
Be Mine: Contextualization of Ownership Research in HCI

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Abstract

While the Human-Computer Interaction (HCI) research on perceived ownership over physical and digital possession is actively developing, there is still a noticeable lack of common conceptual understanding of ownership that would allow for systematizing our explorations and discoveries. In this work, we analyze the ownership literature in different domains and propose the HCI-focused adaptation of the theoretical conceptualization of ownership, including (I) five relevant structural dimensions of ownership, (II) three synthesized motivational aspects of ownership, and (III) three related social behaviors. Developing a common conceptual ground for ownership will allow future technology researchers and practitioners to effectively communicate and articulate their findings.

Author Keywords

Ownership; possessions; HCI; values; social context.

CCS Concepts

•Human-centered computing → HCI theory, concepts and models;

Introduction

With the rapid development of shared economy, increasingly autonomous devices, and the preeminence of cloud-based services, the question of perceived ownership over

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physical and digital possessions becomes ever more relevant to the HCI community [6, 23, 14, 21, 15, 17]. Furthermore, the sense of possession over technological artifacts, as well as related processes of obtaining access and sharing these artifacts are essential in supporting users' security and privacy. However, our understanding of ownership is still rather fractured and predominantly descriptive. Thus, there is a need for a structured and systematic understanding of the concept of ownership that would allow HCI researchers to develop a common ground for producing and effectively articulating corresponding knowledge.

To address this, we examine the conceptual understanding of ownership in different areas of knowledge, and then analyze examples of HCI papers on the perception of physical and digital possession in context of this literature. Through this analysis, we suggest the HCI-focused adaptation of the theoretical conceptualization of ownership. Specifically, how the consideration of ownership over physical and digital targets can be grounded in (I) the multi-dimensional structure of ownership – “*what*” the sense of ownership is; (II) the motivational aspects of ownership genesis – “*why*” the sense of ownership occurs, and (III) related human social behaviors – “*how*” the sense of ownership manifests.

Review of Ownership Literature

In this section, we review the literature on psychological ownership in different disciplines. We begin with a synthesis of definitions of ownership, followed by an examination of the multi-dimensional structure of the phenomena, and an exploration of relevant motivational and behavioral aspects.

The Construct of Psychological Ownership

The state, in which individuals experience a psychological connection with various artifacts, feeling these artifacts as “theirs”, has been defined as *psychological ownership* [4,

11, 9]. Psychological ownership, then, is based on a formed sense of possession toward an object, answering the question “What do I feel is mine?” [34]. The sense of ownership, however, extends beyond objects and can be formed towards both tangible and intangible goods and services [1], which are referred to as **targets** [26]. In sociology, for example, Shove et al. [32] note that possession is not only applicable to objects but to spaces, practices, and power.

The most commonly used definition of ownership [1, 24, 33], suggested by Pierce et al. [26], highlights the dual cognitive-affective nature of the construct [26]. Specifically, one's cognitive ownership awareness through intellectual perception of the target is necessarily tightly coupled with an emotional component of ownership [27]. For instance, Beggan [4] experimentally demonstrated that people tend to evaluate an object more favorably based on the fact that they own it, validating the “mere ownership effect” priorly suggested by Rudmin [29]. Such affective component becomes noticeable when others attempt to claim targets for which one feels a sense of personal or group ownership [27, 33, 3]. Thus, among the numerous definitions (see [27]), the dual perspective allows to conceptually distinguish psychological and legal ownership [10, 26].

Multi-Dimensional Structure of Ownership

Originally, Pierce et al. [26] based their ownership construct on the three dimensions: *self-efficacy*, *belongingness*, and *self-identity*. Avey et al. [1] expanded this structure by proposing the concepts of *territoriality* and *accountability* as additional dimensions. Finally, building on these theoretical models and further literature review, Olckers and Du Plessis [25] suggested to add the dimensions of *autonomy* and *responsibility*, bringing it to seven dimensions that impact the extent to which an individual experiences psychological ownership. These dimensions are further described below:

Self-efficacy/Confidence refers to one's beliefs in their ability to accomplish tasks [2], hence, being in control. Correspondingly, the believed ability to effect a desirable outcome of actions with the target promotes the sense of psychological ownership over it [12, 1, 24, 26].

Belongingness According to Pierce et al. [26], the feelings of psychological ownership through attachment to a place or an object lead to that place or object becoming "home". Belongingness then refers to the extent to which people feel 'at home' in a particular space or place [1, 24, 26].

Self-identity Prior work (e.g., [9, 5]) demonstrated that targets can become so deeply associated with one's self-identity that they are viewed as an extension of self [1]. The self-identity dimension then refers to the phenomena of the target becoming an "extension" of the owner [26, 1, 24]. Miller [22] further argues that 'who you are' is represented in the things that one possesses or chooses not to possess.

Territoriality The tight relationship between ownership and self-identity encourages people to support their territoriality [7], e.g., by marking or defending their territory [1, 33, 7]. Wang et al. [33] distinguish two types of ownership markers: *communicative markers* that persuade others not to attempt to claim the marked object; and *defensive markers* that stop others from accessing marked objects.

Accountability contributes to ownership through the expectation for one's self to be held accountable [18]. Accountability is reflected in the characterization of high levels of psychological ownership through some descriptive behaviors, e.g., stewardship and self-sacrifice [27]. The main argument is that when targets become an extension of self, accountability for what happens with these targets has implications for what happens with the self [1].

Responsibility elaborates the dimension of accountability [25]. For instance, while acceptance of accountability is voluntary [35], responsibility might be externally assigned or enforced to an individual [24]. Thus, ownership includes an enhanced sense of responsibility for the target and the associated implicit right to control and influence it [26, 33].

Autonomy denotes the ability to experience individual initiative to exercise influence and control over targets [30, 31, 25], such that if one perceives a device as theirs, they have a sense of autonomy to decide when and how to use it.

Motivational Components of Ownership

So far, we have reviewed the multi-dimensional structure of the sense of ownership, or "what" it means for an individual to feel that they are in possession of a physical or digital good. The understanding of such structure allows us, as researchers, to develop instruments for recognizing and measuring the sense of ownership. Yet, to support the appropriate establishment of instruments, we need to further understand "why" the sense of ownership occurs.

Within attempts to understand the genesis of one's sense of ownership (see [27]), one of the most promising is a sociobiological perspective that envisions a combination of biological tendencies toward territoriality and accepted social practices (e.g., [9]). One avenue for balancing the biological and social origins of feelings of ownership is to view them as grounded into the need to fulfill basic human motives.

In their review, Pierce et al. [27] proposed that psychological ownership is rooted in three motives: **efficacy** in relation to one's environment, motivation to express one's **self-identity** to others and maintain it across time, and motivation to **have a place** that is familiar and provides some form of personal security. Wang et al. [33] later suggested three different, yet partially overlapping, motives to devel-

oping feelings of ownership: **perceptive motive**, referring to the need to decrease cognitive costs by categorizing the world in perceptive units through signaling the ownership of an object [16]; **instrumental motive**, reflecting the control over the target [11, 29]; and **symbolic motive** that allows one to see their reflection in the target, feel their effort in its existence [28], and thus, communicate their identity [8].

Ownership of Physical and Digital Targets

We observe that the ownership theory literature does not usually distinguish the sense of ownership of material and immaterial targets. However, prior HCI research provided extensive evidence that people treat physical and digital artifacts differently. Such that people tend to see digital objects as unstable, ephemeral, and 'not exactly real' in comparison to physical objects [13, 19, 14]. To further investigate this potential literature gap, we analyze the results reported in four HCI papers on physical and digital possessions, in context of the ownership literature.

The papers were selected after performing a literature search in the ACM Digital Library using the terms "ownership, possession, physical, and digital" and identifying works that included exploratory user studies on the perception of physical and digital possessions. Four papers were then identified for their diversity in representing: physical versus digital possessions [23, 21], shared ownership of technological possessions [15], and the differences in the sense of ownership over various digital possessions [14].

Odom et al. [23] explored what it means to be in possession of an object in the cloud and the differences in the perception of physical and digital possessions. They showed that "material possessions are essential to the repertoire of identity" – *self-identity* dimension. They explained that, in the physical world, people tend to organize their posses-

sions to know where something resides. However, with on-line data, users struggle with having no equivalent sense or clear ownership boundary, corresponding to one's lacking confidence in their ability to accomplish tasks – *self-efficacy* dimension. The authors also highlighted the importance of "having access to possessions when you want". When users have no sense of control over the services that host their digital possessions, they are concerned with losing access to them. Coupled with the discovered importance of "being able to relinquish possession" [23], these results extend to the *autonomy* dimension as they reflect users' beliefs in their ability to experience individual initiative in exercising influence and control over the target [30, 31]. This work further identified the significance of "being accountable for care and protection", reflecting on both the *accountability* and *responsibility* dimensions of ownership. Finally, this work reflects the *territoriality* dimension and corresponding marking behaviors, such as the value of being able to "give access or rights to others" – having some level of implicit control over others' access to the targets.

McMillan et al. [21] explored how users perceive their media collections from physical, to digital, and cloud media. Much of their findings on the differences in perception of owning these possessions correspond to the *self-identity* dimension and symbolic motive of ownership. For example, the authors showed that due to the "costlessness" and lack of "sacrifice" involved in cloud media acquisition compared to downloading music online or buying physical media, cloud media is associated with lower commitment. In par with prior work, this illustrates how efforts put into the target's existence contribute to the sense of ownership [28]. McMillan et al. further described users issues with losing the ability to display one's taste through digital media, which leads to users' difficulties to fulfill the *symbolic* (self-identity) motivation and preventing the development of an appropri-

ate sense of ownership towards the digital media. The discovered difficulties with granting access to a massive library of media due to the users' obscured notion of a personal collection also led to concerns with related social situations, such as gifting behaviors, directly reflecting the *territoriality* dimension's marking behaviors and social practices [20].

Gruning and Lindley [15] investigated shared ownership of physical and digital possessions by couples and families in households. Focusing on what sharing means in this context, the authors identified three themes: A. Accountability, B. Trust, and C. Building relationships and shared identities. A. Content was commonly led and, sometimes, enforced by a "manager" figure, such as parents teaching children to consider the effects of their actions on others. These results constitute a combination of the *accountability* and *responsibility* dimensions. *Accountability* is further discussed in the role of B. Trust in sharing arrangements. Similar to the role of "being able to relinquish possession" [23], Gruning and Lindley found that dealing with the shared content included 'cleaning' shared devices, checking, however, with all sharers of a collection of objects before getting rid of any of them. These results further extend the corresponding reflection of the *autonomy* dimension. Finally, they found that C. sharing was used as a mechanism for the household members to know about each other's tastes and preferences directly correspond to the *self-identity* dimension.

Gruning [14] expanded on the understanding of the specifics of digital possessions. Comparing uses of paper and e-books, Gruning found that "not only are there important differences in the ways people perceive their ownership of physical and digital objects, but that the context of digital ownership (e.g., through an account vs. files stored on a personal computer) also introduces variations in how people value their digital possessions" [14]. First, as per Odom

et al.'s results [23], found that users had concerns about the ephemerality of e-books and preferred paper books for objects they anticipated keeping over the long-term – *autonomy* dimension. Besides, Gruning uncovered a distinction among participants in how they perceived their ownership of digital objects, depending on how they acquired, accessed, and stored them. Participants who relied entirely on an account access and a device, or app, to access and store their e-books generally felt that their ownership of e-books was less certain than their ownership of paper books. Participants who instead used alternative systems for e-book access and storage were more certain of their ownership, although they still did not consider that ownership to be quite the same as ownership of a physical book. Gruning noted that these different models of ownership changed the possibilities for actions that could be taken with e-books – *self-efficacy* dimension of ownership –, which participants cited as key to feeling ownership of e-books. Echoing the Odom et al.'s [23] results on the importance of "knowing what you have" and the ability to clearly organize one's possessions, Gruning showed that even with digital objects "simply the basic desktop computer and file storage system" positively contributes to psychological ownership in comparison to pure cloud access.

This discussion on how users perceive ownership of physical and digital objects highlights clear differences in the sense of ownership of material and immaterial targets. Yet, the ownership literature in its constructs does not differentiate between physical and digital goods. In the next section, we propose to further contextualize the notion of ownership for the HCI community.

Contextualization of Ownership in HCI

We suggest that the consideration of ownership over physical and digital targets can be grounded in the constructs of:

(I) multi-dimensional structure of ownership [26, 1, 24], (II) motivational aspects of ownership genesis [27, 33], and (III) related social behaviors [33, 21, 32, 23]. While the structural component supports the recognition of the sense of ownership, the motivational component reflects the mechanisms of its establishment, and the behavioral component reflects its actionable manifestations.

Our analysis illustrates that the perceptions of ownership over physical and digital objects can be mapped to the previously developed Multi-Dimensional Structure of Ownership (Section 3.2). Specifically, we suggest the following five *dimensions* for a particular consideration in HCI research: **(a) Self-identity** reflecting the target of possession becoming an aspect of a “representation” of an owner (e.g., [21, 23, 15]); **(b) Self-efficacy** reflecting the owner’s judgement of their capability and competence to perform a task and to control the target (e.g., [23, 14]); **(c) Accountability and Responsibility** reflecting the voluntary or enforced authority and obligation to take care of the target and related performances, consequences, and issues (e.g., [23, 15]); **(d) Autonomy** reflecting the owner’s judgement of their capability to independently initiate decisions and actions with the target (e.g., [23, 15, 14]); **(e) Territoriality** reflecting the owner’s identification of their possession through external references and causing the owner to defend the target if ownership is endangered (e.g., [21, 23]).

Furthermore, the analysis of HCI research suggests the need for the selective synthesis of the earlier identified *Motivational Components of Ownership* (Sec. 3.3). Specifically, to appropriately reflect the chosen structural dimensions of psychological ownership and to adapt these motivational systems to the context of HCI research, we suggest to particularly consider the following three ownership motivations: **(i) instrumental motive** [33], or self-efficacy [27]

– the motivation to be effective in relation to one’s environment (e.g., found in [23, 14, 15]); **(ii) symbolic motive** [33], or self-identity [27] – the motivation associated with developing and expressing self-identity to others (e.g., found in [21, 23, 15]), and **(iii) perceptive motive** [33] to categorize the world in perceptive units through the ownership of an object [16] (e.g., found in [21, 23, 14]).

Finally, in correspondence to some evidence in ownership literature (e.g., [1, 7, 32, 20]), prior HCI research reported on the ownership-related *social behaviors*. These include **(1) displaying** targets as representations of one’s identity [21, 15] and **(2) marking behaviors** [33, 21]; further extending the list by adding the consideration of **(3) sharing and gifting behaviors** [21, 6, 17, 23, 15].

Future Work and Conclusion

As the boundary between physical and cloud-based services is increasingly blurry, the question of perceived ownership towards physical and digital targets becomes central to the HCI research community. The successful development of this area is predicated upon researchers having a common conceptual ground to effectively articulate their findings. We highlighted a gap where theories do not traditionally distinguish the sense of ownership of material and immaterial targets while prior HCI work showed important differences in users’ perception of ownership. We proposed an HCI contextualization of ownership that consists in five structural dimensions on “what” the sense of ownership is, three motivational aspects on “why” the sense of ownership occurs, and three social behaviors on “how” the sense of ownership manifests. Such conceptual stance on psychological ownership provides a framework for systematizing the exploration of the related perceptions and processes.

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