)*

"I don't focus on the download, but when it comes to entering personal info during registration, I get uncomfortable." *(Participant 1)*

"I like to personalize my profile with a unique avatar and a bio that's short but individualized." *(Participant 6)*

"My significant other and I use NetEase Cloud Music and we use matching avatars and bios. It's fun and meaningful." *(Participant 4)*

"Setting up a password on Kuwo Music was tedious

because of the complex requirements. I'm likely to forget it." *(Participant 8)*

Participant 2 mentioned experiencing a moment of annoyance during registration when they missed an opportunity to use the WeChat login button, highlighting a slight inconvenience. Participant 1 expressed unease during the registration process because of the need to input personal information. Additionally, Participant 6 emphasized the value they place on editing their profile, including choosing avatars and personal bios that reflect their personality. Participant 4 shared a fun and meaningful experience of setting up couple's avatars and matching personal bios with their significant other. Participant 8 described fatigue and frustration with the lengthy and complex password requirements during registration on Kuwo Music. These insights provide a glimpse into the experiences of participants engaged in the "Chore" type of DSW and include slight fatigue during the download and registration processes, the entertainment and personalization aspects of profile editing, and clear fatigue associated with password management and update processes.

4.2.3.2. Recognition in DSW of the "Routine" Type

"Choosing an app isn't tiring, it's exciting... Like a child with a new toy, I look forward to what it can offer." *(Participant 3)*

"I usually choose an app from among the top-ranked ones, but sometimes they have negative news like copyright issues. This makes me doubt their rankings." *(Participant 2)*

"Searching for songs on QQ Music can be frustrating. It's hard to find popular songs from TikTok and the more I have to search, the more I think about deleting the app." *(Participant 7)*

"Listening to music is relaxing. I lose myself in it and forget life's troubles…" *(Participant 1)*

"Because I'm not particularly tech-savvy, some features of NetEase Cloud Music confuse me. The interface is so complex, I can't even find the exit buttons." *(Participant 4)*

Participant 3 mentioned experiencing anticipation rather than fatigue when beginning to choose an app. They likened it to a child buying a toy, looking forward to the novel experience the chosen app will provide. Participant 2 expressed some concerns about the authenticity of app rankings based on download numbers and ratings, particularly after noticing negative news associated with some top-ranked apps. Additionally, Participant 7 shared frustration when using QQ Music to search for songs, especially popular ones from platforms like Douyin (TikTok), leading to their considering deleting the app. Participant 1 described the process of listening to music as stress-free, providing an escape from life's troubles. Participant 4 stressed a sense of confusion and frustration with the complex interface design of NetEase Cloud Music and struggled to find exit buttons on certain screens. These insights highlight the experiences of participants in "Routine" types of DSW, including fatigue and anticipation in the selection process, notable fatigue when searching for music, enjoyment during the appreciation process, and frustration with information overload.

4.2.3.3. Changes with Elapsed Usage Time

"I've gotten used to MiGu Music and can find songs faster now. It's less frustrating than at the start." *(Participant 5)*

"The song recognition is useful sometimes, but I don't use it much, so I haven't noticed a big difference." *(Participant 9)*

"The main features work fine, but the extra features are

annoying. It's a music app, so why add unnecessary stuff? It feels distracting…" *(Participant 3)*

After two months of using Chinese music streaming applications, several changes were noted among the participants. Participant 5 mentioned that using the MiGu Music app has become much easier over time. They have learned some tricks and can search for songs faster, resulting in reduced frustration and fatigue compared to when they first used the app. Participant 9 stated that they haven't noticed significant differences with the song recognition feature since they hadn't used it frequently. Participant 3 expressed annoyance with the additional features of the Kugou music app, feeling that they distract from the primary function of the app. These findings highlight the changes in participants' experiences with elapsed usage, including subtle changes in fatigue and an awareness of the app straying from its primary purpose.

4.2.4. Intervening Conditions

Intervening conditions encompass a series of processes that can mitigate or alter the intensity of the core phenomenon. They represent structural situations with a broader impact than contextual conditions (Kim and Kang, 2017). In this study, intervening conditions are regarded as factors that may generate negative emotions or behaviors in users during the use of music apps, thereby influencing the intensity of the core phenomenon to some extent. Based on the findings from the coding process, this study identifies "External limitations," "Functional limitations," "Importance of Privacy Protection," and "Frequency of use" as the intervening conditions.

4.2.4.1. External Limitations

"Being overseas, I can't access many songs on Chinese music apps due to regional restrictions." *(Participant 2)*
"My home Wi-Fi doesn't reach everywhere, like the bathroom. It's frustrating when the music lags during my shower…" *(Participant 7)*

Participant 2 mentioned that being overseas limited their access to many songs in domestic Chinese music apps due to regional licensing restrictions. Participant 7 expressed frustration with experiencing lag while listening to music in areas without adequate wireless network coverage, such as their bathroom. These insights provide a glimpse of the external limitations participants face, including physical limitations that affect their ability to fully enjoy their music apps.

4.2.4.2. Functional Limitations

"The music recognition feature isn't reliable. It struggles with background noise, so it's useless in places like coffee shops or malls." *(Participant 2)*
"I don't get why Kugou Music has so many ads in its extra features. They're intrusive, always promoting something, and become tiresome over time." *(Participant 3)*

Participant 2 expressed dissatisfaction with the music recognition feature, finding it unreliable and unable to properly identify songs, especially in noisy environments like coffee shops or malls. Participant 3 criticized Kugou Music for including numerous advertisements in its extra features. They found the constant push to make purchases extremely annoying, and over time, these additional features became uncomfortable and tiresome. These examples highlight some functional limitations of these music apps, including the unreliability of the music recognition function and the imposition of mandatory function-

alities such as the inclusion of advertisements.

4.2.4.3. Importance of Privacy Protection

"Naturally, I worry about data leaks, but NetEase is a large company with no history of such issues..." *(Participant 4)*
"···Also, NetEase Cloud Music seems to only store personal info for half a month, then you need to log in again. That's a good thing." *(Participant 2)*

Participant 4 expressed a level of trust in NetEase Cloud Music regarding the security of their personal information because the company had not previously been involved in any data leakage scandals. Moreover, Participant 2 mentioned that personal information on NetEase Cloud Music was stored for only half a month, after which users were required to log in again. These statements demonstrate the importance of privacy protection in these music apps, including the perception of the company's social image and the implementation of personal data retention time limits.

4.2.4.4. Frequency of Use

"At first, Qishui Music only recommended some songs I liked, but after a month and a half, I enjoy almost all its recommendations." *(Participant 9)*
"The extra features of KuGou Music seemed cool at first, but they became annoying and tiresome over time." *(Participant 3)*

Participant 9 mentioned that when they first started using Qishui Music, only half of the recommended songs matched their tastes. However, after a month and a half of use, almost all the recommended songs satisfied their preferences. This highlights the adaptation period required for recommendations to align

with users' tastes. In contrast, Participant 3 expressed weariness and fatigue associated with the prolonged use of additional features in KuGou Music. Initially, the features felt fresh but eventually became uncomfortable and exhausting. These statements reflect the impact of usage frequency on user experience, including the need to adapt to personalized recommendations and the potential for fatigue resulting from excessive use.

4.2.5. Actions/Interactions

In the grounded theory methodology, action/interaction refers to how research subjects handle, execute, and respond to the core phenomenon and is a key element of the foundational theory (Strauss and Corbin, 1990). Based on the in-depth interview findings, the action/interaction in this study refers primarily to the strategies or measures adopted by users when confronting the core phenomenon and intervening conditions. Specifically, in this paper, action/interaction encompasses "Technical intervention" and "User attitude and purchase intention".

4.2.5.1. Technical Intervention

"With facial recognition tech like Alipay, NetEase Cloud Music skips the need for passwords during registration and payment." *(Participant 4)*
"To access Chinese songs, I bought a VPN. I connect to a Chinese network before using the app." *(Participant 2)*
"I found out that searching with "singer + lyrics/title" helps me find songs accurately." *(Participant 5)*
"After using Qishui Music for a few days, I made a playlist and saved others. Now, the recommended songs match my tastes, so I just use the recommendations." *(Participant 9)*
"I saved my password for Xiami Music in my phone's Notes app. To keep my info safe, I use the app's dual

authentication feature." *(Participant 1)*

While there is a certain degree of correlation with the "External limitations" mentioned in the "Intervening Conditions" section, this part introduces a distinct concept. In this context, the term "Technical intervention" pertains primarily to the measures that users employ within music streaming applications to address the challenges posed by DSW.

Participant 4 mentioned the use of facial recognition technology, similar to Alipay, in NetEase Cloud Music to streamline the registration and payment processes by eliminating the need to enter a password. This highlights the application of facial recognition technologies as a convenient technical intervention. Participant 2 discussed their utilization of VPN technology to access domestic (Chinese) songs, indicating the use of technology to overcome regional restrictions. Furthermore, Participant 5 discovered that using the "singer + lyrics/song title" search method in the app (MiGu Music) allowed for accurate song retrieval, demonstrating search function optimization. Participant 9 shared their experience of creating playlists and relying on the recommended music feature in Qishui Music, demonstrating the utilization of playlists and dependency on personalized recommendations.

Moreover, Participant 1 mentioned recording their app password in the Notes app and utilizing the built-in dual authentication feature in Xiami Music as additional security measures. These insights exemplify the various ways participants employed technical interventions such as facial recognition and VPN technologies, optimized search methods, playlist utilization, dependence on recommendations, and additional security measures to enhance their music app experiences.

4.2.5.2. User Attitude and Purchase Intention

"I've been using Kuwo Music for a month and I dislike its extra features. It feels like they're forcing TikTok content into the music app, which is unnecessary." (*Participant 8*)
"I'm willing to buy a membership for NetEase Cloud Music because it aligns with my ideas of an ideal platform. The membership gives me access to more high-quality music and fewer ads in the extra features." *(Participant 2)*
"Kugou Music already offers plenty of songs even without a membership. I often use its 'audiobook' feature despite the ads - nothing's really free." *(Participant 3)*

Participant 8 expressed a negative attitude towards the additional features of Kuwo Music, feeling that they are unnecessary and force TikTok content into the music app, adding elements that they deem unnecessary. In contrast, Participant 2 shared a positive experience with NetEase Cloud Music and their willingness to purchase a membership to access a wider range of high-quality music. The membership also allows for the elimination of advertisements in the additional features, enhancing the user experience. Participant 3, while not inclined to purchase a membership, found Kugou Music satisfactory in terms of available songs. They also used the "audiobook" function despite the presence of advertisements; thus, accepting the trade-off since free services often come with ads. These insights reflect varying user attitudes toward additional functions, the inclination to purchase membership services for enhanced benefits, and the acceptance of ads in non-membership scenarios.

4.2.6. Consequences

The final category of the coding process is

Consequence, which refers to the results generated by the preceding stage of action/interaction (Strauss and Corbin, 1990). These results can include present or future specific events, reactions, or potential occurrences. In this study, the Consequences identified through open coding were "Continuous use" and "Intention to switch."

4.2.6.1. Continuous Use

"I've had a great experience with NetEase Cloud Music over the past month, and I'd recommend it to my friends and family." *(Participant 2)*
"NetEase Cloud Music is more than just a music platform; it meets my social needs too... Over time, I can see this app becoming a vital part of my life." *(Participant 4)*
"Qishui Music stands out from other music apps with its pure focus on music and near-perfect recommendation system. I'll keep using it." *(Participant 9)*

Participant 2 expressed high satisfaction with their experience using NetEase Cloud Music over the previous month and planned to recommend it to friends and family. They believed that the app had met their need for high-quality music and had also fulfilled their social needs. Participant 4 described NetEase Cloud Music as a fantastic platform that had become an indispensable part of their life. They appreciated the app for providing high-quality music and satisfying their social needs. Participant 9 praised Qishui Music for its uniqueness compared to other music apps and highlighted its almost perfect music recommendation system. They expressed their intention to continue using the app in the future. These participant statements reflected increased loyalty and satisfaction with the respective music platforms used.

4.2.6.2. Intention to Switch

"KuWo Music's overload of ads and unnecessary extras like short videos and live streams have worn me out... I'm looking for a simpler app with a less cluttered interface." *(Participant 8)*
"Despite using QQ Music for a month, when I compare it to my previous experience with NetEase Cloud Music, I find that NetEase's youthful music social features fit me better." *(Participant 2)*

Participant 8 expressed dissatisfaction with KuWo Music due to the overwhelming advertisements and unnecessary additional features, such as short videos and live streaming. They expressed a desire to find a simpler app with a cleaner interface that was focused on the core musical experience. In contrast, Participant 2 compared their experience using QQ Music to their previous experience with NetEase Cloud Music and concluded that NetEase Cloud's youthful music social mode was more suitable for them. These participant statements indicate their intention to switch to more suitable music applications that align with their preferences and needs.

4.3. Selective Coding

Selective coding, an essential step in Grounded Theory research, facilitates the analysis and organization of collected data and enables the construction of a central theory. This method requires in-depth data examination to discern noteworthy concepts, relationships, and patterns (Strauss and Corbin, 1990). Iterative comparisons and integrations of different data pieces were engaged to select and code the relevant content to build the theoretical framework. This research design referenced Shi and Koh (2023)'s and Khandagale and Koh (2023)'s studies, which explored Self-Service Technologies (SSTs) and the application of DSW across all stages of South

Korean online shopping platforms. Building upon their work on DSW's roles and correlations to emotional changes throughout the usage process, the present study delved into the complete journey of Chinese music streaming application usage. According to Shi and Koh (2023) and Khandagale and Koh (2023), during the selective coding stage, this study divided the Chinese music streaming applications' usage process into four primary stages: Pre-usage, Preparatory, During usage, and Post-usage.

Within the Pre-usage stage, Chinese music app users are motivated by the healing power of music and the sense of escapism these apps provide. Their high social inclinations and strong curiosity toward these apps also influenced their decisions to use them.

The Preparatory stage involves Contextual Conditions formed by the external and internal advantages of the apps. External advantages, such as popularity among young people, higher app store ratings, and smaller download sizes, influenced users' choices among these apps. Internal advantages, such as convenient login processes, powerful music recognition features, trendy UI designs, and additional functionalities, expedited decision-making and generated higher expectations for users' future experiences.

During the usage stage, the core phenomenon identified in this study was users' perception of DSW during the use of music applications, which encompassed chore work and routine work. Chore work involved slight inconveniences and unease during registration, as well as noticeable fatigue related to password management and updates. However, there were also moments of entertainment and personalization during profile editing. Routine work included expectations and novelty experiences during app selection, concerns about the authenticity of rankings, and frustration and confusion during music searches related to interface design. Over time, users
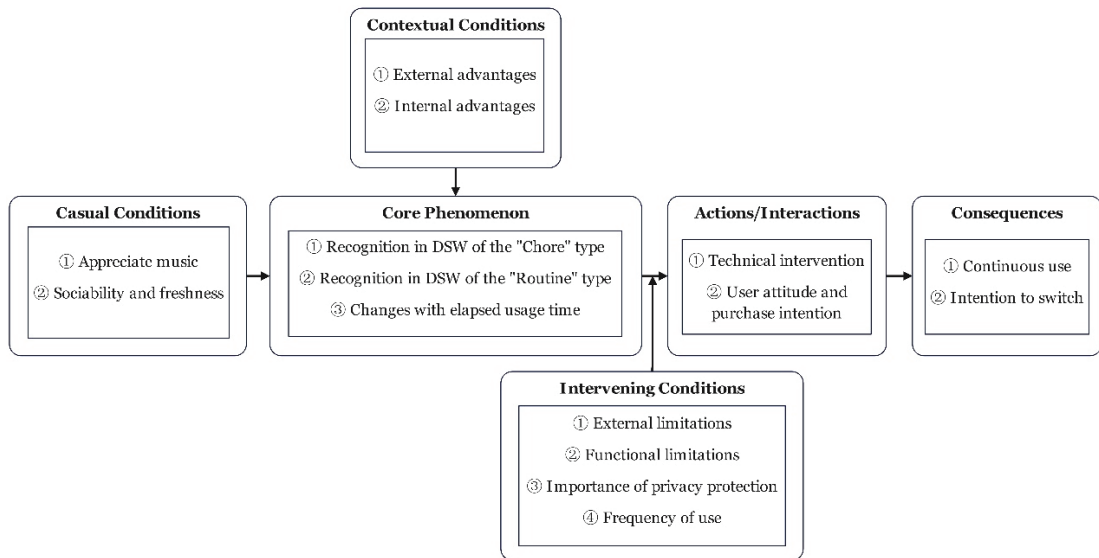
became more proficient but realized that additional features could detract from the app's primary purpose, diminishing the purity of the music-listening experience.

Within the Post-usage stage, intervening conditions such as external limitations, functional constraints, personal privacy protection concerns, and app usage frequency influenced the intensity of the core phenomenon. These conditions included regional licensing restrictions, unreliable music recognition features, excessive advertising, the importance placed on privacy protection, and the impact of app usage on the user experience.

In response to limitations posed by the core phenomenon and intervening conditions, users adopted various strategies and approaches, such as technological interventions, optimized search methods, leveraged playlists, reliance on recommendation systems, and additional security measures. Users were also found to hold differing attitudes toward additional features, with some considering them unnecessary while others were willing to pay for enhanced user experiences. Acceptance of advertisements varied among users, with some tolerating them in exchange for free services.

The consequences of users' actions and interactions can be broadly classified into two categories: continued usage and the emergence of conversion intentions. Some users showed increased satisfaction and loyalty toward music apps, considering them integral to their future lives. Yet some others expressed dissatisfaction with certain applications due to their excessive commercial aspects and advocated for simpler and more streamlined interfaces.

Through the application of the selective coding process, this study consolidated the narrative into four stages: Pre-usage, Preparatory, During usage, and Post-usage. This approach not only broadened

<Figure 1> Paradigm Model of the DSW Working Mechanism in Music Streaming App Usage

the scope of prior studies by presenting a comprehensive exploration of user interactions within the context of Chinese music streaming applications but also facilitated the development of a cohesive framework to understand the user experience process and the concept of DSW. This woven narrative, represented in <Figure 1>, spotlights the four key stages, elucidates critical user engagement phases, and contributes a more nuanced understanding to the existing body of knowledge on music streaming services.

V. Discussion and Conclusion

5.1. Discussion of Findings

This study utilized a longitudinal approach and the Grounded Theory methodology to investigate the working mechanism of DSW in the context of Chinese music streaming applications. The findings revealed that differing perceptions of DSW occur at different usage stages and exhibit varying intensities.

During the selection and download process, users developed an awareness of DSW. The complexity of the selection process, particularly for recognition behavior, contributed to this awareness, while the download behavior received less attention (per interviews with Participants 1 and 2).

Perceptions related to chore activities were predominantly negative, reflecting the laborious nature of these tasks. However, there were also positive perceptions associated with personal profile editing, aligning with the notion of self-expression and the "makeup" category identified by Lee (2021) (per interviews with Participants 4 and 6).

In contrast, perceptions related to routine activities exhibited a more mixed response. Negative perceptions of DSW were prevalent during the use of app functions, indicating a strong perception of labor during app usage. Conversely, positive effects were associated with the utilization of app functionalities, aligning with the concept of a quest for new experiences (per interviews with Participants 2, 3, and 7).

Participant 2 also emphasized their perception of complexity/fatigue in the recognition process during the selection stage.

Notably, the findings of this study diverged from those of Song et al. (2022), underscoring the distinctiveness of the conclusions drawn in this research. This study further revealed that perceptions and attitudes toward DSW change over time. Negative attitudes intensified concerning chore activities, prompting interventions aimed at alleviating frustrating tasks such as password management and manual updates.

Transformations were also observed in routine activities. Based on the interview with Participant 5, negative perceptions of the main functions diminished as users became more proficient in their usage. However, additional "labor" emerged due to the optimization of search methods and the utilization of list functions, leading to encouraging outcomes that suggest sustained app usage in the future.

Conversely, Participant 3's perspective revealed a shift in perceptions over time. Initially, they were enthusiastic about additional features with social attributes similar to SNS. This aligned with the findings of Kim (2023). However, as time passed, negative perceptions increased, leading to an inclination to switch to alternative platforms.

Participant 3, importantly commented on the growth of negative perceptions concerning the excessive use of additional features. These features were perceived to compromise the purity of the music-listening experience, undermining their initial enthusiasm and creating a desire to seek alternative platforms. This shift in perception highlighted users' evolving attitudes toward DSW and the impact it has on their app usage behavior.

In summary, Participant 3's perspective contributed a crucial dimension to this study's findings. This participant's experiences suggest that the initial allure of additional social attribute features can eventually be eclipsed by negative perceptions as time passes, influencing users to consider switching to other platforms. This insight might partially explain the decline in the monthly active users of Tencent's Kugou Music and Kuwo Music in 2022, as reported by Trustdata (2022).

Notably, Kugou Music and Kuwo Music are renowned for their plethora of additional features. Extrapolating from this study's results, it could be speculated that users perceived these additional features as redundant after using the platforms for some time, ultimately leading to their decision to discontinue or reduce use. Hence, while these features initially added value, they might become burdens over time, underscoring the need for a more balanced and user-centric approach in the development of music streaming application features.

5.2. Theoretical Implications

This study primarily builds upon the existing DSW framework, particularly Lee (2021)'s four categories: "chore," "make-up," "routine," and "quest." While providing empirical support for these categories, this research has increased understanding by examining their operations and interactions within the sphere of music applications. For instance, tasks that are typically considered mundane, such as login and playlist creation, become integral facets of the user experience over time, demonstrating the complex and evolving nature of DSW. This insight substantially enriches the burgeoning body of knowledge associated with DSW cognitive stages in the context of modern digital platforms.

Furthermore, this research unveils the intricacies of the application selection process, identifying it as a multifaceted undertaking. It incorporates a myri-

ad of factors, spanning corporate image, application ratings, user reviews, and notably, the anticipated level of DSW. By aligning with Park and Lee (2019)'s concept of voluntary shadow labor in the digital world, this study extends the concept by introducing users' expectations of DSW as a determinant in the decision-making process. This development paves the way for a significant DSW research expansion, underscoring the need for a comprehensive exploration of decision-making in the digital domain.

This research additionally sheds light on the dualistic nature of DSW activities. Routine tasks on music apps, such as song searches or using social features, can contribute to user fatigue. However, this study highlights that the joy and knowledge derived from "quests" can effectively counterbalance this fatigue. This research further suggests that certain types of DSW activities can transition into other types over time, a dynamic also described by Lee and Cho (2022). This shifting interplay between different DSW types furthers our nuanced understanding of digital labor and its transformative impact on user experiences.

Lastly, the findings of this study suggest that mundane DSW-related tasks can subtly evolve over time and closely interact with user behaviors. These transformations are particularly noticeable in association with new application features including "live streaming" and "music friends." As this research analyzes DSW with increasing precision, this revelation establishes a fertile foundation for model development. Such models can better capture the variety of DSW types and their evolution over time, contributing to a deeper understanding of the rapidly changing digital landscape.

In conclusion, this research provides considerable theoretical implications for DSW comprehension. It highlights DSW's dynamic nature, the intricacies involved in user decisions associated with DSW, and

the synchronous transformation of user behaviors with the advent of new digital features.

5.3. Practical Implications

This research provides valuable insights with practical implications for music streaming application design and development, especially within the Chinese context. To begin with, the focus on DSW in this study underscores an opportunity for application developers to innovatively harness user labor in the digital sphere. Using the insights gained by analyzing the various forms of DSW that users experience during their interactions with applications allows developers to boost user engagement. Specifically, this study suggests that features addressing emotional regulation and social interaction can effectively enhance user engagement. By acknowledging that users not only consume content but also contribute to its creation, developers can create features that utilize this labor and transform it into fulfilling experiences.

Secondly, the findings highlight the significance of user interface design in counteracting the adverse effects of DSW. Considering this, developers should contemplate refining their page design, and ensure that it is intuitive, user-friendly, and caters to a wide array of user preferences. This could involve providing options for display setting customization, creating shortcuts for commonly used features, adopting a minimalist design to prevent cognitive overload or a combination of these steps. In summary, these could enhance user experience through improved usability and accessibility.

Thirdly, the labor-intensive aspects of application use, such as registration and password management, are also highlighted in this study. To mitigate this and improve user experience, developers should con-

sider implementing more user-friendly technologies. Possible measures include adopting facial recognition or biometric authentication technologies or integrating social media for user verification to streamline registration and login processes. Minimizing these "chore" and "routine" DSW instances can greatly simplify the use of these applications.

Lastly, this research emphasizes the potential pitfalls of incorporating overabundant or overly diverse features, which can lead to aesthetic fatigue or confusion among users. Prior research (Kang and Uhm, 2010) predating the widespread adoption of music streaming applications, confirmed that streamlined page designs and diverse value-added services could establish switching barriers for users. However, the findings of this research recommend a more nuanced approach. Instead of striving for feature diversity, developers should utilize in-depth market research to more fully comprehend the needs and preferences of their users. A user-centric approach can then guide the creation of a balanced design that effectively caters to these needs. This might include the judicious integration of "social" features, such as live broadcasting and social networking functionalities; both of which have been shown to significantly enhance user engagement in Chinese music streaming applications.

In conclusion, this research stresses the importance of comprehending and addressing DSW in the design and development of music streaming applications. By utilizing a user-centered approach and through strategic exploitation of user labor, developers can create applications that provide a more engaging, user-friendly, and rewarding experience.

5.4. Limitations and Future Research Directions

While this study represents a significant step forward in understanding the dynamics of DSW cogni-

tion in music application usage, it has some limitations and further research is necessary. Firstly, despite achieving theoretical saturation, the study is constrained by the inherent subjectivity of qualitative research (Given, 2008). To address this, future research could utilize quantitative methodologies for empirical analyses; thus, providing a more robust and objective understanding of DSW cognition.

Secondly, the limited one-month time span of the study may not adequately capture entire usage cycles and the associated behaviors and decisions of users over extended periods. Thus, future investigations could conduct long-term research, possibly spanning six months to a year. Such longitudinal studies may yield more comprehensive insights and contribute to a more nuanced understanding of the dynamics of music application usage over time.

Thirdly, the study only interviewed nine participants, aged between 20 and 30. While diversity in terms of gender and occupation was taken into account, the limited sample size could potentially undermine the persuasive power of the results. In future research, it would be beneficial to increase the number of respondents and ensure a diverse age range, which would yield more compelling data and conclusions.

Lastly, the geographical scope of this study is limited and focuses only on Chinese individuals using music streaming applications based in China. This geographical limitation may reduce the broader applicability of the findings. To overcome this constraint and obtain more universally applicable results, future research could incorporate interviews and analyses with music streaming users from diverse regions, such as South Korea or countries in other regions. This would ensure a more globally representative understanding of user behavior and DSW cognition, and increase the potential for the development of universally appealing and effective music applications.

<References>

[1] Aguiar, L., and Martens, B. (2016). Digital music consumption on the Internet: Evidence from clickstream data. *Information Economics and Policy*, *34*, 27-43. https://doi.org/10.1016/j.infoecopol.2016.01.003

[2] Aguiar, L. (2017). Let the music play? Free streaming and its effects on digital music consumption. *Information Economics and Policy*, *41*, 1-14. https://doi.org/10.1016/j.infoecopol.2017.06.002

[3] Barata, M. L., and Coelho, P. S. (2021). Music streaming services: Understanding the drivers of customer purchase and intention to recommend. *Heliyon*, *7*(8), e07783. https://doi.org/10.1016/j.heliyon.2021.e07783

[4] Bu, S. Y., and Koh, J. (2022). Conceptualizing digital shadow work: Focused on mandatory and reward related issues. *The Journal of Information Systems*, *31*(3), 89-108.

[5] Brost, B., Mehrotra, R., and Jehan, T. (2019). The music streaming sessions dataset. *The World Wide Web Conference (WWW '19), Association for Computing Machinery*, 2594-2600.

[6] Charmaz, K. (2006). *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. MA: Sage Publications.

[7] Christopher, C., and Brian, F. (2020) Introduction to public radio and music in the streaming era symposium music in the public service: Public radio and music in the streaming era. *Journal of Radio & Audio Media*, *27*(1), 4-7. https://doi.org/10.1080/19376529.2019.1706260

[8] Datta, H., Knox, G., and Bronnenberg, B. J. (2018). Changing their tune: How consumers' adoption of online streaming affects music consumption and discovery. *Marketing Science*, *37*(1), 5-21. https://doi.org/10.1287/mksc.2017.1051

[9] Dougal, S., and Camille, R. (2021). *Tracing Affordance and Item Adoption on Music Streaming Platforms*. International Society for Music Information Retrieval Conference.

[10] Given, L. M. (2008). *The Sage Encyclopedia of Qualitative Research Methods*. Los Angeles, MA: Sage Publications.

[11] Grand View Research (2022). Music Streaming Market Size & Share Analysis Report, 2030. Available at https://www.grandviewresearch.com/industry-analysis/music-streaming-market.

[12] Hagen, A. N. (2015). The playlist experience: Personal playlists in music streaming services. *Popular Music and Society*, *38*(5), 625-645. https://doi.org/10.1080/03007766.2015.1021174

[13] Illich, I. (1981). *Shadow Work*. MA: Marion Boyars.

[14] Jansson, A. (2021). Beyond the platform: Music streaming as a site of logistical and symbolic struggle. *New Media and Society*, *25*(12), 3203-3221. https://doi.org/10.1177/14614448211036356

[15] Kang, S., and Uhm, G. (2010). The antecedents of switching cost and its effect on customer loyalty in digital music service industry. *Asia Pacific Journal of Information Systems*, *20*(2), 157-180.

[16] Khandagale, P., and Koh, J. (2023). Effects of digital shadow work on foreign users' emotions and behaviors during the use of Korean online shopping sites. *Asia Pacific Journal of Information Systems*, *33*(2), 389-417. https://doi.org/10.14329/apjis.2023.33.2.389

[17] Kim, T. (2023). Social orientation of Chinese music consumption in the streaming era: The structure and significance of Tencent's music platforms. *Korean-Chinese Language and Culture Research*, *67*, 439-460. https://doi.org/10.16874/jslckc.2023..67.016

[18] Lambert, C. (2015). *Shadow Work: The Unpaid, Unseen Jobs That Fill Your Day*. MA: Counterpoint.

[19] Lee, B. H., and Koh, J. (2022). Analysis of technical stress among call center agents: Focusing on digital shadow work and organizational citizenship behavior. *The Korean Society of Knowledge Management*, *23*(4), 21-41.

[20] Lee, W. K., and Cho, A. (2022). A study on the

mechanism governing the use of makeup-type digital shadow work: A case of profile picture management. *The Journal of Information Systems*, *31*(3), 1-18.

[21] Leyshon, A. (2009). The software slump?: Digital music, the democratisation of technology, and the decline of the recording studio sector within the musical economy. *Environment and Planning A: Economy and Space*, *41*(6), 1309-1331. https://doi.org/10.1068/a40352

[22] Liu, T. T., and Koh, J. (2021). Benefit/Cost, negative attitudes toward shadow work, and consumer's response behavior. *Journal of Information Systems*, *30*(2), 79-103.

[23] Lu, G. (2019). A study on music retrieval method based on Python. *Electronic Production*, *14*(3), 82-85.

[24] Park, S. C., and Kim, J. U. (2021). Impacts of e-grocery consumers' shadow work on mobile shopping avoidance and switching behavior. *Information Systems Review*, *23*(4), 165-182.

[25] Park, S. C., and Lee, W. K. (2019). Using grounded theory techniques for reviewing literature: Shadow work in digital environment. *Knowledge Management Research*, *20*(2), 183-195.

[26] Park, S. C. (2019). User behavior on changing the password from the shadow work view. *The Journal of Information Systems*, *28*(2), 93-107.

[27] Park, S. C., Lee, W. K., Koh, J., and Ryoo, S. Y. (2020). Identifying shadow work mechanism in digital technology environments. *Korean Management Review*, *49*(1), 31-50. https://doi.org/10.17287/kmr.2020.49.1.31

[28] Qu, S., Hesmondhalgh, D., and Xiao, J. (2023). Music streaming platforms and self-releasing musicians: The case of China. *Information, Communication and Society*, *26*(4), 699-715. https://doi.org/10.1080/1369118X.2021.1971280

[29] Ryoo, S., and Park, S. C. (2021). Antecedents and consequences of digital shadow work in mobile shopping apps context. *Sustainability*, *13*(14), 1-11. https://doi.org/10.3390/su13147697

[30] Song, J., Lee, W. K., Lee, B. H., and Koh, J. (2022). A longitudinal study on the effect of the application usage period on the change of digital shadow work type: Focused on LBS-based help apps service. *Korean Journal of IT Services*, *21*(6), 91-116.

[31] Statista (2023). Share of Music Streaming Subscribers Worldwide in the 3rd Quarter of 2023. Available at https://www.statista.com/topics/6408/music-streaming/#editorsPicks.

[32] Strauss, A., and Corbin, J. (1990). *Basics of Qualitative Research*. MA: Sage Publications.

[33] Strauss, A., and Corbin, J. (1998). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Thousand Oaks, MA: Sage Publications.

[34] Strauss, A., and Glaser, B. G. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. MA: Aldine Publishing Company.

[35] Trustdata (2022). October 2022 Mobile Internet Industry Rankings. Available at https://www.199it.com/archives/1528182.html#google_vignette.

[36] Wang, H., and Fu, R. (2020). *Exploring User Experience of Music Social Mode - Take NetEase Cloud Music as an Example*. Advances in Intelligent Systems and Computing, MA: Springer-Cham.

[37] Wiesche, M., Jurisch, M. C., Yetton, P. W., and Krcmar, H. (2017). Grounded theory methodology in information systems research. *MIS Quarterly*, *41*(3), 685-701.

[38] Wikstrom, P. (2020). The music industry: Music in the cloud. *European Journal of Communication*, *35*(1), 89-90.

◆ About the Authors ◆

Haoxi Wu

Haoxi Wu graduated from the Department of Business Administration at Chonnam National University and is currently pursuing an Integrated Master's and Doctoral Program in Digital Future Convergence Service at the same institution. His research has been published in the Korea Society of IT Service and presented his research at the KrAIS Summer Workshop 2023 and the Korea Society of IT Services 2023 conference. As a scholarship recipient from the Korea Research Foundation BK21 Team, his research interests lie in the areas of Explainable AI, Digital Shadow Labor, Digital Work, and Self-Service Technology.

Dr. Joon Koh

Joon Koh got his Ph.D. degree at KAIST and worked for Samsung Electronics. He is currently a professor of Department of Business Administration at Chonnam National University. He is currently the Editor-in-Chief of *Information Systems Review*. He received academic awards from the Korea Management Association, the Korea IT Service Association, and the Korea Management Information Systems Association. He has published papers in academic journals such as CACM, IJEC, JAIS, ECRA, JKM, CHB, IJHRM, JCIS, ESWA, Scientometrics, and I&M. He also presented his papers at academic conferences such as ICIS, ECIS, HICSS, and PACIS. His main research fields are digital shadow work and the knowledge ecosystem.