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Abstract

This article argues that the presentation of early computer technology and its reception by the public had a causal effect on the design of computer products. It is also argued that the desire to show computers in operation led to the emergence and proliferation of the 'glass house', a particular element of the commercial interior landscape of the 1960s and 1970s. These glass-walled secure areas, built to house mainframe computer installations, appeared in order to meet the conflicting requirements of environmental stability, controlled access and crucially, the conspicuous display of corporate status.

Although the phenomenon of the glass house disappeared as the computers they housed developed from large, centralised systems into distributed networks of stand-alone computers, this article posits that the widespread adoption of the glass house not only had a profound effect on the visual design of computers themselves but also led to the growth of a range of subsidiary industries, as well as having a lasting impact on the perception and reception of computers in the workplace and attitudes towards the specialist staff involved in their maintenance.

Keywords: glass house, computers, technology, workplace, display, IBM

IBM and the early display of computers

> At the beginning of December 1948, my parents took me Christmas shopping in Manhattan, New York. We were at the corner of Madison Avenue and 57th Street when I saw my dream. There, behind thick glass, was a room, three sides of which were arrayed with flashing lights and noisy relays, attended by priests and priestesses in white lab coats. I watched until towed away by an impatient parent.

The above recollection by Peter H Salus, a historian of technology, is of the first computer he ever saw (Salus, 2012). The computer, the IBM Selective Sequence Electronic Calculator (SSEC), was IBM's first large-scale digital calculating machine, assembled in 1947 and completed in early 1948. The president of IBM, Thomas J. Watson, had set out to prove that no one could beat IBM in building large-scale calculators for scientific use. He instructed his engineers to build the biggest and fastest machine possible. The result, built in only eight months, was 'a weird gigantic hybrid of electronic and

mechanical parts, half modern computer and half punch card machine'[1] (Watson Jr., 1990: 190). At 120 feet long and containing 12,500 tubes and 21,400 mechanical relays, [2] the SSEC was an impressive sight to behold. The public had an intense interest in such devices at this point, following the front-page announcements and movie newsreels of the unveiling of ENIAC in 1946. ENIAC was the 'mechanical brain' developed to calculate ballistics information for the United States Army that could calculate the trajectory of a shell faster than the shell could fly.[3] As a piece of military equipment installed at Aberdeen Proving Ground in Maryland, the ENIAC was not placed on public display. Yet people still had a desire to see such machines, which because of their esoteric nature, were viewed with a certain amount of awe and wonder. In his memoirs, Thomas J. Watson Jr. recalled:

> Trying to make sure the SSEC would get as much public attention as the ENIAC, Dad had it installed in our showroom on the ground floor of IBM headquarters in Manhattan, in full view of the sidewalk. Passersby on Fifty-seventh Street could look in the window and watch the SSEC work. It was an amazing sight to come upon in the middle of the city – three long walls filled with electrical consoles and panels, all studded with dials, switches, meters, and little neon indicator lights that flashed whenever calculations were going on. Hundreds of people stopped to watch it every day, and for years it was the image that popped into people's minds when they heard the word 'computer' (Watson Jr., 1990: 191).

Figure 1 The IBM SSEC in the showroom at IBM World Headquarters, 1948. Courtesy of IBM Archives.

In order to make the room as clean and impressive to visitors as possible, IBM engineers built the computer onto a specially raised floor so that no cables were visible between the electronics encased in the cabinets lining the walls and the free-standing control console and card punches in the middle of the room, also ensuring no one could trip over them (Figure 1). It was almost perfect. Surveying the finished installation just before it opened to the public, Watson spoke to the SSEC team. '"There is just one thing," he said somewhat off-handedly. "The sweep of this room is hindered by those large black columns down the center. Have them removed before the ceremony." And out he marched, tailed by his quivering followers!' (Grosch, 1991: 2).

Figure 2 The publicity version of the SSEC photograph with supporting pillars and stair handrails airbrushed out, 1948. Courtesy of IBM Archives.

With only four days to go, such a request was of course impossible to meet—not least because the pillars housed structural steel beams that supported the 20-storey building above the showroom. As a compromise, the printed souvenir brochures for the opening ceremony were destroyed and a new version rushed through containing an airbrushed image with the columns miraculously removed (Figure 2). Newspapers widely reproduced this airbrushed image following the ceremony on 28 January 1948, and the SSEC 'did a great deal to enhance IBM's reputation as a leader in computer

technology' (Campbell-Kelly & Aspray, 1996: 116). The IBM showroom became established as the standard point of display for the public presentation of IBM's latest developments, and a statement of its superiority over its competitors.

IBM's competitors were, however, gaining ground. John Mauchly and J. Presper Eckert, the people behind the development of the ENIAC, had set up a new company called the Eckert-Mauchly Computer Corporation (EMCC) and created a machine called the UNIVAC,[4] much of the development of which had been funded by the US Census Bureau, one of IBM's biggest clients. When Remington Rand, a significant competitor of IBM's in the typewriter business, bought EMCC the UNIVAC suddenly had the financial means behind it to attract many orders from the insurance companies that were the mainstay of IBM's income. IBM needed another technological first to keep hold of these clients.

Figure 3 The IBM 701 Defense Calculator, at the IBM research and development department in Poughkeepsie in 1952. Courtesy of IBM Archives.

Until the early 1950s, computers (or 'mechanical brains' or 'electronic brains' as they were often called) were designed as one-off installations built to order rather than multiple production machines, and their size necessitated them being assembled more or less from scratch in situ. IBM's next large scale project completed in December 1952, though, used a different approach to building a mainframe computer for scientific use (Figure 3). The Defense Calculator, or IBM 701 as it became known, computed 25 times faster but was only one-quarter of the size of the SSEC (IBM, 1953). It consisted of 11 individual modules each performing a different function and each the size of a large refrigerator. This meant the finished machine could be delivered in parts to customers using a standard freight elevator and easily cabled together on site.

> Dad wanted to launch the 701 with all the usual IBM fanfare, in part because we needed to divert attention from UNIVAC. So we shipped the first 701 to New York, installed it in the ground floor of headquarters, and got ready for a big dedication. To make room for the new machine we dismantled the SSEC—Dad's giant calculator-to-end-all-calculators was only five years old but already obsolete, thanks to the rapid progress of electronics (Watson Jr., 1990: 229).

An IBM press release detailing the installation of the IBM 701 described the view:

> Though the 701 occupies the same quarters as the SSEC, which it rendered obsolete, it is not "built in" to the room as was its predecessor. Instead, it is smartly housed between serrated walls of soft-finished aluminum. A balconied conference room, overlooking the calculator and, separated from it by sloping plate glass, provides a vantage point for observing operations and discussing computations. Ample space is provided for writing the complex and abstract equations that are the

> stock in trade of engineers and scientists in an age of atomic energy and supersonic flight (IBM, 1953).

On their own, though, these technological advances were not enough to keep IBM in the position it desired. Although its status as a frontrunner in the emerging computer industry was not in question, the son of IBM's president, Thomas Watson Jr., realised the company was way behind in terms of design when the general manager of IBM Holland sent him a collection of promotional literature from their Italian competitors, Olivetti, and suggested he do a side-by-side comparison with the equivalent literature from IBM. Where Olivetti's literature was full of 'colour and excitement', IBM's 'looked like directions on how to make bicarbonate of soda' (Watson Jr., 1990: 258). Comparing the two sets of material gave Watson Jr. the final push to implement a plan he had been formulating to improve this state of affairs. In 1956, he hired the industrial designer Eliot Noyes to oversee a corporation-wide design program that was to include all aspects of the corporate identity—everything from new buildings, to each and every product and item of literature.

One of Noyes' first jobs in this position was to redesign the ground floor of IBM's World Headquarters in New York, where the SSEC and then the IBM 701 held pride of place. The existing lobby reflected the old IBM of Thomas Watson Sr. The public looking in from outside on Fifty-seventh Street saw the drab grey cabinets of the computer on a dark carpet in the showroom, but entering into the main lobby from Madison Avenue 'you found yourself back in the 1920s.' In an age of atomic energy and supersonic flight, the lobby appeared 'like the first-class salon on an ocean liner', complete with 'Oriental rugs' and 'black marble pillars trimmed with gold leaf'. '[P]unch-card machines and time clocks on display, cordoned off by velvet ropes hooked to burnished brass posts' lined the walls (Watson Jr., 1990: 259).

The new IBM was to look very different. In order to compete with the UNIVAC, the company had developed a new computer aimed at the business market, the IBM 702. This was to be the main attraction of the redesigned lobby. Now renamed the 'Data Processing Center', the showroom Noyes designed was 'modern, spare and dramatic', with white floors and vivid red walls. Silver signs reading 'IBM 702' were placed on the red wall. 'It was a beautiful presentation for anybody who was interested in modern design. The product made the statement, not the surroundings' (Watson Jr., 1990: 259). The red and white colour scheme completely transformed the appearance of the standard grey and chrome computer from a series of drab cabinets into an understated display of modernity (Figures 4, 5).

> Like the SSEC and the 701 that had preceded it in the window, the 702 was a working machine. Customers who wanted to rent computer time would bring their data in, and we kept the computer running round the clock. If you went by on Madison Avenue in the middle of the night you would see it behind the big plate-glass windows, tended by well-dressed technicians in its brightly lit room. (Watson Jr., 1990: 260)

Instead of merely superimposing a corporate identity on IBM, Noyes' integrated design program called for each aspect of the company to be dealt

with by world-leading architects and designers. Over the coming years, these included Paul Rand, George Nelson, Eero Saarinen and Charles Eames, among others. It was so successful as a strategy that consequently IBM soon became widely known as contemporary design's most fervent industrial patron (*Fortune*, 1959: 129) and IBM's presentation of computing technology became the standard for others to reach.

Figure 4 The Eliot Noyes redesigned showroom as seen from outside in 1959, displaying an IBM 705 computer, its last machine based on valve technology. Courtesy of IBM Archives.

Figure 5 The Eliot Noyes redesigned lobby photographed in 1959, where corporate clients had a view of the same computer that could be seen from outside the building. Courtesy of IBM Archives.

The Development of the 'Glass House'

The transition of the computer from a specific military/scientific instrument to an essential piece of business equipment did not happen overnight, but took many years to become established. The transition was a result of complex interactions between three elements: business customers, computer suppliers and technology (Pugh & Aspray, 1996: 7). The expense and upheaval of transferring manual processes to automated ones was not insignificant and consequently, the first businesses to adopt computer technology were those that had no real choice but to do so because manual processes were for them becoming untenable. Primary among these were the banking and insurance industries, which required the handling, recording and storage of so much information that manual systems were proving incapable of further expansion.

Insurance companies were attracted by the abilities of 'electronic brains' such as the UNIVAC to store and retrieve huge amounts of customer data on magnetic tape instead of the bulky punched cards used by tabulating machines, the filing of which was taking up increasing numbers of whole floors in their buildings. Electronic machinery also promised to address the issue of finding floor space and trained operators for the tabulating machines themselves, as one computer offered many times the capacity of its mechanical predecessor. The banking industry had additional reasons to be interested in the automating capabilities of the latest technology as the steady increase in the use of cheques had caused a substantial problem. In the United States, cheque usage doubled between 1943 and 1952, from four billion to eight billion cheques written each year. On an average day, 69 million cheques were in the process of being cleared, and the annual usage of cheques was predicted to rise to 14 billion by 1960 (Fisher & McKenny, 1993: 44). The workload involved in and backlog being created by manually processing paper cheques was of such proportions that in July 1950, the Bank of America commissioned Stanford Research Institute (SRI) in Menlo Park, California to explore the feasibility of automating the system. The massive program took five years for SRI to develop a prototype bookkeeping machine and a further five years for the full installation of the final Electronic Recording Machine - Accounting (ERMA) built by General Electric. New forms of machine-readable cheques also had to be concurrently developed, based on magnetic ink character recognition (MICR), which had to be adopted as an

industry standard for cheques to work between different banks. As a result, when ERMA finally became operational, the entire banking industry felt its impact (McKenny & Fisher, 1993: 24).

Accommodating large-scale electronic computers into the old buildings occupied by many of the long-standing institutions in banking and insurance was no easy matter (Figure 6). Early computers, despite their large size, solidity and apparent ruggedness, were temperamental devices that required highly stable working environments. Valve-based machines in particular, but also their transistor-based successors, generated large amounts of heat, and needed a sufficient airflow around the internal circuitry to prevent them overheating. At first, blowers forced cool air over hot valves and pumped warm air into the space below raised floors. Blowers were soon replaced by more sophisticated air conditioning known as Site Environment Systems (SES), which also had to maintain a constant operating temperature and level of relative humidity as well as filter the air to control the amount of dust. They also required a consistent supply of electrical power, at much higher levels than for standard office equipment, to drive the electronics, and any break, surge or dip in that power supply could have serious and costly consequences in computer downtime or loss of data. Computer installations, therefore, also involved the commissioning of constant frequency diesel generators, voltage correction units and specialist battery back-up systems for use in an emergency power outage, housed in the same or adjoining rooms. With all this electricity being consumed, one short circuit could cause a serious fire. This very real possibility necessitated the minimum provision of a sprinkler system and even gaseous fire suppression systems, which could envelop the computer in a cloud of expensive Halon gas to extinguish the fire (the cheaper carbon dioxide alternative unfortunately being fatal to human operators) (Hendrie, 2012).

Figure 6 EMI advert in *The Economist*, 12 December 1959. New technology in old buildings. Courtesy of *The Economist.*

For all of these reasons, it would have made a great deal of sense to contain mainframe computers in their own, sealed quarters, hidden away from the day to day business of the office. This would not only safeguard the stability of the operating environment for the sensitive electronic equipment, but also increase security, ensuring that only those trained technical staff authorised to program and operate the computer would have access to the installation. This gave the institutions that were the early adopters of such technology a dilemma; as they also had a strong desire to make their large investment in computing and their position of being at the forefront of technological developments visually clear to their corporate clients. The introduction of a computer was something to be celebrated and advertised, not concealed.

Figure 7 Installation of a Burroughs B220 system as seen through a three-paneled glass wall in the Michigan National Bank, Lansing Michigan, 1960. Courtesy of the Charles Babbage Institute, University of Minnesota, Minneapolis.

A typical solution by banks to this dilemma was to place the computer in full view, while isolating it by placing it behind a series of glass walls (Figure 7). In so doing, the computer acted to bring a Miesian modernity to many old buildings. This was the approach taken by Barclays Bank when it opened the first computer centre in the UK in London in 1961. Housed in a converted furniture showroom, the architects of the 'No. 1 Computer Centre' had to take into account the expectation of 'a steady flow of visitors' starting with an elaborate and very public opening ceremony (Martin, 2011: 44). As with IBM's installation of the SSEC, Barclays placed their EMIDEC 1100 computer[5] on a raised floor to hide its various power cables and interconnections. The modern, clean lines of the room continued with air conditioning ducts hidden above a false ceiling. Visitors to the centre were ushered from an imposing, spacious reception area into a specially built viewing room overlooking the installation, where they were ensured of 'an uninterrupted view of the computer' through the floor-to-ceiling glass walls surrounding the machine (Martin, 2011: 46). Colour coding helped to identify the different components of the computer system and explain their function to visitors, who were presented with a glossy leaflet titled *Barclays Bank Limited: Our First Computer* (Martin, 2011:48). A downside of the raised floor and false ceiling of the installation had the effect of making the already low-ceilinged showroom feel 'rather cramped', but as the computer historian Ian Martin noted, the needs of staff came second to the initial impact Barclays wanted to make (Martin, 2011: 55).

The use of colour in computers quickly became an important issue for many manufacturers, as it started to become clear that the machines were beginning to play an increasingly public role. There was a move away from the traditional grey or black computer cabinets of the 1950s, and in the early 1960s, IBM even produced a large format brochure entitled *Color for Computers* displaying a wide palette of possible colour combinations along with the text:

> Why consider color?
>
> Because color may help you create an operating environment that is more pleasing to your operators *and* your visitors. Because colour, properly balanced and exactingly used can make a difference.
>
> In IBM Data Processing we achieve this difference with *color accent.*
>
> After years of study, IBM Industrial Designers have developed a color system that considers the individual data processing unit as well as its relationship to the total configuration of which it may be part. This is a color system that collectively blends the color arrangement of each machine into a harmonious, systematic, unified whole. (IBM, c1960, original italics)

Figure 8 Illustrations from the IBM Brochure *Color for Computers,* c1960. Courtesy of IBM Archives.

Line drawings of colourful computer installations in large rooms with glass curtain walls, emphasising the computer's additional function as an ambassador for technological prowess accompanied the text of the brochure (Figure 8). In fact, throughout the 1960s and 1970s, colour became a significant part of the computer manufacturer's repertoire, with the majority of companies offering computers in a range of coloured cabinets ranging from fire-engine red to 'ice-lolly orange and freezing light blue' (Woudhuysen, 1979: 42). For some manufacturers, including the UK's International Computers Limited (ICL), colour even became an identifying feature, closely associating its highly recognisable two-tone cream and dark orange product range with its brand name and logo.[6]

Computers were evidently objects to be admired by a far wider audience than those immediately operating them, and computer systems started to be knowingly designed taking into account that they would be installed in glass-walled rooms. Besides experimenting with their colour, their design often bore features aimed purely at the visitor's gaze. As the one time World Head of Design at IBM, Tom Hardy, relates, the fact that while the majority of the myriad rapidly flashing lights on the console of the IBM System 370, for example, 'could provide some basic indications to operators and service personnel, they mostly served as a dynamic "light show" that visually expressed a complex system processing large amounts of data at a rapid pace' (Hardy, 2012) (Figure 9).

Figure 9 The IBM System/370, 1970. Courtesy of IBM Archives.

Figure 10 Peter Sellers in *Dr. Strangelove*, 1963.

Almost immediately, the 'glass house' became the setting in which one expected to see mainframe computers. As an example in popular culture, the opening scene of Stanley Kubrick's 1963 film *Dr. Strangelove* features Peter Sellers as Group Captain Lionel Mandrake working with an IBM mainframe computer in a glass house (Figure 10), as did numerous film and television programmes throughout the 1960s and 70s.[7] Over this period, manufacturer's brochures also indicate that the glass-walled room became a more regular feature of the office complex. Various manufacturers, including IBM and Burroughs, used a glass house setting in their brochures, usually depicting men observing female operators within the room (Figure 11).

Figure 11 Page from an IBM 1440 brochure, 1962. Courtesy of IBM Archives.

High Priests

It seems very telling that the specialist staff that programmed and operated the computers at this point were commonly referred to as 'priests and priestesses', working away in these illuminated temples to technology. The placing of mainframe computers within glass houses, physically isolated from and yet simultaneously highly visible to the main workforce surely had a tangible effect on the ways in which workers within the glass house were perceived and simultaneously on the way such workers viewed themselves. Corporations carefully monitored entry to the glass house, constraining

admission to those with authority to work on the computer; the restriction itself acting to impart an apparent level of superiority and privilege to those within. It was a delineation many were keen to see overcome: as the technology journalist Terry Shannon wrote about the computer company Digital Equipment Corporation:

> I would say that probably the most significant thing that Digital has done is make computing available to the masses. Instead of the high priests in the white robes behind the glass walls, Digital brought computing out of the glass house and made it affordable and acceptable to the mainstream (Shannon, 1997: 8).

The famed computer scientist and technology historian Gardner Hendrie concurs:

> The thing about the glass house was that you could see it but not touch! The term 'glass house' became slang, almost a pejorative, indicating an emerging 'us and them' mentality, as in 'Its okay for those guys in the glass house, but out here ….' (Hendrie, 2012).

A personal recollection highlighting this relationship has been deposited in the 'Corporate Histories Collection' of the Computer History Museum in San Francisco. The author was an ex-customer of Tymshare, a well-known third-party computer timesharing agency in Cupertino, in 1971:

> At this time in business history (early 1970s) the computer capabilities at almost every modern American company were dominated by the 'glass house', so called because the computer room was often a raised floor, glass wall enclosed space with highly restricted entry.
>
> More important, the high priests were the MIS (Management Information Services, what we then called IT) people. They controlled what programs got written and changed, and when and how often they ran. You were at their mercy. If you needed a new program to, for instance, produce a report, the waiting list could be many months. The same was true for changes unless you could justify a priority, and then it was at least days or weeks. On top of all this, the MIS people would often add their interpretation of what they thought you really need. They were of course smarter than you (Humphries, 2005).

The 'high priest' in this context, then, is an irreverence—a disparaging reference to the IT worker as the only one permitted to enter the holy of holies and holder of the arcane knowledge required to communicate with the great machine itself. It should be remembered that at this time, the vast majority of people had absolutely no idea how a computer worked, they were just seen to produce reams of printed paper and strings of numbers. To most people, computers were essentially 'magic' (Hendrie, 2012).[8] It is a state of affairs perhaps indicative of an initial split between general office staff (the outsiders, gazing at the priests in their shrine) and 'privileged' IT staff, aloof and disconnected from the hoi polloi, which would have continued for a number of years until computers started to appear more regularly in the wider office and

became accepted as everyday objects by the workforce. It is this 'us and them' mentality that has been lampooned so successfully in many arenas mocking 'geek' culture. Given the longevity of the precept, it has clearly become an accepted cultural stereotype and one which has been referenced in sources ranging from historical narratives such as Robert X. Cringely's TV documentary *Triumph of the Nerds* to television sitcoms appearing a decade later such as Graham Linehan's *The IT Crowd.*[9]

Subsidiary Industries

The assertion made here, that the glass house became a significant entity in the real commercial interior landscape of the 1960s and 1970s (as opposed to its appearance in the idealised worlds of popular culture and manufacturer's brochures), can be further evidenced by the numerous adverts in the computer industry press that reflect customers' requirements of the time.

By the end of the 1960s, as computer installations had become a common sight in the workplace, a whole infrastructure of subsidiary industries needed to support the creation of 'glass house' computer environments was evidently firmly in place. Many larger companies had set up specialist divisions to cope with the increasing number of demands for suitable glass house environments from client companies installing computer systems, especially in the false flooring used to accommodate computer cabling. The American metal producing organisations National Lead and Washington Aluminum Company Inc. created Floating Floors Inc. and WacoFloors respectively. The giant Westinghouse Electric Corporation started a Westinghouse Raised Flooring division (Figure 12), and Walter Kidde & Co, known for fire detection and extinguishing systems, started Weber Technical Products to produce flooring; while in the UK, Metal Castings Doehler Ltd. operated a Floating Floors Division. Magazines of the period from both the USA and the UK (the two leading countries in computer production and consumption at this point) were strewn with adverts for these manufacturers of raised flooring systems, which sold the benefits of their flexibility, ease of installation, easy cleaning, efficiency in ease of access to cabling, corrosion resistance and dust-free nature and most importantly, their extreme load-bearing capabilities (one WacoFloors advert even depicting an elephant standing on one foot on a section of raised flooring!).

Figure 12 Westinghouse Raised Flooring advert, *Datamation*, June 1968.

Figure 13 Floating Floors Inc. Air Conditioning advert, *Datamation*, March 1970.

Adverts for Site Environment Systems—the specialist computer room air conditioning units—are also commonplace in these magazines, promising the precision control of temperature within a few degrees and humidity within a small percentage '24 hours a day, 365 days a year' (Figure 13). They frequently reminded customers of the stringent environmental conditions computers required, comparing them directly to the lesser requirements of humans: the headline of a 1968 advert from National Lead describing normal air conditioning as being 'okay for people … but not computers'.

Additionally, there is an abundance of adverts for a variety of power supply, voltage correction and battery back up systems (Figures 14, 15),

enabling accurate maintenance of power at just the correct levels. One company, Borg Warner, even advertised its 'Accupower' products alongside an image of the sun, as 'the next best source of uninterruptible a.c. power'. Other companies, such as BVC, advertised vacuum-cleaning systems designed to be built in to computer rooms to ensure no build up of dust that could cause a fire if in contact with hot electronic components.

Figure 14 Ideal Electric advert, *Datamation*, April 1969.

Figure 15 Exide advert, *Datamation*, May 1968.

The Demise of the Glass House

The phenomenon of the glass house seems to have disappeared as quickly as it appeared, as computers developed from being batch processing mainframes to timeshared mainframes and then minicomputers distributed among normal office equipment, and eventually to be replaced by personal computers, all within the space of a decade or so.[10] Minicomputers and personal computers had none of the particular power or environmental requirements of mainframes, and so had no need for the voltage correction, fire suppression or specialist air conditioning systems previously held so important (Hendrie, 2012). In addition, because of their increasing ordinariness and ubiquity as they fell in price and grew in popularity, computers were no longer considered 'special' pieces of equipment to be displayed as corporate assets or status symbols (Atkinson, 2010: 155). It might even be argued that the computer could not be accepted as an everyday piece of office equipment until it came out of the glass house and into the general workspace. In any case, certainly by the start of the 1980s, the types of advert described above, once so widespread, are conspicuous by their absence from the computer industry press.

Many of the smaller companies involved in providing the infrastructure for the glass house disappeared without trace, while the larger companies who set up specialist divisions merely moved on to provide related products or services as the market changed. Westinghouse Licensing is now a subsidiary of CBS Corporation, and exists purely to manage the intellectual property of its trademarks, while other parts of the company involved in nuclear energy were bought by Toshiba and operate as Westinghouse Electric Company. The brand name Westinghouse is still used to market a variety of household goods, including televisions, air conditioning units and solar panels. National Lead continues as a lead mining and smelting concern operating as NL Industries, and also produces products ranging from titanium dioxide pigments to ball bearings. Some of the power supply companies were apparently more resilient. Exide continue to produce back up battery systems for computer servers, although in the typical marketing speak of today they now refer to them as 'stored energy storage solutions for critical systems', and Ideal Electric continue to produce generators, though they are now owned by Hyundai.

While there is no longer any technological requirement for the glass house, centralised computers do of course still exist within many corporations in the form of network servers. These provide a vital function in terms of supporting internal and external networks for databases, electronic mail and

secure internet access for individual PCs, but the server computers themselves are usually nondescript black boxes, often stored in racks hidden away in the basement of other out-of-the-way place, and in no way are they the centre of public gaze or attention.

Conclusions

Far from being a culturally neutral piece of technological equipment, when it first appeared as a commercial product the computer was presented and received as an object of awe and wonder, placed on very public display. As a result of this brightly lit presentation, untouchable behind large glass walls, the computer was perceived by observers to be something far out of the ordinary, almost otherworldly, perhaps almost mythological, 'consumed in image if not in usage by a whole population which appropriates them as a purely magical object' (Barthes, 1973: 95).[11]

The corporate desire to advertise investments in the latest computing technology while still protecting the computer's demanding operating environment firstly acted to affect the old buildings into which they were placed, and then led directly to the development of an important, if ultimately ephemeral phenomenon in the design of the workplace interior in the form of the glass house; a development that was, in turn, responsible for the birth of whole new industries in specialist flooring, air conditioning and power supply and handling.

Manufacturers' awareness of this type of visual presentation of their computing technology had a causal effect on the industrial design of computer products, in that they were specifically designed to attract attention through the application of colour and to communicate their intangible functions through the addition of largely superficial and irrelevant flashing lights.

Finally, the widespread adoption of the glass house acted to separate and isolate the technical staff that operated computers from the general office environment, and in doing so, may have been indirectly responsible for the stereotyping of IT workers and attitudes towards them commonly seen in popular culture today.

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References

Anon, 1959. 'IBM Banishes Dowdiness', *Fortune*, 59 (6): 128-135.
Atkinson, Paul, 2010. *Computer*, London Reaktion.
Barthes, Roland, 1957. *Mythologies*, London, Paladin (original text 1957, Paris, Editions du Seuil).

Campbell-Kelly, Martin & Aspray, William, 1996, *Computer: A history of the information machine*, New York, Basic Books.
Fisher, A. & McKenney, J. L. 1993. 'The Development of the ERMA Banking System: Lessons from History', *IEEE Annals of the History of Computing*, 15 (1): 44-57.
Grosch, H. R. J., 1991. *Computer: Bit slices from a life*, Novato, CA, Third Millenium Books.
Hardy, Tom., 2012. Email communication with the author, dated 24 October 2012.
Hendrie, Gardner, 2012. Interview with the author, 8 October 2012.
Humphries, M, 2005. *Why did anyone use timeshared computers?*, Computer History Museum Corporate Histories Collection. Available online at <http://corphist.computerhistory.org/corphist/view.php?s=stories&id=41> . Last accessed 22 October 2013.
IBM, 1953. *Installation of the first 701*, press release dated 27 March 1953. Available online at <http://www-03.ibm.com/ibm/history/exhibits/701/701_first.html>. Last accessed 22 October 2013.
IBM, c1960. *Color for Computers*, corporate brochure, IBM Archives, New York, undated.
Martin, Ian, 2011. 'Britain's First Computing Centre for Banking: What Did This Building Do?', in Batiz-Lazo, B., Maixé-Altés, J. C. & Thomes, P. (Eds) 2011, *Technological Innovation in Retail Finance: International Historical Perspectives*, Oxford, Routledge, 37-70.
McKenney, J. L. & Fisher, A. 1993. 'Manufacturing the ERMA Banking System: Lessons from History', *IEEE Annals of the History of Computing*, 15 (4): 7-26.
Pugh, Emerson W. & Aspray, William, 1996. 'Creating the Computer Industry,' *Annals of the History of Computing, IEEE* , 18 (2): 7-17
Salus, Peter H., 2012. 'The first big iron: British or American?' in *www3.hp.com.* Available online at <http://h30565.www3.hp.com/t5/UK-Articles/The-first-big-iron-British-or-American/ba-p/1966> Last accessed 22 October 2013.
Shannon, Terry, quoted in Goldstein, A (Ed) *VAX Open VMS at 20*, Digital Equipment Corporation, 1997. Available online at <http://h71000.www7.hp.com/openvms/20th/ > Last accessed 22 October 2013.
Watson Jr., Thomas J. & Petre, P., 1990. *Father, Son & Co.: My life at IBM and beyond*, New York, Bantam Books.
Woudhuysen, James, 1979. 'Things to come', *Design*, July 1979.

Notes

[1] IBM had previously been named the Computing and Tabulating Recording Company, in the days when the word 'computer' referred to a human mathematician, and had a long history in the development and sale of punch card tabulating machines invented by Herman Hollerith and used to aid large-scale computations such as the 1890 US Census.

[2] Vacuum tubes, or thermionic valves as they were also known, were a much faster but more unreliable replacement for electromechanical relay switches used in calculating equipment. They first appeared in computers developed in both the UK and the US during WWII.
[3] ENIAC stood for 'Electronic Numerical Integrator and Computer', the development of which began in 1943 at the University of Pennsylvania's Moore's School of Electrical Engineering.
[4] UNIVAC was an acronym for UNIVersal Automatic Computer.
[5] The Emidec 1100 was a British all-transistor computer manufactured by EMI Computing Services Division. It became better known as the ICT 1101 when the division was bought by International Computers and Tabulators in 1962.
[6] IBM was commonly nicknamed 'The Big Blue', although as they produced computers in a variety of colours, this is more likely due to the fact that the company had had a blue logo since the late 1940s.
[7] A website listing various films and shows from the 1950s onwards and the computers that appeared in them (many of them in glass houses) can be found online at <http://www.starringthecomputer.com/>. Accessed 9 December 2013.
[8] The notion of the holders of esoteric knowledge acting as the intermediary between a computer and the populace was used to great effect by Douglas Adams in *The Hitchikers Guide to the Galaxy*. In it he describes the great computer 'Deep Thought' being programmed to calculate the answer to the ultimate question of 'Life, the Universe and Everything'. On hearing it will take seven and a half million years to calculate, it is pointed out to the attendant philosophers Vroomfondel and Majikthise that philosphers could make a career for life out of predicting the results. (Adams D, *The Hitchikers Guide to the Galaxy: The Original Radio Scripts*, London, Pan Books, 1985, 77. Episode originally broadcast 29 March 1978)
[9] Robert X. Cringely's *Triumph of the Nerds* (CBS, 1996) was based on his 1992 book '*Accidental Empires: How the Boys of Silicon Valley Make Their Millions, Battle Foreign Competition, and Still Can't Get a Date'* (Addison Wesley, 1992). Graham Linehan's The IT Crowd (Channel 4, 2006) portrayed its two main characters, the IT technicians Moss and Roy, as socially inept 'nerds' isolated physically and socially from the rest of the workforce.
[10] Mainframe computers were still being routinely installed in businesses in the mid 1970s, gradually being replaced by minicomputers. The large-scale adoption of personal computers started towards the end of 1981 with the launch of the IBM PC.
[11] Barthes used this phrase in comparing the Citroen D.S. to a Gothic cathedral, the marketing act of elevating the functional car to an exhibition piece transforming it into an object of worship.