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## Touch Screen

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The touch screen is a new familiar, but it has made itself at home in a short period of time. An early version, as a finger-touch device, appeared in the mid-1960s, when E.A. Johnson of the Royal Radar Establishment in Malvern, England, detailed his prototypical work in an article titled ‘Touch Display – A Novel Input/Output Device for Computers’ (Johnson 1965). This was followed two years later, in 1967, by the more developed ‘Touch Displays: A Programmed Man-Machine Interface’ (Johnson 1967). This patented proposal was rapidly followed by a different system which was based on pressure and used a stylus rather than a finger to unleash functions. In the 1970s and 1980s, multi-touch systems were developed using infrared sensors and cameras, and, in the next decade, these various technologies were combined to make machines for work, such as Personal Digital Assistants, as well as mobile phones with touch screens. Both usually required stylus inputs and worked with more or less reliable handwriting-recognition systems. From 2000, though, the interest in touch-screen technology emerged in design industries and animation. Large-format touch screens emulated the big boards used by designers to track projects. Where once clay or paper models had sufficed, now there were images, or digital assets, to be conjured up, altered, dismissed, moved around, animated by fingertips. In this same period, Sony developed SmartSkin, a flat surface that could recognise multiple touch points and gestures through sensing elements integrated into the touch-screen surface. Its aim was to let the hand act as it acts habitually in the world, but with its gestures now relating to digital objects. By 2006, a multi-touch device using a biometric concept of ‘frustrated total internal reflection’ was being lauded for its seemingly interface-free, entirely intuitive responsiveness to human gestures. A repertoire of movements for enlarging, tilting, rotating, and shifting pixelated materials was demonstrated on Ted Talks (see Han 2006). It was followed by other so-called ‘Natural User Interfaces’, with the technologies involved set up so they might be used intuitively. The word *natural* signified that the operation of the device did not involve an input device, be it stylus or mouse, but simply a hand. The age of hand-operated machinery

returned, if perversely. In 2007 the iPhone appeared with one button, no hardware keyboard, and an internet browser. This generation of touch screens had touch points as small as a pixel and virtual software keyboards that appear and disappear just when needed. Screens are responsive, there to be touched. They are to be held, and stroked. Touch-screen technology is incorporated into white goods, black goods, things in the home, the pocket, the office. Touch comes to mean not necessarily physical contact, for near-field communication might be the communication mechanism between human and machine in various smart gadgets that respond to a wave of the arm or hand. But this is an extension of the sense of the interface as natural, as automatic as a shrug of the shoulder, a blink of an eye.

The touch screen appears as a sensitive window onto what Marshall McLuhan described as ‘electronic circuitry’ through which information flows. In *Understanding Media*, McLuhan observes that electric light is ‘pure information’, without content – except, he notes, in those cases where it is used to spell out a name or advertisement. If the light is on,

whether the light is being used for brain surgery or night baseball is a matter of indifference. It could be argued that these activities are in some way the ‘content’ of the electric light, since they could not exist without the electric light. This fact merely underlines the point that ‘the medium is the message’ because it is the medium that shapes and controls the scale and form of human association and action. The content or uses of such media are as diverse as they are ineffectual in shaping the form of human association. (McLuhan 1964: 8)

But with the touch screen, information does not just flow past. It can be held up, padded, or swiped into being. In being touched, the screen seems to stop being a screen that obstructs or shuts off. Touching makes the screen act as permeable. However, it also proves to resist permeability, remaining always ever the same glass, the same hard barrier. At this point, intimacy, most often signalled through touch, collapses into distance, be that the inaccessibility of what is beneath the glass, the obscurity of its workings, or its dependence on remote and fragile systems. There may be some people who can ‘jailbreak’ their devices, such as Kindle e-readers, by installing custom fonts or screensavers, and there might be some who jailbreak their iOS or other operating system, in order to install non-proprietary apps. But for the most part, to customise is to choose from a given selection of screensavers or ringtones or to configure an app the way the user prefers it. To customise is not to compromise the pre-set functions of the machine. It is a machine like any other, pre-programmed, set up to execute predicted operations.

The screen of the touch screen is not a window, but a conduit to the machine’s operations. The screen can be fingered, and so it seems as if that

which is called up, moved, enlarged, sent, and so on is fingered too. What passes under the fingers or is brought into being by them is varied – tokens of love, work, misery, horror, banality, kitsch – but it all flits through the same system, contained within the dimensions of the small screen. Thomas Hirschhorn's *Touching Reality* (2012), a 4.4-minute video, concentrates on the touch screen as a conduit of brutality. A fixed camera observes a touch-screen device. On it are a series of photographs. These photographs are of carnage and corpses. They are scenes of war and its casualties, victims of bombs, burnings and gunshot, anonymous and in places unknown or unindicated, just as the owner of the fingers is unknown. One hand's fingers pinch and flick across images of mutilated bodies, honing in on details, such as exposed brains or deep gashes, flicking left to move on to the next, right to double-check on a detail, gently tapping to zoom out. The fingers touch the bodies, but do not of course touch them. They touch their image – real finger on mediated bloody body, missing eye, lost limb. And these fingers touch with such tender gestures, gently avoiding the risk of scratching the screen. Habit sets in, but carelessness does not arise. The finger touch remains poised and gentle. Its caressing operations have been interpreted by Hito Steyerl, who has reflected extensively on our digital condition, as a recognition of the touch screen's traumatic birth, its coming into being through horrendous labour conditions of long hours and poor recompense (Simon 2011). Hirschhorn's title is *Touching Reality*. His screen shows us the reality of war, the brutal images that are censored from the usual media channels, but can be found online (Hirschhorn 2013). The fingers touch this harsher reality (or rather images of it) and, in turn, the reality touches the viewer, or the viewer of the viewer, who observes the artwork on another screen. But of course it can all mean the opposite. There is no touching, just another mediation that can be as casually scanned as any pixelated data, and the touch is only the touch of fingers on cool glass. Reality cannot be touched. Everyone, whoever they are, is already dead anyway.

Walter Benjamin observed a loss of meaning in 1933, which he associated with forms of mediation of stories in the newspaper. The metaphor is one of touch – things 'lose all connection with one another':

In our writing, opposites that in happier ages fertilized one another have become insoluble antinomies. Thus, science and belle lettres, criticism and literary production, culture and politics, fall apart in disorder and lose all connection with one another. The scene of this literary confusion is the newspaper[.] (Benjamin 2005c: 741)

In earlier days, when the newspaper contributed to the formation of bourgeois civil society, it was a vehicle for rethreading the world in reflection, as zones of democratic discussion developed (Habermas 1992: 72). Newspapers make

of people a community living through the same time consciously. In the newspaper, the present is experienced as present for the first time (see Müller 2014: 66). But in the modern age, the newspaper echoes only the incoherent babble of modern life, mixing myth and politics, economy and culture, science and art, gossip and misery, all separated out into sections, with little apparent connection to each other. The logic of the internet and what passes on the touch screen exacerbates this. What appears on the screen, commanded by the fingers, loses in particularity, in order to become incoherent, equatable things, a generality, each substitutable by the other. Connection is an electrical question, rather than one of coherence and context. The present that the newspaper brought into being as an experience breaks into illimitable instants, finger taps on myriad pages, in the infinite chain of links.

This body that touch seems to have, the one that responds to fingertips, is our body too. McLuhan describes radio and TV as types of electric technology. This electric technology, he notes further, is connected to our central nervous system (McLuhan 1964: 68). In turn it connects us, brings us in touch with the world, making it impossible to be aloof and dissociated. It produces sense, and when it is off, there is only absence. There is nothing more off than the touch-screen device without power. Its impenetrable darkness is a sign of that. Without it being on, touch and being touched threaten to wane. We are no longer in touch. We fall out of touch. Communications are down. The very capacity to communicate is withdrawn.

What is behind the screen and ‘feels’ the touch of the finger also withdraws, for it is also only a screen acting as a screen used to do, using its capacity to keep a user out, while transmitting the illusion of an operator reaching through to infinite possible contents. What appears is in permanent movement and that mobility may be more important than the contents or messages. Movements are commanded by users, but functions make sense only as machinic aptitudes that are in communication with other machines, made and operated by humans of course, but nonetheless ‘in touch’ with a network that may at any moment be devoid of human presence. The machine will command new gestures from the user. It will also retrain experienced fingers that got used to typing on physical keyboards arranged to prevent the tangle of typewriter keys, caused by overly swift typists. The new keyboard may be arrayed alphabetically, and perhaps jabbed with just one finger at a time.

The touch screen is a surface for seeing – a surface on which things are read, images are looked at. It is also a surface on which marks can be made, a place for writing. Handwriting on tablets using a stylus has been, till now, a subsidiary function. Difficulties in getting accurate handwriting-recognition systems have weighed against an extension of this function, and styluses require resistive touch screens for the most part, which are less favoured in the industry. But software keyboards that spring up at the moment they are needed are an integral part of touch screens. The touch screen is also a surface on which the fingers perform a kind of commanding without writing,

whereby through the touch of pixels events and actions are unleashed, where once MS-DOS commands had to be written out in newly familiar languages. And as it responds to us, if it is connected to the network of the web, it is also responding to other systems and commands, writing out a trail of our movements, transactions, and communications. The touch screen is a writing machine. New gestures for writing need to be learnt: single-hand or one-finger typing, alphabetic rather than QWERTY keyboard layouts, typing in mid-air with a hand instead of a surface to press against and steady the device. The hand moves as it types and so does the device. Typing with fingers instead of a stylus leads to a motion of the smartphone, especially when this typing takes place as one hand holds the phone. Four factors come into play: the striking force of the finger that types, the resistance force of the hand that holds the phone, the location of the finger as it hits a virtual key, the position of the hand that holds the phone. What seems to be a contingent, intangible set of factors can in fact be mapped from within the machine. The writing that the fingers unleash on the software keyboard might be tracked by those who wish to steal data. Coordinates could be used to rewrite the information, that is to say, to leak it elsewhere, through a malevolent application that has secreted itself on, for example, a smartphone (see Cai and Chen 2011).

As interfaces, touch screens arrange and regulate everyday lives and its activities. Through a touch screen, newspapers are read, moving images watched, radio and music heard. Through it, communications by telephone and other means are made, extending the actuality of touch into the metaphor of being in touch. Every pocket or bag holds a touch screen, a black box, its workings hard to access. It is always there, waiting for activation through a caressing finger. The touch screen has brought the hand into being as a writing tool. The implement is gone. Only the finger jabs to unleash functions, sometimes to write or draw directly. The surface is a responsive sheet, or appears to be so. In actuality it is the top of a sandwich of functions. At the beginning, only one finger could demand responses from the screen. Now the screen is multi-touch and responds to gestures too, reading the body's pinches, spins, flicks, sometimes its specific amount of pressure or tempo of sequential taps. One press and the screen starts up; a few moments delay, if it has been off, and then it responds to the fingertip, to the knuckle, to the tap, the flick, and the swipe. Its surface is smooth and primed to respond. In turn, the fingertips and other parts of the fingers become sensitised in new ways, developing gestures not previously performed, such as the thumb-and-two-finger gesture of expansion. The body's repertoire of movements changes in dialogue with the new machinery. The fingers relate to the smoothness of the screen, but that smoothness which is a surface is also a vector, a new geometry of active surface space, or perhaps what Benjamin termed *Spielraum*, a play space, room for manoeuvre, or wiggle room (Benjamin 2008: 45). Technology is directed to liberate humans from toil; the individual suddenly sees scope for play, a field of action (*Spielraum*), vastly extended. The person does not yet

know how to move within or around this space, but still makes demands upon it. *Spielraum* conveys a reorganisation of the self in the world. This space for play – along with other spatialised concepts, such as *Leibraum* and *Bildraum*, body space and image space (see Benjamin 2005b: 217) – is a description of an interpenetration of person and technology, as, for example, in his example, in cinema, where an audience encounters the dynamic film image. For Benjamin, machinery passes through the human being, augmenting the ‘sensorium’. A new human is embryonic in the epoch of industrial capitalism, one who connects in altered ways with, in, and through the world, and is learning how to move around the world under different conditions of experience and operativity. This body is mediating and mediated, mutable and adaptable to new experiences of space and time, recomposed endlessly through apparatuses and through images. Its learning to negotiate new circumstances benefits from play. The *Spielraum* is a realm of exploration, of active participation in the new geometries that are invented by technologically produced and distributed forms. *Spielraum* encourages play and flexibility. The touch screen might, however, represent the limit point of *Spielraum*. Benjamin’s positively valued concepts of distraction and tactile engagement – whereby things are grasped by the hand, met halfway, consumed as a matter of habit – are pressed into something more akin to permanent commotion and compulsively jabbing fingers. Everything collapses into a relationship between a massive, limitless outside and a delimited fingertip. This finger is bound to the system. Touch-screen technologies permit numerous perceptions of images and texts. They are often annexed to networks, which allow for constant refreshing, seemingly limitless accessibility across space.

The rhetoric of the device insists on touch. Touch makes it work. Touch makes us work. Touch is what the device needs to function in a technical sense. Most touch screens are either analogue, using electrical resistance to sense touches, or digital, using electrical capacitance. A circuit based on capacitance has been most effective to date, with the human working as a conductor. When the finger hits a touch screen, which is composed of a grid of electrodes, a capacitive contact is formed and the AC current of the device elicits from the user a corresponding current – within levels for natural charge conduction in bodies – to complete a circuit. Some other body part – the hand on the back of the phone or the feet on the ground – electrically grounds the device, completing the circuit. We work for the machine in touching it. The touch that touch screens rely on makes of the body an instrument. This aspect of the human whose touch becomes a working function of the apparatus is found in the touch screen’s very beginnings. In E.A. Johnson’s patent application to the United States Patent Office in 1969, the rationale of the touch-screen interface was speed of input:

For example, the cathode ray tube may display a list of items and it may be desired to examine one of the items in further detail.

It is frequently troublesome to indicate to the data processing system which item is the one to be examined. Under these circumstances it should be possible to provide sites on the cathode ray tube which are responsive to touching by the hand of the operator. The effect would be that the operator touches the place on the cathode ray tube screen where the item is displayed and this signals back to the data processing system that that particular item is selected (for further examination, say). (Johnson 1969)

The device exists within the discourse of work and efficiency. It is a rationalised system, a time-motion-aware system, which decreases the possibility of error by restricting inputs to those that are pre-programmed. Indeed, the avoidance of human generated error is a concern of the system, which specifically mentions in the patent the building in of measures generated by the machine to query human actions, tilting the role of overseer away from the human worker to the machine. When the controller uses the touch wire labelled 'ERASE', the computer is programmed to present the words 'CONFIRM ERASURE OF X'. The patent outlines a concept of its functioning as pure medium rather than message, for it was necessary that 'the matter actually displayed on the electronic data display may be varied by the system', depending on job or need. The system produces variance. The operator responds.

In other words, the display resembles an alpha-numeric keyboard in which the labels attached to the keys are not fixed but can be changed by the system computers in accordance with the required meaning at any time. The effect of this idea is far reaching. Not only does it allow the number of 'keys' to be very limited whilst retaining a large measure of flexibility in their interpretation but it also allows the 'meaning' of a key to be changed as a result of information previously fed to the system. (Johnson 1969)

But touch has other fantasmatic resonances. 'Touching is believing'. So insisted the first Apple iPhone print advertisement in August 2007. In blackness, overwritten to one side by the product name and the strapline, a source of light emanates across a limited range, as a finger brings into being, into life, the touch screen of a phone. It glows blueish white. The finger makes contact with the screen, just as Adam's finger touches God's in Michelangelo's *The Creation of Adam* on the ceiling of the Sistine Chapel. It is not enough to see. But to touch is to know, to make tangible and present, even when what is touched is not, because this touch is like no other. It is not just *The Creation of Adam* that is referenced. The finger on the screen and the strapline evoke Caravaggio's *The Incredulity of Saint Thomas*. Thomas, who doubts that

the other disciples have seen a resurrected Jesus, insists: 'Except I shall see in his hands the print of the nails, and put my finger into the print of the nails, and thrust my hand into his side, I will not believe' (John 20: 25). Caravaggio depicts the moment, eight days later, when Jesus appears before Thomas and states 'Reach hither thy finger, and behold my hands; and reach hither thy hand, and thrust it into my side: and be not faithless, but believing' (John 20:27). The finger reaches into the fifth stigma, beneath the burial shroud, while all eyes are trained upon it, and Thomas can no longer disbelieve that the miracle has occurred. It is not enough to see. To touch is truly to know. And what the touch screen lets us know is that it too can perform miracles every day. The Apple advertisement was emulated in an act of Pope Francis in January 2016, when he visited the Paul VI hall at the Vatican (Wyke 2016). His fingers reach out to touch the image of a girl's face on the screen of a mobile phone held up by a worshipper, who wishes for a relative to be blessed. This touch is a miraculous one.

Goethe wrote: 'Seeing with vision that feels, feeling with fingers that see' (Goethe 2005: 69). The line appears in a series of erotic poems titled *Roman Elegies* (1795), and it was occasioned by his reflection on how caressing a woman's skin made him see marble anew. The fingers tapping on the woman's back as he considers the artistic glories of the Renaissance in this new setting reveal to Goethe the commonalities between aesthetic and erotic sensations. Through love and art the body and its senses are reborn. There is a sense in which this lover's look at form and life merges the senses, or confuses the senses, in the quest for knowing a body and exposing oneself to art. The encounter with another and the dislocation, from what seems to him a cold and dull Northern Europe to the South, produce this sensual sensitivity that courses through the fingertips. In what ways might this be captured in a contemporary use of the fingers in close coordination with seeing on the touch screen? Travel and face-to-face, or finger-to-back, contact are replaced in the touch screen by a sense of dislocation and deterritorialisation and by the loss of direct bodily presence. Yet touch is still the sense that is mobilised. But it is touch without feeling, if all that can be felt is the ever same pebble-smooth surface of the screen. Touch is abstracted to a function. There are new resonances to seeing and feeling, when scientific research is pervaded by the tactile vision of the scanning tunnelling microscope, which, in a realm where light does not penetrate, sends out a beam to feel the sample. Touch becomes a means to something else, a visioning, as it does with the touch screen. It is also a vector of touch, in that in a reversal of the operation, researchers use the visual interface to interact at the atomic level with a needle that is able to move individual molecules, producing animations from the invisible realm (see Casavecchia 2012). The touch without touch sensation is not necessarily accepted. There is touch with feeling.

On the Apple watch, physical sensations are sent through the wrist in order to persuade a user that the action performed is continuous with how



this action has always been performed before: pressing buttons, scrolling wheels. Technological research pursues ‘haptography’. Haptography is a recoding of touch sensations such that they can be recorded and mobilised in equivalent situations. It embeds the message into the medium and its capacity to vibrate and transmit. These recorded touches can be communicated over distance, or so it seems. In fact their local versions are mobilised through the network. Through selecting a ‘contact’ in the address book, an Apple Watch user can transmit a tap to the wrist of a selected Apple Watch wearer. Heartbeat simulations can be conveyed too. The touch-screen smartphone taps into the wearer’s body and extends an abstracted touch to another wearer’s body. The touch-screen device touches back. It has a kind of body, or at least borrows our one. This is reinforced to the extent that the touch screens of smartphones develop surfaces that heal themselves, through the use of in-built microspheres that release liquid chemicals that seep into cracks and harden almost imperceptibly. Developers work to render the screen surface more flexible, making it like an organic entity that can grow and shrink. Haptic technology strives to produce touch-screen interfaces that emulate buttons to press or switches to click, vibrations and resistances, as in Immersion’s TouchSense® Technology. A physical skeuomorphism is at work. New e-readers have screens textured to feel like paper. Many continue to report a wistful missing of the tactile experience of paper, its sounds, its look. As virtual pages are turned, a vibration is emitted to emulate the feeling of paper sliding over paper. The lack of orientation in an e-reader may change the way in which reading and understanding occurs. E-readers (those who read on screens, rather than the machines) possess no sense of the topography of the text, its context; that is, of where on the page an idea resides, or where in the book one is, except for the numerical indication of percentages or time left to read the whole at an average rate. Studies attempt to establish – and re-establish as expectations change – the extent to which the haptic experience of a book and its pages affects questions of memory, recall, comprehension, and pleasure (see Jabr 2011). Reading with a finger in contact with a surface that is always ever the same whatever the book, whatever the page, may lead to surface – or superficial – reading, assert various studies, without a deep engagement with the text.

The loss of the physicality of the book was imagined before the event of its occurrence. In Stanislaw Lem’s *Return From the Stars* (1961) something like a touch-screen e-reader appears on sale in a bookshop that is more like a laboratory:

No longer was it possible to browse among shelves, to weigh volumes in hand, to feel their heft, the promise of ponderous reading. The bookstore resembled, instead, an electronic laboratory. The books were crystals with recorded contents. They can be read with the aid of an opton, which was similar

to a book but had only one page between the covers. At a touch, successive pages of the text appeared on it. But options were little used, the sales-robot told me. The public preferred lectures – lectures read out loud, they could be set to any voice, tempo, and modulation. Only scientific publications having a very limited distribution were still printed, on a plastic imitation paper. Thus all my purchases fitted into one pocket, though there must have been almost three hundred titles. My handful of crystal corn – my books. I selected a number of works on history and sociology, a few on statistics and demography, and what the girl from *Adapt* had recommended on psychology. A couple of the larger mathematical textbooks – larger, of course, in the sense of their content, not of their physical size. The robot that served me was itself an encyclopedia, in that – as it told me – it was linked directly, through electronic catalogs, to templates of every book on earth. As a rule, a bookstore had only single ‘copies’ of books, and when someone needed a particular book, the contents of the work was recorded in a crystal.

The originals – *Crystomatrices* – were not to be seen; they were kept behind pale blue enamel the steel plates. So a book was printed, as it were, every time someone needed it. The question of printings, of their quantity, of their running out, had ceased to exist. Actually, a great achievement, and yet I regretted the passing of books. (Lem 1982: 257)

Regrets meet the passing away of the physical book. Reading is redundant and listening becomes the preferred mode of reception. Lem imagines a print-on-demand system. Each book appears only once it is wanted. And mostly they do not appear. They flash up one page at a time from dormant crystals, compressed into silicon.

But, more happily, the touch screen, as it has come to be used in the twenty-first century, provides an opportunity to produce something other than the reading experience facilitated by the book, making the text the site of animations, sound, engagements with scale, non-linear narratives, or all manner of interactive elements. Tactus Technology devotes research to making ‘dynamic screens’, where buttons ‘morph out of the surface of your device’ (Tactus Technology 2015). ‘Microfluidics’, the deployment of tiny quantities of a liquid or gas, plug or make bubbles on a screen, allowing for writing systems such as Braille to disrupt the smooth surface. Touch might be actualised in the bumpy touch screen, but it is also sufficiently abstracted as a capacity that the touch screen may disappear to become pure projection. There is a sense of this in the motion-sensor cameras that can unleash actions in gaming. A wave of the hand throws a dart or strikes a ball. Ultrahaptics is a name given to an extension of this. Ultrasound waves emanating from a computer to a location in the air produce pressure differences that human skin

can detect as tactile sensations. As users move their hands around this force field, the air hosts vibrations and pressure points and feedback mechanisms.

Rutted screens and wrinkled air work in a small way against the pervasive image of the touch screen as smooth, without breaks or tears. Byung-Chul Han considers the smartphone with its touch screen to be a main figure, along with Jeff Koons's silver balloon dog and the so-called Brazilian waxing off of pubic hair, in a contemporary aesthetic of smoothness (Han 2015: 9). Han traces in what ways and why this smoothness is the contemporary ideal. Smoothness does not injure. It is emblematic in possessing no resistance. It is shiny and seductive. It demands to be touched. It is a pornographic object which presses in, for touch negates the distance that sight (and worship) demands. This closeness, this to-handness, means that it is not a mystified object. Smoothness for Han is positive and it acts to accelerate the circulation of information, communication, and capital. It augments this circulation by the gadgets' internal dynamic of updates, tweaks, viruses, and ultimately new versions or upgraded forms that insist on adoption. Digital devices bring a new compulsion, a new slavery. These compel us to communicate. Communication is annexed to capital. This speeds up capitalism's circulations. Han points out how the word *digital* is related to the word for finger, which is a counting mechanism. History or stories are, by contrast, accounts, which do not count. Tweets and information are unable to become accounts, being too fragmented and scattergun. They can only count. They are additive and not narrative. Facebook friends are counted too, above all else. This circulation, for Han, though it produces communication between bodies and organisations, engages a circuit only of one. On the smartphone, as on Koons's reflective mirror dogs and the like, one does not encounter the other, only the self. This is emblematised in the reflection of the face on the screen surface when off and, when on, in its camera function, which produces the commentary on a life, exemplified in selfie images and moments of a day uploaded to networks. It is not multitude but solitude that forms (Han 2013: 50-51).

The touch screen is ready to hand, or ready to finger. What is the touch screen as a reader? There are idiosyncratic ways of touching the screen, but are these themselves legible? Individuality is for it a forensic issue only, in those cases where fingerprints provide access. The fingerprint that one leaves on the screen is a marker of each person's uniqueness, and yet that print's uniqueness is not currently important to the function of bridging the gap in the electrical circuit. Everything is caught up in the screen's capacity. Flexibility has become less a recognition of specific modes of interacting and producing on the machine and more, in recent technical developments, a desired property of the screen itself, a bendy surface, a wearable surface that develops new proximities to the body. It seeks inputs only.

As the screen is used, it deteriorates. Its ideal form is to be wholly reflective, unblemished. In its use it is constantly smeared, despite the coatings

of oleophobic materials, repelling the grease of body parts. Fingerprints leave their mark. In time, the screen gets scratched or broken. The touch screen is destroyed by its own functioning. It loses something of itself from the very first moment of use. It wears and tears, stripping from itself constantly its exchange value, as the cerium oxide dulls. But exchange value depletes anyway, as it is so tightly enmeshed in the logic of improved capability, rapid upgrades, new models, new functions and features. With each moment, it heads towards worthlessness. The screen itself as something touched comes into vision, as it does when it is broken. It passes into history, as something dying or superseded. Isaac Asimov's *Foundation* (1951) described something like a tablet, and even in imagining it before its appearance, Asimov imagined too that nothing, human or technological, exists without wear and tear:

Seldon removed his calculator pad from the pouch at his belt. Men said he kept one beneath his pillow for use in moments of wakefulness. Its gray, glossy finish was slightly worn by use. Seldon's nimble fingers, spotted now with age, played along the files and rows of buttons that filled its surface. Red symbols glowed out from the upper tier. (Asimov 1951: 17)

Technologies emerge from science and dreams. They emerge concretely out of other technologies and even from their dead ends. The touch screen is a hybrid of typewriter and TV. Both these were imagined as other to themselves, and that other that they left behind became the touch screen. In *One Way Street*, a brochure from 1925 on urban experience, Benjamin wondered about the impact of the typewriter and its consequences for the writing hand. He imagined the typewriter otherwise to itself. He was interested in projecting forwards from this writing-machine start and speculated on the possibility of future modes of notating thought mechanically. This derives from a discontent with the typewriter, for he suspects that the mechanical writing action of the typewriter will be chosen over handwriting only once flexibility in typeface choice is obtainable:

The typewriter will alienate the hand of the literary writer from the pen only when the precision of typographic forms has directly entered the conception of his books. One might suspect that new systems with more variable typefaces would then be needed. They will replace the pliancy of the hand with the innervation of the commanding fingers. (Benjamin 2005a: 457)

Such flexibility is a necessity because only then can all the nuances of thought and of expression be captured by and for the writer, whose writing down is dependent on his or her physical connection to the words, the paper, the pen. One single standardising typeface could not provide this, he argues. Once versatility is achieved the writer might happily compose directly on

the machine, rather than with pen in hand - this would of course affect the resultant composition, and books would be composed according to the capabilities of the machine. Commanding fingers hitting keys are said to bring new types of text, composed differently into the world, with varied typefaces that orient meaning.

The touch screen has to date usurped many of the functions of the television, not least because it is the place for watching moving-image material. When McLuhan conceptualised TV in *Understanding Media*, he made the argument that 'TV will not work as background'. TV was a cool medium: 'It engages you. You have to be with it' (McLuhan 1964: 332). Curiously this had found a form in the 1950s in a hugely popular programme for children that used TV otherwise to how it settled into the home. Each TV screen as an interactive surface. *Winky Dink and You*, which aired from 1953 to 1957 on the CBS network, was presented by Jack Barry and his hapless friend Mr Bungle, who introduced clips of the character Winky Dink involved in situations in which viewers were asked to participate. They did this by covering their TV screen with a 'magic drawing screen', a piece of vinyl plastic, which they had purchased. This was rubbed before being applied to the screen, in order to generate the static electricity that would hold it in place. With Winky Dink crayons viewers could take part in a 'join the dots' game, completion of which was designed to help the story continue – a bridge might be drawn across a river that needed crossing, a ladder to reach a height, a cage to trap a lion. The screen could be used for decoding messages and to outline characters. Without the screen and its drawings parts of the programme became redundant. TV was imagined as an interactive medium, if in a limited sense. It moved towards what McLuhan proposed as native to it.

The touch screen is based on interactivity, if only in the very minimal sense that it is based on touch. There is a banalised form of interactivity as a property of touch. The discourse of marketing and business psychology promotes touch as a vector to sales. A slide presentation directed at branders and advertisers in the retail sector by PHD Media Worldwide and researchers specializing in business psychology at University College London emphasises how touch impacts emotions. It uses this knowledge to build an argument about emotional affect and consumer desire. It observes how in Apple stores the low 'kitchen-like' tables invite consumers to touch and try the products, on the assumption that to make a connection with the device encourages purchase. Furthermore, the gadgets may have been shifted off-centre or to the edge of a table by sales staff, as this appeals to the potential buyer to make that initial contact, nudging the device back to the middle of the table, nudging the self towards possession. The presentation details a series of experiments with print and touch-screen-based advertising, devising situations in which people were invited to touch advertising images with their fingers or with a mouse. Those who touched the images on the screen were found subsequently to remember many more of the products. Tactile-tablet

advertisements had a much higher ‘[s]pontaneous awareness’ than non-touch PC versions (‘Touching is Believing’ 2015).

Touch is an emotional vector, and it appears it can be – and will be – mobilised for purposes of affect in the realm of consumption. This is a limited version of interactivity, one that is captured easily for the logic of accumulation, though, of course, the same conclusions can be used for other ends: memory, work, play, education. What is proper to the touch-screen device? Embedded animations, clips, text that reformulates over time, art catalogues where the text changes but the image discussed remains the same in the same place, new forms of narrative that draw the hand and fingers in: these are smaller signals of a touch-screen-specific culture of writing. A broader touch-screen aesthetic has been articulated, culminating in a flurry of activity around 2012. Designers began to think their outputs in relation to the mode of interaction with the touch screen. One example is the branding for the telecommunications company Olo. As the designers at Bibliothèque phrase it:

The logo is the first to exploit the new multi-touch hardware of smart phones and tablets. Custom software allows for interactive manipulation of the logo to become a creative tool in building the visual language. Playing with the interactive logo allows the designer to create an infinite number of brand-orientated digital assets that can be integrated into the brand. (Bibliothèque)

The logo is a swirl of loops in bright colours spelling ‘Olo’. It can be easily made by one finger sweeping over a screen, but it can be pulled about at will, unravelled, and twisted, using all the panoply of multi-touch gestures, until it careers across the screen like a wriggling snake. The logo is touchable, and in touching it the consumer makes it act. In this way, affection is sought. This logo was another contribution to what has been defined as a New Aesthetic which takes its lead from how touch-screen swipes are represented in instruction manuals (see Streitz and Stephanidis 2013). An example is again from a communications brand, Telefonica’s TU, whose logo, launched in 2012, was a slightly crude set of lines making up the letters, with overlaps of the strokes signalled by differing colours. In 2012, too, the logo for the first device to be called Microsoft Surface (later renamed Pixelsense) was a pink swirl that looked as if it emerged from a free touch-screen gesture. The concept of the ‘New Aesthetic’ was broached by James Bridle in 2011 at a South By South West conference on music, films, and emerging technologies. Bridle observed how unprecedented digital forms were appearing in the visual world – for example, pixels in fashion, splinter camouflage, glitches sound and visual effects (see Bridle 2011). The concept was publicised further by Bruce Sterling, who located it as a typical avant-garde movement (Sterling 2012). Bridle drew attention to a series of paintings by Evan Roth from 2012. Titled *Multi-Touch Paintings*, these large-scale canvases derived from the performance of routine

tasks on multi-touch hand-held computing devices. Fingerprint smears or dots jump around in red and back. Vastly enlarged, they make the gesture – the new gesture – the object, and they return finger painting, a primitive child's gesture, as a high-technology feat (Roth 2012). This brings the gesture into a new visibility, one that has also been documented by the artist Meggan Gould. From 2012, Gould made artworks by scanning the smeared and sticky screens of her family's iPads (Gould). Each screen's content was then removed and all that can be seen remaining are the trails of grease and dust and dirt, as touch accumulates and takes on some sort of form, an insistently material one, on the touch screen. The touch screen contributed to aesthetic vocabularies in 2012. Perhaps the gestures and surfaces by now so well integrated with our senses and minds nowadays tend towards invisibility.

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