Action Office, or, Another Kind of 'Architecture Without Architects'

Phillip Denny

Action Office, a popular line of office furniture launched in 1964, remains in production today. In the opinion of its inventor, Robert Propst, it was a system devised for organising information in multiple formats. Indeed, more than a collection of office furniture, the system comprises a network of 'information products': books, publications, audio-visual materials, conferences and architectural models, which, in concert, produce an optimal environment for knowledge work in the information age.[1] This integration of diverse formats characterises 'systems furniture', of which 'AO' (as it is called according to the managerial shorthand) is the best-known example. Moreover, the heterogeneity of the line's parts reflects the elasticity of the 'system' concept at this historical moment; in this instance, a collection of things that form a complex whole. The range of multimedia elements which compose the AO galaxy adheres to what computer scientist Herbert A. Simon called a complex system, 'a large number of parts that interact in a non-simple way'.[2] As an object of historical reflection, Propst's system exceeded furniture design, management theory, and for that matter architecture too, in its capacity to form connections between its many material, informational, and human elements. This standardised system of partitions, desks, chairs, shelves, racks, and organisers aligned to produce a complex, efficient human interface for knowledge work.

As a means of setting out, it would seem apparent that AO should be thought of alongside other historical interventions in the workplace, such as Frank and Lillian Gilbreth's time-and-motion studies in scientific management. As a point of comparison, the Gilbreths' work sought to standardise labour processes toward the predictable, streamlined performance of repetitive actions.[3] The vast majority of the Gilbreths' interventions disciplined the performance of a labourer's work with the intention of reducing movement and physical exertion by means of scientifically-derived workplace choreography.

Propst devised an altogether different approach. AO sought to streamline the working environment in order to optimise a user's ability to perform a slew of non-standardisable tasks efficiently. What distinguishes this difference in approach is not only a question of method or context, but especially differences in the changing nature of work. Rather than optimising the laying of bricks or the assembly of widgets on an assembly line, as was the case with respect to the Gilbreths' subjects, Propst's office workers confronted, on a daily basis, a constantly changing roster of informational tasks, and moreover, the tools of their labour had changed. The factory and the modern office, principal sites of production in the twentieth century, ultimately share fewer similarities than differences.[4]

What did office labour look like in 1964? The modern office worker employed an array of novel information technologies in order to perform a host of bureaucratic workflows: recording, transcribing, calculating, typing, copying, calling, receiving, filing, storing, shredding, and so on. Of course, these

actions represent entirely different varieties of manual work than those that were studied by the Gilbreths, such as bricklaying. Moreover, this form of analysis discretised the performance of work to such an extent that the optimisation of multi-process, complex tasks would have been beyond the means of the Gilbreths' abilities.[5]

How then ought one to improve productivity in an environment that plays host to complex, elastic workflows? Historical examples of an alternative approach are numerous. One tradition of particular relevance is the perennial introduction of improvements to the organisation and equipment of the domestic kitchen. Innovators such as the American Christine Frederick (1883–1970) and Austrian architect Margarete Schütte-Lihotzky (1897–2000), conceptualised the kitchen as a site of industry and 'industriousness'.[6] Accordingly, the kitchen was predisposed, in their thinking, to adjustment along the lines of scientific management and efficiency theory that were applied in factories. Despite a considerable chronological interval separating them, their work shared a common result: the organisational rationalisation of space in order to improve the efficiency of work.

We should consider how AO fits (and does not fit) into the historical lineage of these other projects. Insofar as Propst envisioned a spatial paradigm cultivated from the specific demands of a certain kind of work, the resemblance seems rather apparent. Propst designed an environment that immersed knowledge workers in a space augmented with technologies necessary to engage diverse forms of informational labour. At the same time, the comparison might elide patent differences. For instance, both Frederick and Schütte-Lihotzky's projects were motivated by the particular context in which they were situated, that is, the domestic home, and the historically moralistic imperatives that enlisted women as managers of household economies. By contrast, Herman Miller's AO essentially greased the wheel of an advanced division of labour endemic to late capitalism. The rationalisation of workspace according to the spatial consequences of workflows and 'paper trails' was a process undertaken in the interest of satisfying the managerial desire for increased worker productivity; office planning consultants such as Quickborner, Francis Duffy, and Herman Miller's own 'Facilities Management Institute' all claimed to improve worker performance.[7]

We must not fail to understand the particular social historical situation of the individuals who functioned in these spaces. It is not coincidental that Christine Frederick, Margarete Schütte-Lihotzky and Robert Propst designed environments intended to be used, principally, by women. In each case, the design of women into a given spatial environment and form of labour is conditioned by and enforces a vast complex of patriarchal structures.[8] Herman Miller's advertisements for AO of the mid-1970s, such as the short film *Beautiful Girls*, make this point painfully clear.[9] From the perspective of the marketing team tasked with advertising AO, women appeared in AO environments solely as clerical workers – the film spots are addressed to unambiguously male supervisors:

> in just six years, you businessmen in America are going to equip your secretaries with eight billion dollars' worth of typewriters, dictation equipment, copiers, typewriter ribbons – and furniture… Someone is going to have to meet her environmental needs on the job, and that someone is Herman Miller.[10]

What does this piece of corporate propaganda tell us about the designed situation of women in the modern office? The film's narrator later continues to emphasise the pivotal value – an eight billion dollar industry, after all – of secretarial work: 'Doesn't it make sense to keep her efficient and happy? She operates a machine… She indeed is the heart of the machine age… but she is not a machine:

Fig. 1: An Action Office 2 installation used in Herman Miller advertising, circa 1975. Photo from Ralph Caplan, *The Design of Herman Miller* (Zeeland, Michigan: Herman Miller, Inc., 1976). Reproduced by permission of the Herman Miller Corporate Archive.

She's an action secretary, and she needs Action Office.'[11] The narrator's verbal elision of women labourers and their environment (action secretary/ Action Office) belies the project's grand ambition to create a frictionless, integrated system in which 'a large number of parts… interacts in a non-simple way'. Here, furniture, architecture, machines, and their operators are designed to work in concert to properly direct the flow of memos, presentations, documents, contracts – information of all sorts. In this light, AO manifestly appears as yet another form of information technology, as one system dissolving into a larger one that includes 'people, processes, and place': the organisation, its work, and its spatial context, that is, its architecture.[12]

AO is thus a difficult object for design history insofar as it displaces the functional definitions of either architecture or furniture. As introduced here, AO reconfigures the subject at the same time that it configures space, all the while remaining both not-architecture and not-furniture. This double negation leaves AO floating freely in and between architecture and design history. The relative dearth of extant scholarship on this case, moreover, suggests the extent to which architecture's critics and historians have so far been unable to grapple with its slippery multiplicity.[13]

To treat AO only in the terms of an object, that is, as either furniture or architecture, would be to neglect the 'informational dimension' of the design, that is, the designed set of behaviours that ensured AO's proper deployment and use, the software laid out in manuals and other 'information products' and thus set the preconditions for the free movement of papers and messages, that is, information, through AO. In Propst's own words: 'information is at least fifty percent of the system'.[14] AO was furniture in excess of architecture, the former absorbing the latter's basic claim to spatial organisation, and as such, it represents a thorny problem for history confronting the limits of design. Below, we will trace the history of this system's development and deployment in the context of transformations occurring within and among larger systems of labour and technology, and attend to how these mutations were reinscribed in this complex set of designed objects.[15]

Prehistory of Action Office

Propst had worked on the AO system for almost four years by the time it launched in 1964. Before joining Herman Miller in Michigan, Propst had studied chemical engineering at the University of Denver, later switching into a program in fine arts. He entered the navy during World War II, during which time he served in the South Pacific arena. After the war, he served as the head of the art department in a Texas college. Soon after, Propst formed an eponymous industrial design firm, Propst Co., in 1953, in Denver, Colorado. As an independent contractor in search of work, Propst often offered his design innovations to potential clients 'on spec'.[16] On one occasion, Propst marketed a novel connection system for furniture components to Herman Miller, a furniture company based in Zeeland, Michigan. Soon after, the company retained Propst as a consultant, then hired him on a full-time basis in 1960 as head of the Herman Miller Research Corporation (HMRC). A distinct corporate entity, the corporation served as Propst's home base until his departure in 1980. In the first year of his tenure at Herman Miller, Propst initiated a study of human behaviour in the workplace, supposedly in response to his dissatisfaction with the furnishings of his workspace. After four years working in collaboration with the designer George Nelson, the first iteration of AO was offered for sale to the public.

As the founding director of HMRC, Propst established the culture of research that led to new product development. Propst's methods included observational techniques that sought to unpack the logics and frustrations endemic to the office.[17] As such, Propst's time-lapse studies introduced an ethnographic valence to the study of the workplace.

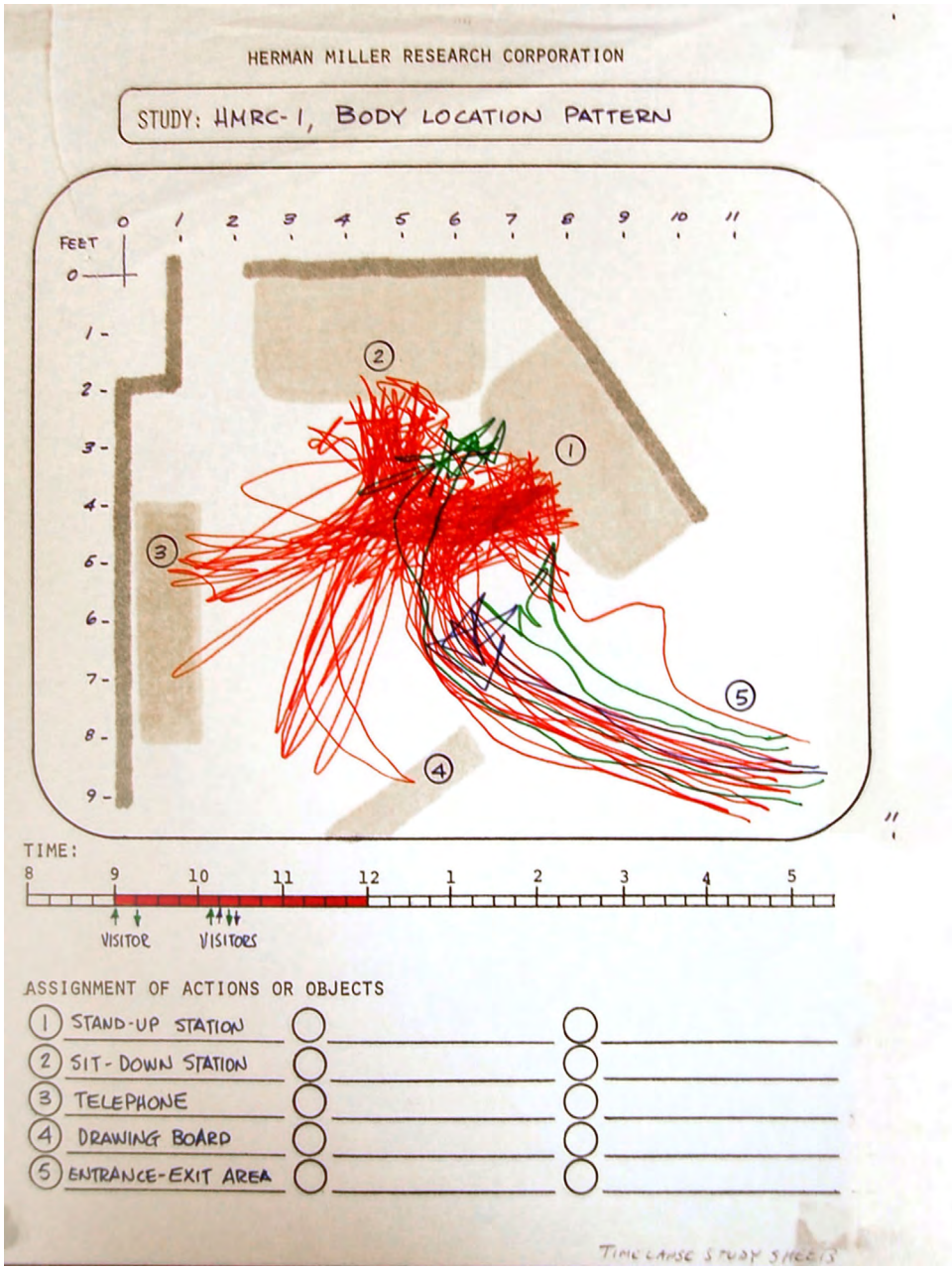

Fig. 2: 'HMRC-1, Body Location Pattern' research trial sheet, undated. Chart on paper. 8.5 x 11 in. 2010.83.649, Robert Propst Papers, from the Collections of the Henry Ford. Gift of the Family of Robert L. Propst. Reproduced by permission.

Fig. 3: Propst Housing System prototype houses under construction in Lake Sammamish, Washington, 1984. Reproduced by permission of the architect, William “Bill” Miller.

Fig. 4

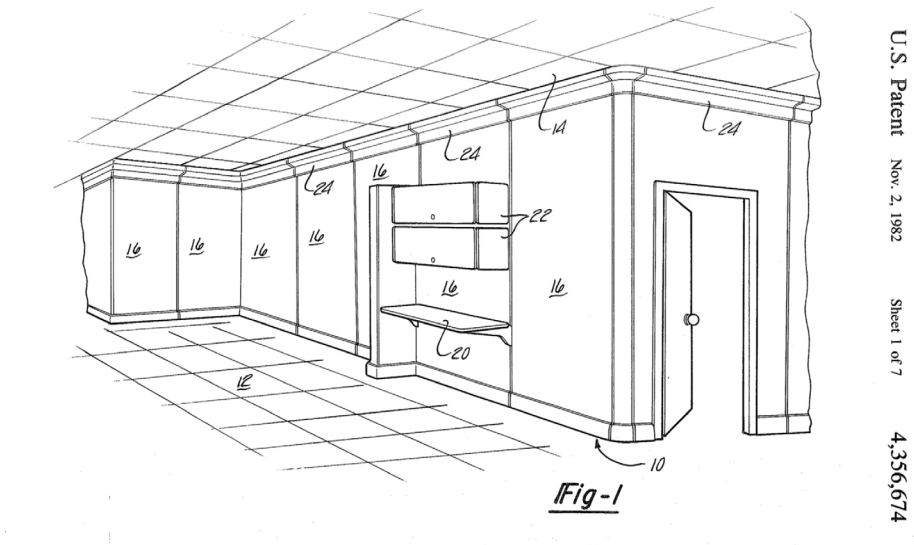

Fig. 5

Fig. 4: Robert Propst, interior of a Propst Housing System prototype. Sketch on paper, undated. Reproduced by permission of Claudia Berg Propst.

Fig. 5: Robert Propst, US Patent 4,356,674, Free-standing Space Divider Assembly with Acoustic Upper End Border, filed 1980. US Patent Office.

Although studies of everyday contexts such as the office, urban plaza, or home would not become mainstream until the late 1970s, the need for such a study seemed self-apparent in the particular context of Herman Miller Research.[18] Propsts's work represented the state-of-the-art in mid-century evidence-based design. But what exactly motivated Propst's placement of these research methods at the heart of product development? We can start to answer the question by first looking to his founding mission statement for HMRC:

> (1) avoid all research which is connected to the defence industry (this is about 80 percent in the USA), and (2) not to be involved in any projects in which relation to human environmental design are meaningless and worthless.[19]

Insofar as rejecting the defence industry meant turning down '80 percent' of research work in the US at mid-century, HMRC was founded with an almost counter-cultural mission, unexpected for a company that has since been renowned for introducing the world to the office cubicle, an artefact that is also a modern-day emblem of conservative corporate culture and workplace tedium. But in the 1960s this wasn't yet the case.

Propst endorsed the Bürolandschaft or 'office landscape' paradigm developed in the early 1950s by the Quickborner Team of management and space planning consultants.[20] Transparent and open, Bürolandschaft represented everything that offices of the day generally were not. Quickborner-designed workspaces featured few fixed walls, with desks arranged in loose groupings. Plans were a clash of seemingly arbitrary geometries. Visually chaotic and yet hyper-organised, these spaces reflected the organic relations that underlay complex social structures like the mid-century corporate office. More importantly, what the office landscape negated was not rational order – quite the contrary – but rather the symbolic function of the office, that is, a logic which, for instance, traditionally correlates large corner offices with organisational importance.[21]

Propst's own words echo Quickborner's rejection of the office as either determined by, or reinforcing a hierarchy of organisational status: 'organizational life can't stand environments that confer nothing but status, in which you can't do anything but pose. The healthy organizational effect washes all the baloney away.'[22] Rather, both Quickborner and Propst's organisational paradigms subsumed symbolic considerations into the common currency of informational transfer: an executive may occupy a privileged node in the network of office communications, but in this light, the proverbial corner office is recast as an entirely inappropriate disposition of space. Documents like the 'word processing resource manual' demonstrate the functional logic that subtended spatial decision-making in these paradigms. Work- and information-flows, and interpersonal communication patterns prevailed as determinants in organising the interior.

Even so, perhaps the second half of HMRC's mission statement is more radical; the organisation would focus not on architecture, and not on furniture, but rather 'human environmental design'. Indeed, the environmental sentiment uttered in Propst's statement connects Herman Miller's decidedly 'square' aims – producing the optimum environment for working, after all – with the countercultural discourses du jour. As we will see below, the notion of 'environment' developed in the research and products of Herman Miller was markedly different from the 'environmentalism' of contemporary environmental activists.[23] Although the new office landscape's rejection of status-symbolism may have engendered both egalitarianism and environmentalism in the very heart of organisations that operated on principles of devolution and exclusion, Propst's notion of environment was specifically inflected by a devotion to information, and a concept

Fig. 6

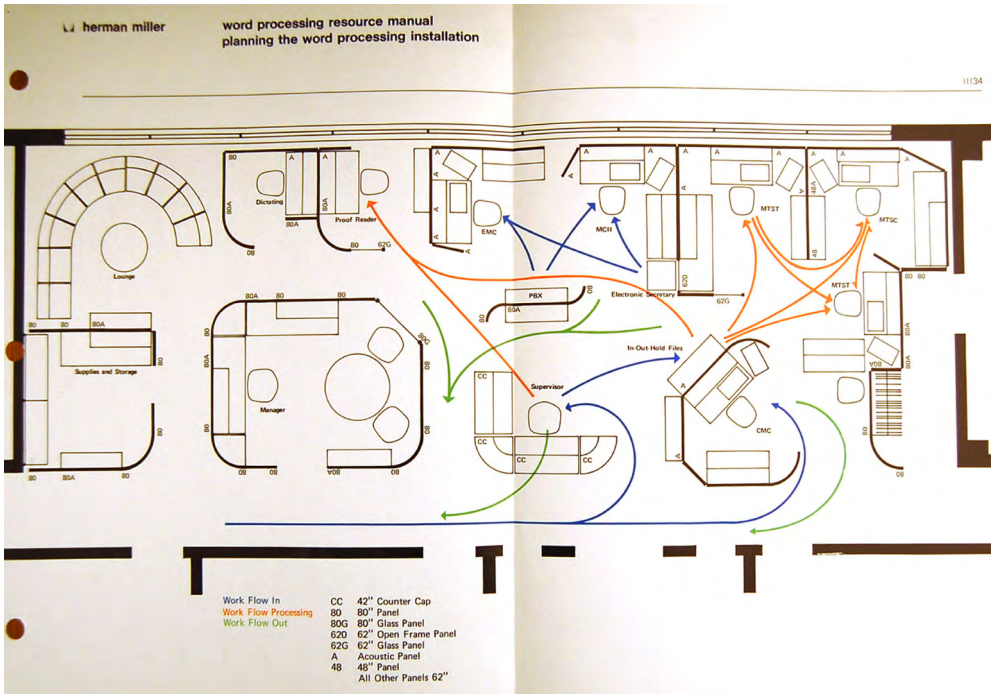

Fig. 7

Fig. 6: Foster + Associates, office interior featuring AO 2 furniture, Fitzroy, London, circa 1975. Reproduced by permission from Toshio Nakamura, ed., *Norman Foster: 1964–87* (Tokyo: a+u Publishing, 1988).

Fig. 7: 'Word Processing Resource Manual: Planning the Word Processing Installation', Herman Miller, Inc., c. 1974. Reproduced by permission of the Herman Miller Corporate Archive.

of the corporation as a body for processing information.[24] AO would thus aim to offer the optimum material conditions for working in a new variety of abstract space such as, in Herman Miller's corporate jargon, 'the word processing installation'.

By inscribing the human as a processor of information intimately connected by posture and position to the environment at arm's reach, Propst's office joined the human to the apparatus. Such a connection updates the Taylorist notion of a worker whose use of tools and machines is made efficient by the intervention of consultants. Here, the office environment itself gains disciplinary cachet in the organisation of labour.

Devices like the 'perch', a high-seated, saddle-like, 360-degree-swivelling stool is one such element: it dictates the posture of its user by mobilising the precarity of the act of sitting upon it. The subject must either maintain her focused position or get off the perch altogether. Indeed, a system of similarly difficult objects further enlists the human element in a supple man-machine relationship in which her comfort is precisely not the governing factor.

To what end? Not comfort, but rather the efficient performance of information work. At this juncture we ought to briefly return to where we began. We are now well prepared to summarise and cast into relief the differences of approach and philosophy developed in the context of AO and the counterpoints to this work in the efforts of the Gilbreths, Frederick, and the rest. Early proponents of Taylorist scientific management, whether in the workplace or the home, sought to minimise 'waste movement' and thus alleviate fatigue in the so-called 'human motor'.[25] In these models, objects like the perch appear literally unthinkable as effective interventions in the workplace precisely because they address not an economy of physical fatigue, but rather the limits of prolonged mental exertion. In the case of Propst's perch, a modicum of the user's attention is required even to perform the basic act of sitting. If the Gilbreths disciplined the movements of workers by means of strict choreographic routines, Propst designed this function as an ambient condition of the very environment of labour. In this way, the physical disposition of AO constrained the field of possible behaviours at the same time that it lubricated the smooth performance of a set of processing tasks.

To reiterate Herbert Simon's definition of a system, AO produces, in a 'non-simple way' the scenario for complex, organisational behaviour. Where office architecture traditionally offered fixed spaces defined by walls, ceilings, doors, and windows, systems furniture such as this set out 'arenas' – Propst's term for the workstation – of action that defined vectors for the movement of people and information through an organisation.[26]

Research and development: from Action Office to 'Action House'

AO sold poorly on its launch in 1964. With metal hardware and wood finishes, individual pieces were expensive, and would-be buyers did not understand the advantages over traditional office furniture. After the failure of the first iteration, Propst and his team decided on a more radical tack. What emerged was an integrated system that gave users the flexibility to transform their workspace on the fly. The basic ingredients of AO 2 emerged quickly: freestanding panels that could be linked together to form interior partitions, and modular work surfaces and storage cabinets that hooked onto the vertical panels.

The product line was introduced in 1967, and was shortly followed up with a publication that served as both user's manual and design manifesto: *The Office: A Facility Based on Change*. The thin booklet was a distillation of Propst's research, and, importantly, it offered space-planning methods and techniques that promised users new gains

Fig. 8: Robert Propst, ‘The Perch’ AO, Herman Miller, Inc., undated. Reproduced by permission of the Herman Miller Corporate Archive.

in productivity. The promise worked, especially for Herman Miller's sales figures. AO 2 has sold tremendously well – by one estimate, more than five billion dollars since 1967.

Throughout the 1970s, Propst continued to make improvements to the system, and by 1980, he was working on room-height divider panels outfitted with windows and doors, the partitions becoming increasingly wall-like.[27] The new components would allow facility managers to divide office spaces with fully-enclosed interiors. In effect, the new system offered a means to create architecture without architects. When Propst left Herman Miller in 1980, it was this innovation that he recognised as the basis for his next venture.

On leaving Michigan, Propst, along with his wife Leanore, purchased twenty-six wooded acres on Lake Sammamish outside of Seattle, Washington. They partitioned the land and established Propst Estates, a real estate development that would feature homes constructed in a prefabricated wooden building system of Propst's design, based upon his room-height AO partitions. Lacking a license to practice architecture, the inventor retained a local architect – trading one Miller for another – named William 'Bill' Miller to help him realise his vision. By the end of 1984, Propst Housing Venture, as the company was called, had erected four prototype buildings on the Lake Sammamish compound.[28]

Propst never called them Action Houses, but his architect did, and with good reason: the building system translated the logic of AO 2's space dividers into a means of architectural enclosure. Like the office partitions, the building panels were composite, and connected with the same mechanism used in the furniture line. Here, they were installed in a purpose-built architectural structure. Just like the best possible office space for AO 2 furniture, the best architecture for the Propst Housing System would allow spatial partitioning independent of any structural role. An inverted wood truss was sprung from a narrow, concrete foundation to create the floor platform. A wood-and-steel truss formed the roof, rising directly from the foundation on four piers. According to Bill Miller, this method of construction disrupted as little ground as possible, and thus preserved the site's mature trees, all the while providing an unencumbered space within which the enclosure panels could be freely arranged.

Stepping through a panel fitted with a door, the interior of the Propst's personal Action House comprised a single continuous space. And like the open-plan offices that made Propst a fortune in royalties, the residence featured AO 2 furniture throughout. Here, high-end wood finishes replaced the system's typical beige plastic. Low partitions defined a central living area with views of the forests beyond. A small library was enclosed by an octagonal ring of tall panels fitted out with the system's shelving. The furniture was even installed in the kitchen, utilising three-quarter partitions, cabinets, and counters customised with appliances and fixtures. The only space that wasn't AO was the bathroom. The house was a demonstration of AO's flexibility as a universal environmental system, appropriate for domestic and commercial applications alike. The houses were kept presentation-ready as Propst attempted to find investors. These were the houses that Action Office built.

Attempts were made to sell the system to building firms the world over until as late as the mid-1990s. However, potential buyers were concerned that Propst's approach was too limited in scope. Comprising only the wall panels, Propst Housing System required investors to grapple with how best to provide the structure that the non-loadbearing partitions would sit within. As the prototype structures demonstrated, this was no simple task. In the end, an investor willing to support the project's development was never found. Robert Propst died in 2000, and after Leanore passed in 2011, the

buildings fell into disrepair. An estate sale was arranged, the property was sold, and all of the houses were demolished in 2014. Soon after, the acreage was acquired by a developer who spec-built homes of 'contemporary' design on the wooded land still officially recorded in the city register as Propst Estates.[29]

Conclusions

Over and above AO's historical-theoretical treatment as either an object of architecture or of industrial design, the preceding has sought to demonstrate the appropriateness of an approach which emphasises its operational, processual dimension. Reconsidered in these terms, AO is a designed system that sought to intervene in space irrespective of the disciplinary boundaries that designers and historians have traditionally erected. In this sense, it is perhaps most useful to think of this case as an instance of information technology, that is, a device which intervened in the labour environment in such a way as to reconfigure the spatial codes and behaviours that define the office's operation.

Information, not objects: AO was a multimedia system whose components lubricated the circulation of data through the workplace. It was a working apparatus whose ergonomics reconfigured the body, and whose underlying conceptual bases – 'information transfer', 'signal' and 'bandwidth' –enacted the prevailing metaphors of the information age as governing concepts. Indeed, Propst spoke of AO as an active system, not a static, structuring apparatus, but rather something which could itself produce feedback. Notably, Propst minimised the filing cabinet, which he referred to as one of many places for 'paper to hide and die', instead reconceptualising the office as a display environment: 'You can see it, it is all signalled or marked and it will feed back a strong purge signal when it becomes overabundant.'[30] In this way, AO performed as a responsive environment.

At the same time, AO's informational agency only further aligned it with the many other informational devices and processors inhabiting the information-age office: IBM Selectric typewriters, Dictaphones, fax machines, slide projectors, calculators, and so on. For this very reason, AO remains a difficult object of historical scholarship: both not-architecture and not-furniture, but rather something more like infrastructure. As has been evoked here, the emergence of Propst's systems furniture produced the preconditions of informational labour. For this reason, it's no wonder that AO has been all but unrecognised in historical scholarship; as Marshall McLuhan noted of media environments, they remain invisible in the absence of a counter-environment.[31] AO has blended into this informational milieu as one system among many, and in the process, it destabilised known boundaries between architecture, furniture, and organisation.

Notes

1. Robert Propst cited in Ralph Caplan, *The Design of Herman Miller* (New York: Watson-Guptill, 1976), 76–77. Herman Miller hosted workshops to train facility managers in the proper use of the AO system; for instance, 'The Office and the Human Performer', held in Grand Rapids, Michigan, August 1968.
2. Herbert A. Simon, 'The Architecture of Complexity' in *Proceedings of the American Philosophical Society* 106, no. 6 (12 December 1962), 468. Robert Venturi cites Simon's definition of the 'complex system' in defining his concept of the 'difficult whole'; see Venturi, *Complexity and Contradiction in Architecture* (New York: Museum of Modern Art, 1966), 88.
3. Frank and Lillian Gilbreth's consultancy disciplined the body to conform to prescribed choreographic dictates that allowed human-machines to perform more work, more quickly, and more consistently. It is not surprising that the distinctive aesthetic marker of the Gilbreth's time-motion studies, the 'motion blur', is raised again as a graphic device employed in early advertising images for the Action Office system. The motion blur

simultaneously captures the human subject's rapid 'actions' while obliterating marks of personhood – the subjects face and other identifying details are seemingly lost in the shuffle.

4. Peter Galison and Caroline A. Jones, 'Factory, Laboratory, Studio: Dispersing Sites of Production' in Peter Galison and Emily Thompson, eds., *The Architecture of Science* (Cambridge, MA: MIT Press, 1999).
5. On the history of Taylorist thinking in architecture, see Mary McLeod, '"Architecture or Revolution": Taylorism, Technocracy, and Social Change', *Art Journal* 43, no. 2 (July 1982): 132–47.
6. Frederick is best known for two books she published between 1918 and 1823, during the interwar period in the United States. The first, *The New Housekeeping: Efficiency Studies in Home Management,* explicitly introduced Taylorist efficiency theory into the domestic sphere; chapters such as 'Applying "Standard Practice" and "Motion Study" to Household Tasks' and 'Standardizing Conditions in Kitchen Arrangement' refer to principles from Frederick Winslow Taylor, and praise 'the efficiency engineers who are called into large factories to find what is wrong, or suggest better methods' (16); See Christine Frederick, *The New Housekeeping: Efficiency Studies in Home Management* (New York: Doubleday, 1918) and Christine Frederick, *Household Engineering: Scientific Management in the Home* (Chicago: American School of Home Economics, 1921).
7. This term refers to the physical path of a document through a given organisation's plant. For example, an incoming letter might enter a headquarters' centralised mailroom before being delivered to a desk on another floor. The document might then be transcribed by a clerk before being duplicated, filed, and sent on to a manager in a separate location. In the case of a document sent from one staff member to management for authorisation, the entire process is likely to be repeated in reverse. The movement of a single document through any organisation entails its serial transfer among multiple actors, and spaces.
8. On the intersection of technological efficiency and the gendered division of domestic labour, see Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic books, 1983).
9. It is unclear how *Beautiful Girls* was presented to the public. It is unlikely that the film was ever broadcast to a television audience. According to Herman Miller archivist Amy Auscherman, it is probable that the film was screened at tradeshows and similar events. *Beautiful Girls* is held, unprocessed, in the Herman Miller Corporate Archive in Zeeland, Michigan.
10. *Beautiful Girls,* 01:30.
11. Ibid.*,* 04:10.
12. *People, Process, Place* describes the constituent factors for correct implementation of the AO system according to the Herman Miller Research Corporation and is the exact title of a film made by the company advertising the consulting services of its in-house Facility Management Institute.
13. The vast majority of scholarly and general audience literature on AO has been authored by either representatives and employees of Herman Miller or recipients of its munificence. The latest contribution to this discourse is no exception; see *Herman Miller: A Way of Living*, ed. Auscherman et al. (London: Phaidon, 2019).
14. Ralph Caplan, *The Design of Herman Miller* (New York: Watson-Guptill, 1976), pp. 76–77.
15. See, for instance, Bruno Latour, 'Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts' in Bijker and Law, eds., *Shaping Technology/ Building Society: Studies in Sociotechnical Change* (Cambridge, MA: MIT Press, 1992), 225–58.
16. This refers to the development of a product before a buyer has been secured. In the United States, residential housing production often proceeds 'on spec', with the expectation that buyers will be found after construction has begun. See Ralph Caplan, 'Robert Propst' in 'Nelson, Eames, Girard, Propst: The Design Process at Herman Miller', *Design Quarterly* No. 98/99 (1975): 40–49.
17. Robert Probst, 'Time Lapse Study Sheet for Action Office System, HMRC-1, Body Location Pattern'.

From the collections of The Henry Ford (2010.83.649, Robert Propst Papers).

18. Well-known examples include Bruno Latour's *Laboratory Life: The Construction of Scientific Facts* (Beverly Hills, Calif., and London: Sage Publications, 1979), and William H. Whyte's study of civic space with the *Street Life Project* (1971–80), and the associated milestone book and film *The Social Life of Small Urban Spaces* (Washington, D.C.: Conservation Foundation, 1980).
19. Caplan, 'Robert Propst', 43.
20. The name Quickborner was coined in reference to the town of Quickborn on the outskirts of Hamburg, where Wolfgang and Eberhard Schnelle founded the company in 1958.
21. Notable examples of early Quickborner-designed offices include the OSRAM Headquarters in Munich, Germany, (1963), designed by architect Walter Henn.
22. Robert Propst quoted in Caplan, 'Robert Propst', 41.
23. For instance, Rachel Carson's *Silent Spring*, a wellspring of the environmental movement, was published in 1962 while the first iteration of AO was in development. See also Reinhold Martin, 'Environment, c. 1973' in *Grey Room* 14 (Winter, 2004), 78–101.
24. See John Harwood's extensive work on the meeting of biopolitical subjects, corporations, and corporate space: 'The Interface: Ergonomics and the Aesthetics of Survival' in *Governing By Design: Architecture, Economy, and Politics in the Twentieth Century,* ed. Aggregate Architectural History Collaborative, (Pittsburgh: University of Pittsburgh Press, 2012), 70–92.
25. Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (Berkeley: University of California Press, 1990).
26. Jean Baudrillard, 'Structures of Atmosphere' in *The System of Objects* (London: Verso Books 1996 [1968]), 30–69. See also Beatriz Colomina, 'Enclosed by Images: The Eameses' Multimedia Architecture' first published in *Grey Room* 2 (Winter, 2001): 5–29.
27. Robert Propst, Free-Standing Space Divider Assembly with Acoustic Upper End Border. US. Patent, 4,356,674, filed 31 March 1980.
28. In the late stages of his career, Propst founded Propst Housing Venture with his spouse, business partner, and editor, Leanore, in Bellevue, Washington. The company was not extraordinarily successful, but did produce 'four prototype buildings', including one that served as the Propsts' home, built in 1983, and another, 'their workplace'. Both structures were demolished in 2014, according to building permits filed with the city of Sammamish. See 'Leanore June Propst' *The Seattle Times* (1–2 April 2011).
29. 'Surveyor's Certificate: Propst Estates, Sec. 18, Twp. 25 N. Rge. 6E., W.M.', 17 January 1984. *Department of Permitting and Environmental Review,* King County, Washington.
30. 'More Action in the Office', *Industrial Design* 15 no. 10 (November 1968): 32–33.
31. Marshall McLuhan, 'The Invisible Environment: The Future of an Erosion', *Perspecta* 11 (1967): 161–67.

Biography

Phillip Denny is a PhD student at Harvard University. His research focuses on prefabricated architecture in the twentieth century. His writing has most recently appeared in *Harvard Design Magazine*, *Volume*, *Metropolis*, *The New York Times*, *CLOG*, and *PLAT*. He edited *The Art of Joining: Designing the Universal Connector* (Leipzig: Spector Books, 2019), an anthology of research on architect Konrad Wachsmann. Phillip contributed to the catalogue for Architecture Itself and Other Postmodernist Myths, curated by Sylvia Lavin at the CCA. In 2019, he received a Graham Foundation grant to support his work on an English-language translation of Nicolas Schöffer's 1969 urban manifesto *La ville cybernétique*.