



Figure 1: Growing stages of Ivy. Ivy starts to grow on the legs and hand rails and eventually roots itself on its place.

## Ivy: Reading a Critical Design for Sedentary Behavior in the Office Context

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### Abstract

In this paper, we present and discuss Ivy, a critical artifact offering a novel design perspective on interventions that aim to reduce sedentary behavior in office workers. Ivy is an interactive office chair that represents the amount of sitting time through growing ivy strands. Using the matrix of common argument types by Bardzell et al., we propose a structured "reading" of Ivy, as an example supporting reasoned and accessible conversations about criticality in design. Our reading of Ivy emphasized that its criticality emerges mainly from data physicalization as a new form of interactivity intended to trigger reflectiveness. The insights of this design study contribute towards a critical perspective on designing interventions to reduce sedentary time and spark discussion amongst designers and researchers in the field of Human-Computer Interaction.

### Author Keywords

Critical Design; Critical Theory; Office work; Sedentary Behavior

### CSS Concepts

• **Human-centered computing~Interaction Design**; Interaction design theory, concepts, and paradigms



Figure 2: Productivity Chair retrieved from Hemmert et al. [8]



Figure 3: The End of Sitting [17]



Figure 4: Ivy chair with growing ivy strands when sitting too long

## Introduction

Our increasing sedentary lifestyles are a growing health risk [15], with physical inactivity being the fourth leading cause of death worldwide [11]. A large part of our sedentary behavior takes place during office hours [4], making the office an important environment to target sitting behavior. To combat the negative health effects of prolonged sitting at work, a myriad of digital tools to reduce sedentary behavior (SB) have been developed over recent years [5, 9]. Prime examples of such technologies are health applications and wearables. There is, however, a relative dearth of critical designs in this context. Critical design is a *"form of research aimed at leveraging designs to make consumers more critical about their everyday lives, and in particular how their lives are mediated by assumptions, values, ideologies, and behavioral norms inscribed in designs"* [1, p3297]. One notable example is the shape-changing 'Productivity Chair' that uses computationally controlled discomfort when a user is not productive (Figure 2) [8]. This design criticizes the trend of workplace surveillance for productivity maximization. A second notable design is 'the End of Sitting' installation [17], a work environment without chairs and desks that questions the conventional limits of working environments (Figure 3).

Critical design can challenge existing views by sparking discussions on current lifestyles and practices [1]. As Malpass argues, the interrogative, discursive and experimental approaches, often adopted in critical designs, can challenge the status quo [14]. To make critical design more accessible to the broader design and HCI community, Bardzell et al. propose to support our *"ability to "read" (i.e. critically interpret) critical designs that is, to construct and critique design*

*arguments about critical designs."* [2, p1951]. In the present work, we present Ivy, an interactive artefact transgressing existing discourses in SB interventions for the workplace. Through a structured "reading" of Ivy, we aim at supporting reasoned conversations about arguments for criticality in design.

## Design of Ivy

Ivy is built as a working prototype that aims to increase awareness of SB by representing sitting behavior through a growing ivy plant on the office chair [16]. Ivy will start to grow after sitting for 30 minutes, and the longer the user sits, the more ivy strands will grow on the handrails and legs of the chair (Figure 1). Ivy will continue to grow and will ultimately immobilize the chair after two hours of prolonged sitting (Figure 4). This paper contributes towards a critical perspective on designing for SB interventions and spark discussion amongst designers and researchers in the field of Human-Computer Interaction (HCI).

## Reading Ivy as a Critical Design

By discussing Ivy as a critical design, we highlight relevant design qualities and critically interpret these qualities in relation to the set of norms and conventions we see in the domain of SB office interventions. To guide this process, we use the 3-steps approach of Bardzell et al. [2]. The unit of analysis of Ivy (step 1) is a finished working prototype. In subsequent steps, we situate Ivy in relation to conventions and norms of SB office interventions and discuss the critical aspects of Ivy. We use the matrix of common argument types [2] to map our arguments and visualize how we read Ivy as a critical design. This tool supports the understanding of design arguments as well as guides design choices in critical design processes [2]. In the

**Explanations columns [2]:**

- *Changing perspectives:* The design presents a framing or point of view that is new, coherent, and interesting enough to help the user perceive the particulars of a domain according to a new schema.
- *Proposals for change:* The design embodies a provocative proposal for an alternative way of being; the proposal is grounded in possibility, cannot be easily dismissed as “science fiction,” and the user can imagine her or himself in its universe.
- *Enhancing appreciation.* The design contributes to the user’s appreciation of or judgment on design’s role in a sociocultural issue of significance, by making the user more perceptive, imaginative, or aware of the complexity of a domain.
- *Reflectiveness:* (i) The sense of encouraging user reflectiveness, that is, facilitating the user’s shift from direct perception and action to a more reflective or self-aware stance. (ii) The design itself embodying reflectiveness, by revealing or foregrounding the tropes by which it distinguishes itself from design conventions as the rhetorical devices that they are.

matrix (Figure 5), the rows represent six interaction dimensions, namely topic, purpose, functionality, interactivity, form and materiality. The columns represent four dimensions of criticality: changing perspectives, proposal for change, enhancing appreciation and reflectiveness (see definitions in the sidebars pages 3-4). By combining an interaction dimension with a dimension of criticality, a specific type of argumentation can be sought and formulated. We discuss seven arguments, of which the labels are represented in the matrix (Figure 5).

	Changing Perspectives	Proposals for Change	Enhancing Appreciation	Reflectiveness
Topic				
Purpose				
Functionality				Fu, R
Interactivity	I, C	I, P	I, E	I, R
Form				Fo, R
Materiality				M, R

**Figure 5:** The reading of Ivy as a critical design [2], showing the arguments we discuss and reflect on

*An Unusual Ordinarity (Fo, R + Fu,R)*

The design form of a chair, an object that serves a function for sitting, does not inherently embody a proposal for an alternative way of being. It however uses an ordinary element with unusual features in order to reconfigure traditional meaning of furniture in our context. Previous examples of critical design adopting that perspective can be found in [6, 7]. Using a chair is a conscious choice made to question and reflect on how our office environment shapes our behavior (Fu, R). Linking the form of the intervention to the targeted

behavior may deepen the reflectiveness, understanding underlying values of the design (Fo, R) [13]. An opposite perspective is represented in ‘the End of Sitting’ project which entails a radical proposal for change by removing chairs and desks entirely from their new workspace universe [17].

*Physicalization of Data (I, C + Fo, R + I, E + I, P)*

With Ivy we make use of data physicalization, a physical representation of data to help people explore, understand and communicate data [10]. Ivy adopts a qualitative perspective to represent sitting behavior by using growing ivy strands, thereby making a direct connection between the measured input and the physicalized output. With this approach, Ivy counters the current trend of digitalization and the quantified-self movement [3], thereby embodying a change in perspective (I, C). By making data physical, Ivy can deepen the self-awareness of the negative consequence of prolonged sedentary behavior and support sense-making (Fo, R). This approach contrasts the quantitative perspective that is often adopted by SB interventions where sitting behavior is represented through graphs and numbers (e.g., the amount of sitting time on a smartwatch). It does constitute for designers a proposal for change (I, P) in the way they work with data and design feedback mechanisms. Furthermore, we argue that Ivy provides a more imaginative and perceptive approach in the representation of feedback on sitting behavior by the slow pace of the growing ivy. With this slow pace, Ivy may trigger enhanced appreciation of the feedback given to the user (I, E). This as opposed to instant feedback that is used in prompting software.

**Explanations rows [2]:**

- *Topic*: the human domain in which the design serves, intervenes, participates, etc.
- *Purpose*: central purpose of the design qua design, that is, its rationality considered as a whole.
- *Functionality*: discrete capabilities or things that the design can do or can enable its user to do.
- *Interactivity*: mainly as input/output with a human.
- *Form*: all the ways a design could have been formed, structured, styled, and/or made available to human awareness
- *Materiality*: the physical materials out of which the design is made, including what makes it available to human perception and consciousness, the qualities of that perception, how it is physically interacted with, etc.

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*Paradox in Aesthetics (Fo, R)*

There is a paradox present when sitting on Ivy for a prolonged period. Since the chair tends to become, arguably, more aesthetically pleasing when Ivy grows (Fo, R), 'bad behavior' is somehow rewarded by the design. Previous approaches such as the 'Productivity Chair' [8] focus mainly on negative emotions to question an undesirable behavior. The use of mixed emotions in our artefact, through the beautiful exposure of one's idleness, is in line with the project 'Pleasurable Troublemakers' which points out 'bad behavior' through aesthetically pleasing features, intended to create situated friction [12]. This seemingly contradictory design choice creates a poetic awareness that is not limited to the individual user. The growing aesthetical features can trigger social engagement from colleagues, due to its increasing visibility.

*Metaphors as a Means for Reflection (M, R + I, R)*

We used several metaphors in Ivy to stimulate reflection on the targeted behavior. First, in the materiality by choosing ivy, a plant that will only grow on something when it is at the same spot for a long time (M, R). Ivy makes use of this metaphor to link the feedback given by the design to the prolonged sitting behavior of the user. Second, the user will eventually be rooted to the chair and thus restricted in one's movement. Through this restriction, we intend to trigger reflectiveness on the user's current sedentary behavior by hinting at becoming stiff after a prolonged period of sedentary behavior (I, R). Third, as ivy plants also have a poisonous type, Ivy hints to the negative health effects of prolonged sitting (M, R). The use of poisonous Ivy therefore alludes to one of the most 'poisonous' behaviors of recent time, sitting [11].

**Discussion and Conclusion**

This study set out to present and discuss a critical design to reduce sedentary behavior in office environments. With Ivy, an office chair that represents the total amount of sedentary time through growing ivy strands, we challenge current approaches adopted by SB intervention for the office environment. Using the Matrix of Common Argument Types by Bardzell et al. [2], we discussed the criticality of Ivy to challenge the status quo of SB interventions. Our reading of Ivy emphasized that its criticality emerges mainly from data physicalization as a new form of interactivity intended to trigger reflectiveness. Through an intentional paradox in the aesthetic qualities of the design and the use of metaphors, Ivy aims to enhance poetic awareness, social engagement and more reflective interactions.

As stressed by Bardzell et al. [2], the point of the matrix is not to "check as many boxes as possible" to justify the criticality of a design but to support reasoned debates within the community regardless of the level of expertise with critical design. We envision now to use the arguments to open a worthwhile debate with fellow designers tackling the issue of sedentary behavior at work. Reasoning about critical design using this structured approach can also support the design of empirical studies. Our next steps include confronting office workers with Ivy in order to investigate how they make sense, and eventually rethink the social norms around workplaces. As a nascent form of design practice, critical design would also benefit from the development of more readings such as the one we present here, in order to build a shared literacy within the community.

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