Misuser Innovations

The Role of "Misuses" and "Misusers" in Digital Communication Technologies

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Studying the digital is an opportunity to revisit and reconsider certain notions that may have been overlooked or did not receive full attention in STS scholarship based on nondigital technologies. It is old news that users of technology can twist and turn technological products to serve ends that were not foreseen from the outset. STS researchers have documented how unanticipated uses of technology and resistances to the designer's program of action have given way to new uses. Their work has examined moments of resistance (Levy 2015), tampering (Gillespie 2006), nonuse (Wyatt 2003), and de-scription of technical objects (Akrich 1992). Occasionally, such appropriations are invested with claims and values that are in conflict with prescribed uses of the technology (Oudshoorn and Pinch 2003). Engineers and designers too have learned the lesson by now: users often develop new functions for old products that had not been foreseen at the outset. This insight has even been incorporated in the design process itself and inscribed in the curriculum at engineering and design schools. What additional claims are then left to be made for the misuser, that has not already been extensively discussed in relation to the user?

In this chapter, we propose that reflections over misuses and misusers, while relevant for understanding the use and adoption of any kind of technology, become critical for digital communication technologies. The plasticity associated with them boils down to the difficulties of imposing any single norm on other parties and bring to closure the prescribed uses. Extending Flichy's concept of "frame of use" (2007), we suggest that sociotechnical practices are discursively and normatively framed by developers and users as being *proper uses* (desired, appropriate) or, conversely, *misuses* (deviant, disruptive). Then, what begins as a deviation from a preexisting normative frame of use may lead to innovations from which grows a new set of prescribed uses and misuses. Our reflection takes hold in a study of three controversies around alleged misuses that flourished at the dawn of networked computing: gaming on an educational system; recreational communication on a research infrastructure; and user robots in the context of IRC networks. In all of these cases, conflicts erupted over how to use the device in the proper

way. As signs of conflict, we point to the many accusations and complaints users had about system misuse and misusers. The construction of use and misuse of digital devices is the central theme of our investigation. By misuse, we mean a category that is ascribed to some actors by other actors, all of whom are considered users of the device. This contrasts with hacking, file sharing, and other misuses that involve the law, where there are other actors involved (e.g., governments) that don't directly pertain to the device. We have limited our discussion to cases where the controversy is contained within the device. The advantage with illustrating this discussion with historical cases is that we can put in perspective the construction of the misuser. What at one point in time is framed by users as a distraction and a waste vis-à-vis the presumed, primary function of the device is, at a later point, the central activity that defines the purpose of the device. In the case of PLATO, Bitnet, and IRC, the conflict centered around users playing games and chatting, whereas the communication networks were initially meant for educational and informational purposes.

The observations that we draw from these cases resonate with previous findings in studies of users of technology: that users tend to act in unpredictable ways, that in doing so they sometimes stumble over functions that had not been anticipated by the designer or the manufacturer, and, finally, that this can become the starting point of new functionalities or markets (Von Hippel 1986, 2001, 2005). These are claims that have been made in regard to all kinds of technologies and with respect to all kinds of users. We make a more specific claim in proposing that there is a close connection between digital devices and conflicts over what counts as a proper or appropriate usage. This claim has already been made by Brunton (2013) in his thorough analysis of "spam" as a phenomenon that, he contends, is inextricably tied to the development of information technologies. As he puts it (2013, 203), since the early days of digital networks, "spam has always been there—as threat, as concept, or as fact. It provokes and demands the invention of governance and acts of self-definition on the part of those with whom it interferes. They must be clear about misbehavior, bad speech, and abuse of the system, which entails beginning to talk about what is worthwhile, good, and appropriate." It is this heightened level of conflict over how proper use is constructed that warrants our investigation into the notion of misuse. This in turn we attribute to how the digital has been constructed as flexible, plastic, in order for it to comply with the design ideal of horizontal, peer-to-peer cooperation.[1] Consequently, the system administrator, moderator/operator, or project leader cannot so easily bring any single interpretation of what constitutes the functionality of the device to closure. Lacking any decisive advantage over the other users, the only means for sanctioning misbehaving users, and, consequently, for stabilizing the prescribed function and use of the device, is through the mobilization of social norms and the active policing of uses. In other words, by wielding the "misuser" label. This strategy proved ineffective in the three cases discussed here, but the failure was a productive one, in the sense that out of the deviations sprang new markets and new industries, which in turn helped to redefine what the functionality of computers and communication networks is supposed to be. Whether or not a deviant practice will be reevaluated as an act of innovation by posterity depends on the success of this practice in establishing itself as the new norm for use.

Recreational Uses of Digital Resources: A Threefold Case Study

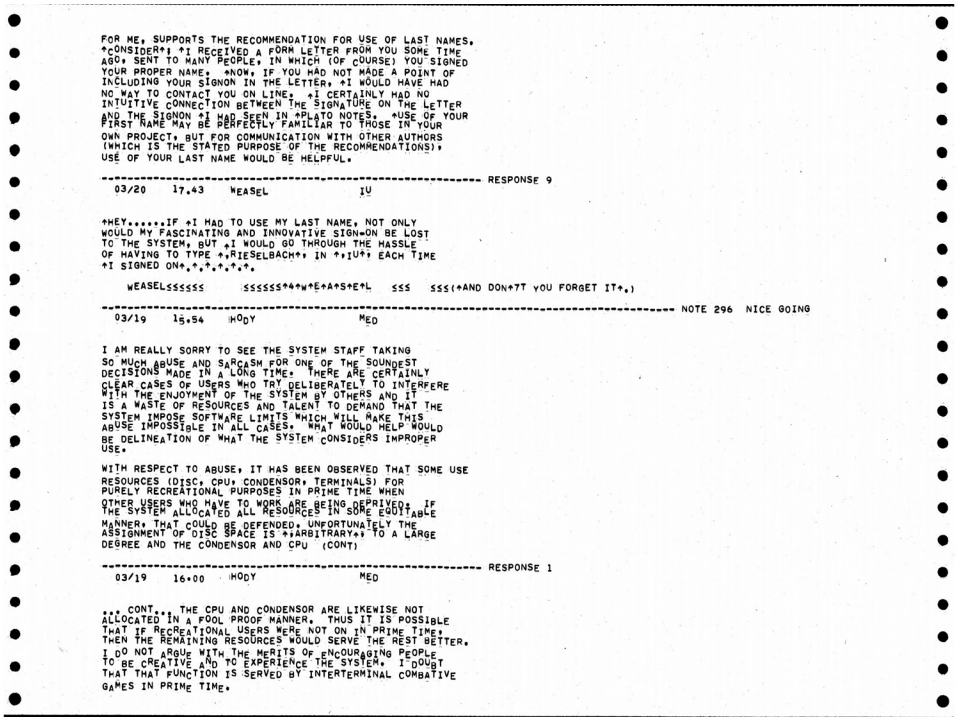
Our reflection is grounded in the study of three communication platforms that flourished at the dawn of home computing: PLATO, Bitnet, and Internet Relay Chat (IRC). These three cases are interesting because they prompted discussions around what is the proper use of a digital technology. Their historical character provides the necessary distance to put the misuser construct in perspective. A historical perspective is necessary because it is only in hindsight that one can tell, if misuse was just misuse or if it was part of the innovation process. A common denominator of these cases is that in each of these settings, misuse was associated with a recreational use of the device: playing games (PLATO), chatting (Bitnet), and bot programming (IRC). These activities could be subsumed under the overarching category of "play," as used by Danet et al. (1997).[2] They deviate from the convened frame of use for each of these platforms—respectively teaching, file transfer, and chat.

To conduct these historical case studies, we used an approach inspired from virtual ethnography (Hine 2000) that we call "asynchronous online ethnography" (Latzko-Toth 2013): the observation, description, and analysis of the past social life of an online group, based on archived traces of digitally mediated activities and interactions. Like "trace ethnography" (Geiger and Ribes 2011), this approach does not rely on trace data only but involves participant observation, interviews, and documentary research to get a deep understanding of sociotechnical practices under study. Latzko-Toth and Jones (2014) digitized a corpus of conversations that took place in the early online forum PLATO Notes (see figure 1). Following University of Illinois Archives nomenclature, the 68 files (plus one addendum) in our dataset are referred to as follows: LN01–LN19 (October 1972 to August 1973), ON01–ON09, ON18–ON41 (January 1974 to December 1975), PN01–PN16 (December 1975 to June 1976). The Bitnet corpus consists of a set of e-journal issues preserved on the Internet Archive website. Finally, the IRC corpus was gathered by Latzko-Toth from various sources, and mainly consists of archived posts from two mailing lists (Operlist and Wastelanders) and a Usenet newsgroup (alt.irc). Firsthand experience with PLATO (Jones) and IRC (Latzko-Toth) as well as interviews with key actors of PLATO and IRC development provided triangulation in how we interpreted the data.

Our analysis focused on the rhetorical ways by which use and misuse were constructed and evolved through time, particularly in moments where conflicts erupted over accusations and complaints about misuse and misuser. A QDA software was used as a text processing and coding tool. This allowed for an inductive approach to the material, letting analytic categories and topics emerge through coding. Considering the amount of material, we turned to plain-text searches on keywords to focus our attention of relevant messages. We would then iterate the process once a new topic or significant term was identified.

PLATO Games

PLATO was an educational and social computer platform developed at the Computer-based Education Research Laboratory (CERL) at the University of Illinois at Urbana-Champaign in the 1960s and 1970s. Emerging in the context of a growing public interest for computerized teaching (see Chan, this volume), it is



FOR ME, SUPPORTS THE RECOMMENDATION FOR USE OF LAST NAMES.
CONSIDER! *I RECEIVED A FORM LETTER FROM YOU SOME TIME
AGO, SENT TO MANY PEOPLE, IN WHICH (OF COURSE) YOU SIGNED
YOUR PROPER NAME. *NOW, IF YOU HAD NOT MADE A POINT OF
INCLUDING YOUR SIGNON IN THE LETTER, *I WOULD HAVE HAD
NO WAY TO CONTACT YOU ON LINE. *I CERTAINLY HAD NO
INTUITIVE CONNECTION BETWEEN THE SIGNATURE ON THE LETTER
AND THE SIGNON *I HAD SEEN IN *PLATO NOTES. *USE OF YOUR
FIRST NAME MAY BE PERFECTLY FAMILIAR TO THOSE IN YOUR
OWN PROJECT, BUT FOR COMMUNICATION WITH OTHER AUTHORS
(WHICH IS THE STATED PURPOSE OF THE RECOMMENDATIONS),
USE OF YOUR LAST NAME WOULD BE HELPFUL.

---------- RESPONSE 9
03/20 17.43 WEASEL IU

*HEY.....IF *I HAD TO USE MY LAST NAME, NOT ONLY
WOULD MY FASCINATING AND INNOVATIVE SIGN-ON BE LOST
TO THE SYSTEM, BUT *I WOULD GO THROUGH THE HASSLE
OF HAVING TO TYPE *-RIESELBACH-* IN *IU*; EACH TIME
I SIGNED ON.*.*.*.*.*.*.

WEASELSSSSSS SSSSSS*+*W*E*A*S*E*L SSS SSS(*AND DON*TT YOU FORGET IT*.)

---------- NOTE 296 NICE GOING
03/19 15.54 HODY MED

I AM REALLY SORRY TO SEE THE SYSTEM STAFF TAKING
SO MUCH ABUSE AND SARCASM FOR ONE OF THE SOUNDEST
DECISIONS MADE IN A LONG TIME. THERE ARE CERTAINLY
CLEAR CASES OF USERS WHO TRY DELIBERATELY TO INTERFERE
WITH THE ENJOYMENT OF THE SYSTEM BY OTHERS AND IT
IS A WASTE OF RESOURCES AND TALENT TO DEMAND THAT THE
SYSTEM IMPOSE SOFTWARE LIMITS WHICH WILL MAKE THIS
ABUSE IMPOSSIBLE IN ALL CASES. WHAT WOULD HELP WOULD
BE DELINEATION OF WHAT THE SYSTEM CONSIDERS IMPROPER
USE.

WITH RESPECT TO ABUSE, IT HAS BEEN OBSERVED THAT SOME USE
RESOURCES (DISC, CPU, CONDENSOR, TERMINALS) FOR
PURELY RECREATIONAL PURPOSES IN PRIME TIME WHEN
OTHER USERS WHO HAVE TO WORK ARE BEING DEPRIVED. IF
THE SYSTEM ALLOCATED ALL RESOURCES IN SOME EQUITABLE
MANNER, THAT COULD BE DEFENDED. UNFORTUNATELY THE
ASSIGNMENT OF DISC SPACE IS *ARBITRARY* TO A LARGE
DEGREE AND THE CONDENSOR AND CPU (CONT)

---------- RESPONSE 1
03/19 16.00 HODY MED

... CONT... THE CPU AND CONDENSOR ARE LIKEWISE NOT
ALLOCATED IN A FOOL PROOF MANNER. THUS IT IS POSSIBLE
THAT IF RECREATIONAL USERS WERE NOT ON IN PRIME TIME,
THEN THE REMAINING RESOURCES WOULD SERVE THE REST BETTER.
I DO NOT ARGUE WITH THE MERITS OF ENCOURAGING PEOPLE
TO BE CREATIVE AND TO EXPERIENCE THE SYSTEM. I DOUBT
THAT THAT FUNCTION IS SERVED BY INTERTERMINAL COMBATIVE
GAMES IN PRIME TIME.

FIGURE 1: A sample of PLATO Notes original printouts.

considered to be the first computer-assisted learning system to be widely disseminated (Van Meer 2003). A key element of PLATO plasticity was its powerful yet relatively simple programming language: TUTOR. It made possible a wide array of creative programs—called "lessons"—including purely recreational ones, but also communication and collaboration services that became essential to the system development.

Games and other "non-educational programs" were at the heart of an ongoing debate over proper allocation of resources. In fact, they were epitomizing a broader debate over the *purpose* of PLATO, highlighting the interpretive flexibility of the artifact. The following quotes are from three different PLATO users and developers, from the "general interest" Notes forum hosted on the system. They provide a good oversight of the conflict over this topic:

> I must point out that this is an experimental teaching computer, and its function is primarily that of an educational asset. During the day, there are so many authors and students, that the terminals and computer time are limited to those people who are using the computer *as it was designed, for educational purposes*. (File LN09, 3/28/1973, emphasis added)

> If recreational users were not on in prime time, then the remaining resources would serve the rest better. I do not argue with the merits of encouraging people to be creative and to experience the system. I doubt that that function is served by interterminal combative games in prime time. (File ON24, 3/19/1975)

> The machine should (given resources) be available to all students, not only those in specific courses, and for all purposes, not only lessons. *Just like a library*. The catch is the "given resources." If PLATO can allocate resources sensibly, . . . it should. (File ON26, 4/8/1975)

CERL authorities had a "freedom of authorship" policy (derived from notions of "academic freedom" common at US colleges and universities and early hacker ethos) that encouraged exploratory and creative practices on PLATO, including purely recreational ones. But that ethos had to deal with the scarcity of key digital resources as well as nondigital ones (e.g., lab operating hours, system staff labor, etc.). Thus, games and other programs from "unsupervised authors" were competing with other applications for resources, including terminals, memory space, and peak hour time slots:

> The objection is not to "game" lessons per se but to recreational use of terminals and site ecs [memory] when others have pressing needs for these resources. (File ON09, 5/13/1974)

> Why abuse [the system] with games during prime time, when games eat away at precious, valuable [memory] space, when this time is the ONLY time some authors can work? (File ON21, 2/4/1975)

The quotes illustrate the idea of disruptiveness that was associated with gaming, deemed as transforming the frame of use of the system:

> Room 165 CERL is a classroom, not an arcade. I can't believe you weren't aware of the crunch for terminals when you entered the games. (File PN11, 4/20/1976)

> Children of unspecified ages spend their days at cerl playing games. . . . Concomitant with playing is the issuing of loud, disgusting noises . . . when the non-educational use of the . . . system interferes with serious work, SOMETHING HAS TO BE DONE. (File ON34, 8/20/1975)

One participant in the discussion notes that "there are clear cases of users who try deliberately to interfere with the enjoyment of the system by others" and suggests that, instead of curbing them with material restrictions coded into the system, it "would be useful [to] delineat[e] . . . what the system considers improper use" (File ON24, 3/19/1975). This epitomizes how misusers are constructed as trespassing the line drawn by official designers (the "system people") around what constitutes the desired frame of use for the system. The following examples show how that norm is rhetorically constructed: what constitutes appropriate and inappropriate uses of PLATO, what is "of value," and what is not:

> We should be careful to know the difference between "serious" and "non-serious" usage. The usual game-playing that at times takes place should not constitute "serious" usage. (File ON02, 1/23/1974)

> Why would you want to play games when there are so many other neat things to do on Plato? (File LN12, 4/18/1973)

> How come you ********* keep stealing the games from this ****** computer. They're probably the only thing of value or interest on this machine. (File LN09, 3/27/1973)

The notion of "educational value"—a boundary object (Star and Griesemer 1989) between teachers, system developers, and students—served as a guiding principle and also as a rhetorical device, a claim to legitimize users' appeals vis-à-vis resources, to sort out what was and what was not a misuse of those resources. Thus, "theories" of education could be invoked either to ban games or, conversely, to justify their presence on the platform:

> The entire idea of PLATO is to show that learning need not be the rote methods in use before. Most "game" lessons . . . include some element of education in them. (File LN06, 1/22/1973)

> Systems people must realize the educational benefit of certain games both to those using them and to those (especially new) authors writing and coding them. If system capacity permits, certain game playing and games authoring should be considered educationally as vital as more discipline oriented lesson viewing and authoring. (File ON05, 2/28/1974)

Games were also seen by some as being beneficial to PLATO (and therefore to its users) because they were pushing the system to its limits and forcing PLATO developers to improve the design of the system:

> The question of redundant computation on the system is a more rational way of dealing with the REAL problem than making a neurotic attack on some symbolic organism called "games." It seems to be a matter of system engineering to *utilize the available resources profitably*. . . . Get rid of lousy lessons and programs that are less functional than the computer stuff they consume . . . entertainment and education are both functional, redundant computation and idle time are not. (File ON21, 2/5/1975, emphasis added)

Our case study of PLATO illustrates how the notions of proper use and device purpose are relative and constructed. It also sheds light on the discursive aspect of building a normative frame of use and negotiating its possible extension or transformation.

Bitnet Chats

Bitnet (Because It's Time network) is a computer networking initiative launched in 1981 to link liberal art faculties across the world, by interconnecting IBM computers using a proprietary protocol (RSCS). It was eventually superseded by the Internet.

Communication as Misuse

Reading through archives of Bitnet newsletters, one thing strikes the contemporary reader: the network was not originally conceived of as a communication

infrastructure. According to its charter, written in October 1986, Bitnet is a computer network established with the "purpose of facilitating non-commercial exchange of information consistent with the academic purposes of its . . . members" (Bitnet Executive Committee 1986). The broad notion of "exchange of information" doesn't exclude communication, but the formulation stresses the academic value of the content transferred from an institution to another. The words chosen reflect a compromise and tolerance for communicational uses of Bitnet as long as they are deemed academically relevant. It results from years of sometimes heated debates about the primary purpose of the system. The crux of the matter lay in the design of the network protocol used in Bitnet: messages had priority over file transfers. File servers were the original dominant application on Bitnet (Condon 1990). In that sense, Bitnet was designed as a long-distance file exchange system. Communication applications (email, chat, bulletin boards) where secondary. Even more, real-time communication (chat) was a *détournement* of the system's message functionality. The more that feature was used, the less file serving could work properly, due to long delays (sometimes days!) generated by queues. In that sense, "recreational communication" appeared as a misuse insofar as it was competing with and preventing "legitimate uses" of the network:

> Since RSCS gives priority to message buffers ahead of file buffers, this has a tendency to slow file transfer to a standstill. . . . When I have a professor . . . who has thesis students sending their papers to him via the network for correcting and comes and complains that his files are not getting through and I check and see a few copies of MONOPOLY and ZORK and ADVENTURE going from Spain to Germany . . . and then I . . . see a very large number of message buffers (going to Chat systems in the United States) preempting the file transfer of legitimate computer work, I begin to see abuse with a capit[a]l A. (Nussbacher 1985)

A similar hijacking of the prioritized transmission of characters between PLATO terminals—which allowed for the development of chat programs (Dear 2017)—was not met with a similar opposition from PLATO administrators. This could be explained by the fact that this type of use had no detrimental consequences on other activities, nor drained them from resources.

The Disruptive Individual

Another interesting aspect of the Bitnet case is that it vividly illustrates the transformative power of a single individual within a digital infrastructure. Christopher Condon was both one of these "entrepreneur" individuals and a commentator of the phenomenon. While pursuing undergraduate studies at Sacred Heart University, he was involved in the Bitnet Network Information Center (BitNic) hosted at Yale University. Condon was the founder and editor of a series of periodical newsletters, including *BitList* and *NetMonth*. *BitList* started as a mere list of Bitnet servers providing information of new servers, "dead" servers, their network address, their type, and other relevant facts. It quickly became the essential link between Bitnet users. As Condon regularly recalls, it was considered the "official list" because it was the *only* list of its kind. The content of the newsletter diversified considerably, and it soon became a "hub" of information *and* communication between Bitnet users (and staff). It was also instrumental in promoting new programs and other periodicals (like *Class Four: The Relay Magazine*), hence giving traction to new

initiatives. Overall, this electronic medium was transformative in turning a set of scattered servers and users into a reflexive online community. In one of his editorial notes, Condon cites two other individuals whose initiatives, just like his, had a transformative impact of the very nature of Bitnet: Eric Thomas, author of the ListServ mailing list program, and Jeffrey Kell, who wrote the distributed chat program "Relay":

> Most change is brought about not by work groups or committees, but by individuals (for whatever reason). Eric Thomas took it upon himself to improve the original BITNIC LISTSERV and propagate his version throughout the network. Jeff Kell wrote RELAY and did much the same thing. While these people received (and are receiving) assistance from others in the network to continue their efforts, the impetus for change [is] an individual one. Or rather, the effort in BITNET change is a group one, where the momentum behind that change, the groundwork, often comes from a single person. (Condon 1988)

Communication as the New Purpose

While it appears *positive* in hindsight, these transformative actions are in fact *disruptive*, in the sense that they profoundly reshape the distribution of resources in the network while redefining the artifact and its meaning to the point of a reversal of foreground and background, ends and means. As Grier and Campbell put it, Condon "was the individual most responsible for converting the back stage of the old Bitnet into the front stage of the new" (Grier and Campbell 2000, 36). Communication, which used to be a *means* to achieve the originally assigned tasks of the system, eventually became its very purpose: "BITNET was an end in itself. As the network has grown, this emphasis has changed. . . . The End is now to provide academic communications services, and BITNET has become the Means" (Condon 1988). Finally, the *identity* of the network is affected, in that a specific use or application of the system may be equated with the whole device: "I noticed something interesting. Many of the people I talked to were under the impression that Relay *was* BITNET. That is, they were not aware that BITNET existed for some other purpose" (Condon 1990).

Earning and Preserving Legitimacy

Toward the middle of the 1980s, chat programs started to bloom on Bitnet (Kell 1986). Due to limited buffer space and the priority on message transfer, they caused the saturation of the network. In a note sent in February 1985 to all Bitnet users and administrators, Henry Nussbacher, then head of the Network Information Center (BITNIC), condemned chat servers operating on Bitnet, stating that they were a serious threat to the network. Because public chat implies "rebroadcasting" of messages to a whole group of users, they imposed a heavy load on bandwidth. He recommended that such program should be banned from Bitnet. Along with technical reasons, Nussbacher justifies this veto by the frivolous content of messages, way beyond the scope of "academic" use of resources: "The bulk of data being transferred over TP [twisted pair] lines becomes a hackers CB world. High school students and college undergraduates discuss everything from dirty jokes to sex to crashing the VM system" (Nussbacher 1985). Kell recalls, "Nussbacher's infamous paper . . . was circulated. . . . And boom, the party was over. . . .

Management in general (contacts, administrators, technical people) developed a bad taste for 'chatting,' and most of it was put to a halt. Others went underground, and when discovered and exposed, only served to increase management distaste for the whole concept" (Kell 1986).

Enters Kell, who figures a way to alleviate the load on Bitnet links by using a decentralized infrastructure of chat servers *relaying* messages to one another—and broadcasting them locally—instead a broadcasting them to the entire network. The "Relay" program was born. Kell skillfully combined technical optimization and public relations to have his program viewed more positively than single-server "chat machines"—as they were called. It implied making concessions by establishing use policies and enforcing restrictions (on the time of the day, on user location, and even on which chat rooms—channels—were allowed). Because "bad programs" were always reappearing like the heads of the Hydra, Relay began to be seen by Bitnet managers as a way to police the practice of chatting: "The biggest 'boost' to Relay came when some management switched over to our side, although granted with considerable caution. . . . Thus the first set of statistics, limitations, and restrictions were imposed in an effort to make Relay 'legitimate.' . . . It would be of enormous value to have the Relay program finally reach a 'legitimate' status" (Kell 1986). Bitnet Relay also gained legitimacy because it was considered by users as the most efficient way to get technical help with the system, and for that reason, it had major advocates including Christopher Condon. But that legitimacy remained fragile and contested. For instance, flaws in the program were exploited by hackers from Computer Chaos Club in Germany to get into computers at Cornell, whose authorities incriminated the local Relay server and shut it down. But the largest threat on Relay came from "rogue" chat machines—the centralized, resource-consuming type. First, they were a bad publicity for online chat in general. But some of them were worse: they imitated the "look and feel" of Relay—and even allegedly took its name. Toward the end of 1986, a controversy on Relay "clones" revealed a struggle between Relay promoters who wanted to preserve its hardly acquired legitimacy and clone developers who, intentionally or not, took advantage of it to fool node administrators. From then on, Relay advocates would demonize and fight rogue chats, including modified versions of the Relay program: "Even though Relay is somewhat accepted by the network administration, a copy of Relay can be easily hacked to break the rules it is designed to enforce. . . . These 'dark-side hackers' would *misuse* anything" (Kell 1987, emphasis added). Building the Relay network was therefore also building a sociotechnical network, an *actor-network* strong enough to resist attacks from Bitnet management and to aggregate and absorb all other chatting devices; it is a struggle to establish a standard, a normative frame of use of online chat. If there were any hope that Relay would ever become "official"—legitimate—then, all chatting practices outside that frame had to be labeled as "misuse" and suppressed.

IRC Bots

IRC is an online chat protocol initially developed in Finland in the late 1980s. It started as a modest program with limited features and evolved into a large, complex technical infrastructure consisting of myriad independent networks of servers. Long before the arrival of ICQ, MSN Messenger, Skype, Twitter, and Snapchat, IRC emerged as a decentralized, always-up messaging infrastructure allowing

millions of simultaneous users to have real-time, polyphonic, written conversations online (Latzko-Toth 2010). Just like its predecessors, IRC has struggled to be recognized as a proper use of network resources (particularly in academic institutions). In the 1990s, many universities banned IRC as it was considered a waste of bandwidth, an invitation to obnoxious hackers to attack their computers, and overall an Internet application with no educational value:

> Sysadmins view it as a frivolity and pick-up mechanism, and the easiest thing to do when problems arise is to simply remove it—most sysadmins don't want to deal with IRC at all, and if it causes problems, removing it means they don't have to deal with it. (Operlist, 1/8/1992)

> To quote [four] randomly asked administrators here at UC Berkeley today, of how the[y] viewed IRC, they all same something different, but all equalled the same thing. No educational value. (Operlist, 1/9/1992)

From the above, it can be seen that IRC was to the Internet what games had been to PLATO, or Relay to Bitnet, and this regular reference to educational value has to do with the academic settings within which these digital infrastructures had been developed as well as to rhetorical appeals to education as an intrinsically valuable purpose. But contested as the status of IRC was, in this section we will focus on the notion of misuse *within* the context of IRC, as it epitomizes the relationality of misuse. A robot or bot is an autonomous program capable of signing on to IRC by itself and interacting with other servers and clients. IRC bots serve various purposes, from policing use to mere fun. In addition to bots, there are less elaborated code objects known as scripts which, just like bots, can react to online events without any direct intervention from the user. Are programming a script and "running a bot" appropriate in the context of IRC? What is at stake here is the definition of what constitute a proper use of IRC.

The IRC device is a complex ecology of human and nonhuman actants, the latter consisting of various software entities including servers, services, user clients, and "user bots." Interestingly enough, the latter term emerged as a means to differentiate them from "official bots" endorsed by the administrators and operators of a specific IRC network. In other words, the very notion of user bot implies their potentially contested status and the fact that they can possibly fall outside the perimeter of what is considered to be part of the device (features) and what is deemed external and potentially disruptive to it (bugs). If one reads the discussions about bots that took place on the main online venues where IRC development was discussed in its early days (notably Operlist and alt.irc), it appears that the normative frame of use of the original IRC network (EFnet) tended to exclude running bots, as bluntly stated in the IRC FAQ (Rose 1994) and exemplified by the dialogue below, where R. R., an IRC operator, ironically rephrases a beginner's question to suggest that chatting has been superseded as the main purpose of IRC by "running bots":

> > I was just wondering what is the current status of running bots on EFNet,
> > is it permitted? and if so, what servers currently allow them? . . .
>
> I was just wondering what is the current status of chatting on EFnet, is it permitted? and if so, what servers currently allow it? With all the clone/war/

> takeover . . . and all the efforts of server admins to combat them, is there any chatting going on? Is it actually possible to chat without running a bot? (R.R., alt.irc, 5/13/1996)

As revealed by a thorough examination of IRC history, user bots played a key role in the dynamics of innovation within IRC networks (see Latzko-Toth 2014). The original IRC code was an "unfinished artifact" (Maxigas 2015) when it was released by Jarkko Oikarinen. It somehow came with an antidote to this incompleteness: the distribution package included a set of bot templates that constituted an invitation to add new features—called "services"—to a minimalist protocol by delegating these extra functionalities to bots. The term "bespoke code" was coined by Geiger (2014) to name this way for users of a software infrastructure to contribute to it by adding a nonofficial layer of code, notably in the form of bots.

Early on, user bots were controversial on IRC. Some were simply considered annoying and were treated like a particular and elaborated form of "spam," because they would make repetitive, frivolous comments on the public chat channel, send private messages to users, or duplicate (clone) themselves. Some IRC users would see them as an innocent form of entertainment. Other bots were frowned upon for very different reasons: they were interfering with the governance of IRC networks and channels. Who opens a conversation channel first rules it until he or she leaves the channel or nominates another "channel operator." Thus, the original IRC protocol did not provide any way to "register" a channel and to permanently establish oneself as its owner or manager, which resulted in constant fights over the control of a channel. Channel bots were developed to fix this problem. By continuously sitting on the channel they are taking care of, they serve a double function: they keep the channel open and keep control of it on behalf of their owner. Even more, since most bots feature access levels, they allow for a much more subtle scale of power than the binary structure inscribed in the IRC protocol (operators versus non-operators).

The "user bot" was disruptive to IRC in the sense that it established a new de facto regime of governance within the digital space of an IRC network, directly competing with the "official" regime of governance as reflected by the typology of IRC operators, channel operators, and so forth. On EFnet, this shift in channel governance was vigorously criticized by the self-appointed, co-opted official designers (server administrators, code developers) who established a *channels-are-not-owned* policy and who regarded channel bots as a violation of that policy—while setting a double standard when it came to keeping control on their own channels.

Interestingly, a common argument against the practice of connecting user bots was that they were "a waste of resources": they take away connection sockets—limited on every server—from human users and generate unnecessary data traffic inside the network. An impassioned debate around the status of user bots took place among the founders of another large IRC network (Undernet), which was set up precisely for the purpose of testing bots. There again, allocation of digital resources was at the core of discussions, as illustrated in the following excerpt of a "bot policy" draft, where the notion of useful bot is also outlined:

> Idle bots are nothing more than a drain on the resources of the many servers which comprise the network. In an attempt to help keep the number of idle processes to a minimum, all processes on this server must display some activity at least once every eight hours. . . . The only exceptions to this clause are bots that

provide useful services such as note services, database services, file services, or communication services, provided they are sanctioned by the opers of this server.[3]

To contenders who would insist on their frivolous nature, bot proponents would justify their existence by the educational value found in programming them, like in the following examples:

When I first started to [use] IRC . . . I started to program bots :) At first that is ALL i did. . . . It hel[p]ed me to learn A LOT about irc and its calls!! (D. L., Wastelanders, 5/2/1993)

Bots are educational. It's been criticized that IRC is nothing more then brainless chatting. However, anyone who ha[s] attempted to write a bot, figure[d] out how it works, etc. knows you can learn a little programming, logic, etc. (B., Wastelanders, 2/16/1995)

It may be useful to point out that soon after these discussions took place, Undernet operators decided to establish a channel registration procedure and set up an "official" bot (X/Cservice) to look after registered channels. It basically made the channel bot a formal component of the IRC network. Today, channel registration—or an equivalent function, ChanFix, allowing to recover ownership—has become a standard feature implemented on most IRC networks.

Like in previous cases, the controversy around the appropriateness of running bots on IRC as a way of using it revolves around what uses should be given priority in terms of resources directed to them, based on a normative frame of use that is constantly subject to redefinition attempts. But the case of the IRC user bot also exemplifies how "misusing" networked digital resources can lead to reconfiguring the whole device, with the consequence of profoundly transforming the way it operates and/or it is governed, thus exhibiting its plasticity.

Discussion: Steps toward a Theory of the Misuser in the Digital Age

The three historical case studies above allow us to outline what we call the figure of the misuser. This figure is rhetorically mobilized in discursive exchanges inside a community of innovation gathering designers, early users, and other stakeholders of a nascent digital innovation.[4] In analyzing the traces of these exchanges, we could find regular occurrences of such terms as "misuse/misuser," "disruptive use/user," and "abuse," and conversely the adjectives "proper," "legitimate," and "serious" associated with the word "use." This led us to making the hypothesis that the categories of "misuse" and "misuser," although they originate from the actors themselves, are performative and effectively contributing to shaping the innovation as they are deployed in boundary work (Gieryn 1999) by members of a community of innovation to circumscribe "proper" use versus improper use of a digital communication device. Furthermore, we propose that the importance of these categories in the dynamics of digital innovation is tied to the plasticity of these artifacts, which is why we refer to them as "misuser innovations"—to underline that innovative uses of digital communication technologies that contribute to

define them are often stemming from marginalized users of an existing device established for other purposes.

In this final section, we articulate the notion of "misuser" as a useful analytical category to understand the dynamics of innovation at play in the construction of a networked, software-based communication device. To do so, we first have to explain why this category matters, and why it particularly matters in the digital context.

Some early instances of misusers are featured in Kline and Pinch's classic study of the reshaping of the automobile by recalcitrant farmers in the first half of 20th century (Kline and Pinch 1996). In terms of militancy and technical ingenuity, few contemporary users could measure up to the resistance of the farmers against the automobile. The case study was issued from a social construction of technology (SCOT) perspective, but it was written in response to criticism leveled at an earlier version of that theory. Initially, SCOT had put emphasis on how artifacts are shaped by relevant social groups up until the moment of a closure in the design and function of the artifact. However, to speak about a closure of an artifact implies a closure on who is counted as relevant, emphasizing the designer and manufacturer while leaving out the user and/or consumer from the equation. With the study of farmers and automobiles, the point on interpretive flexibility of products was reasserted but now extended beyond the singular point of closure. Kline and Pinch showed how parts of the farming community reacted with fierce resistance, in the extreme cases by digging traps and ambushing drivers. Later, other farmers begun to repurpose the automobile, for instance, by using the motor as a power source for various tasks. The attitude of manufacturers toward the interpretative flexibility exercised by farmers shifted with the seasons of the market. To start with, the inventiveness of the farmers expanded the market for general purpose-built cars. As the product range was diversified, and some models were developed that catered specifically to farmers' needs, such inventiveness became instead an infringement on the niche market. Consequently, manufacturers began condemning practices that they had initially condoned. Farmers, having had no say over the original development process of the automobile, exercised some influence on its subsequent developments. Although the interventions by the farmers were spectacular and entertaining, Kline and Pinch concede that, when all is said and done, "it is clear that one social group initially had more influence than any other in terms of giving a meaning to the artifact: the manufacturers" (1996, 774).

Our case for singling out the misuser takes foothold in the last remark, concerning the relative (un)importance of the farmer-user in the overall development process of the automobile. It is because of this power of disrupting—destabilizing—the whole system that the misuser stands out from misbehaving and unruly users in general. What is distinctive about the former is the capacity of a single (mis)user or a small subgroup of them to reconfigure the distribution of resources in the entire network and, with that, to performatively reinterpret how the device is supposed to work for everyone else. In the extreme case, every user will be equally affected by the exertion of interpretative flexibility by every other user. When the interpretative agency of all users approximates such a symmetry, we may say that the device demonstrates a high degree of plasticity. That is, the way the device functions is plastic and bendable to the interventions and interpretations of any of the users.

In the cases investigated in this chapter, PLATO, Bitnet, and IRC, this plasticity was mostly experienced in a negative way. Every user was dependent on the same

and, at the time, very limited resource allocation of computation, bandwidth, memory, connection sockets, and so on. The link between this conflict of interests over resources and the application of the "misuser" label comes out from the case descriptions. The opposite situation is at hand when a single user or a small subgroup of users may deviate from prescribed uses and tinker with the device without this activity having much of a destabilizing (disruptive) effect on the network as a whole. Arguably, the automobile exemplifies a device of the latter kind. The process by which this device can be reinterpreted is relatively inflexible because it is sunk into the car manufacturing process, the transportation systems, traffic regulations, and so forth. A farmer who turned his automobile into a power generator did so without it having much of an effect on every other driver. Only indirectly, by demonstrating a demand in a niche market, did the farmer modify the product range of automobiles. As mentioned by Kline and Pinch in their article, manufacturers and others who felt that they ought to have an interpretative superiority over the farmers did nevertheless complain about the product being misused. Our proposition is, however, that the actors' need for distinguishing between proper uses and misuses of a device is proportionate to the plasticity of the device. Or, put differently, the need to distinguish between use and misuse is proportionate to users' perceived risk that a deviation from prescribed uses poses to the integrity and ascribed functions of the entire network. The felt need is greater for social sanctions against deviations that users believe put everybody's uses of the device at risk, by, for instance, causing system owners to restrict access or resources. It is the latter kind of situations that, we contend, warrant us to make a special case of misusers of digital communication technologies, provided we keep in mind that "misuse" is itself an actor's category, something we can trace in actors' accounts.

It is understood that the words "misuse" and "deviation" are loaded, derogatory labels. Their meanings derive from a taken-for-granted setup of the device at the time, corresponding to a dominant interpretation—within the group of designers or the larger user community—of what the function and the use of the device are supposed to be. This dominant interpretation is what we call the normative frame of use of the technology, drawing on Flichy's (2007) concept of "frame of use." The frame of use "describes the kind of social activities proposed by the technology, the integrated routines of daily life, sets of social practices, kinds of people, places and situations connected to the technical artifact" and "shows [what its] purpose" is to users and nonusers (Flichy 2007, 83). There is therefore a prescriptive, normative dimension inherent to such a frame. The term resonates with the notion of technological frame (Bijker 1987; Orlikowski and Gash 1994), which is a sociocognitive construct guiding how groups of actors "make sense" and interpret the purpose of a technology. However, while this concept suggests that different social groups may have different technological frames competing together, the concept of a normative frame of use rather stresses that there always tends to be a dominant interpretation of what proper use is for the technological device in question. This dominance results from an active policing process that Callon (1998), drawing on Goffman's theory of social interaction, calls "framing."

As noted by Callon, actors' framing efforts are constantly threatened by "overflows": activities and relations leaking outside the enclosure of the frame (Callon 1998). Or at least this is the perspective that we are invited to adopt from the point of view of an established normative frame of use. But what if, as Callon suggests, we adopt a reversed perspective and see overflows not as accidents but as the typical way by which creativity occurs? While adoption of established interpretations

and norms leads on to the reproduction of past or current relations, a deviation points to something new and unanticipated. It is therefore conceivable that the same act that at one moment is labeled "misuse," at a later time will be spoken of as innovation. A new configuration of the device might arise from that act, transforming the expectations and the interpretations of the mass of users in the process.

The special connection between misuse and digital technology can be gleaned from the remarks above. The automobile, on the one hand, and the communication platforms discussed in this chapter, on the other hand, are located at opposite poles on a scale of plasticity. By this we do not say that digital devices are inherently more plastic than nondigital devices. On this ground, the high plasticity of a digital device should be understood not as an inherent quality of digital materiality but as a sociotechnical construct operating at two levels of users' perceptions. First, plasticity is constructed at the level of the *affordances* of the device that result from design decisions—for instance, leaving it "unfinished" and "incomplete" and providing interfaces to expand it, like authoring and scripting languages.[5] Indeed, plasticity was the sought-after quality when (reprogrammable) software was first separated from hardware in the subsequent developments of the ENIAC computer. At a secondary level, plasticity boils down to the perceived *fragility* of a normative frame of use vis-à-vis a single user's divergent interpretations and patterns of (mis)use, and how susceptible the device is to being repurposed and its functions transformed as a result of its interpretive flexibility.

This is to say that the high plasticity of some digital communication devices, while it may be facilitated by some design features (e.g., programmability, expandability, connectivity, recursivity), is constructed and can be reversed. As is demonstrated by digital rights management (DRM) devices, the plasticity of a digital artifact can be inhibited in the design process (Gillespie 2006). For a technical fix such as DRM to be effective in preventing users from tinkering with the device, however, requires the leverage of supplementary resources. This might include that the protocols for interoperability between industrialists are renegotiated, national laws are amended, the investigative powers of the police are boosted, and so on. In other words, it presupposes an asymmetry in (nontechnical) resources available to the various stakeholders and users of the device in question. Even then, as is amply shown by the filesharing controversy, technical fixes are always vulnerable to reverse-engineering attacks (Burkart and Andersson-Schwarz 2015). The labeling of filesharers as thieves and pirates (i.e., as misusers of the communication network) is part and parcel of the efforts to police behavior and enforce prescribed uses that could not be eliminated through the technical fix alone.

When investigating the concept of misuse, the most fruitful cases are likely to be those where no single party holds such an advantage that technical fixes can be imposed on the others. Well-behaving users of the device must bracket up their technical agency, given that it is more or less equally distributed to everyone in the network, with social norms. It is for this reason that the "Internet troll" takes on a heightened importance in the regulation of peer-to-peer collaborations on the Internet. Troll-labeling is the other side of the openness in such projects (Tkacz 2013). Labeling someone a "misuser" is a political act to deligitimize certain activities with, and interpretations of, the device, while promoting proper ones. Users who are in the risk zone are thereby discouraged from pulling the device further in a direction judged as inappropriate by the party applying the label (Söderberg 2010). The self-understanding of the one labeled a misuser, together with his or her reinterpretations of the technology in question, is defined in his or her relation

with the owner or lawgiver or normsetter of the technology. In horizontal and informal projects, the lawgiver might be a sys-admin, a moderator in a discussion forum, or some other spokesperson of the silent majority. Of course, the accusations of being a misuser are sometimes adopted as a positive identity, around which like-minded (mis)users can be rallied, sometimes resulting in the balance of forces being overturned.

Conclusion

Our aim in this chapter was to shed light on a particular and underrated aspect of the dynamics of innovation in the field of digital communication technology: the key figure of the misuser and the tension between so-called "proper" uses and "misuses" in stabilizing a normative frame of use that will define the main purpose of the artifact. From the discussion about alleged misuses of PLATO (games), Bitnet (chat programs), and IRC (bots), we have seen how the notions of disruptiveness and misuse were frequently evoked as a rhetorical strategy by some actors to police the use of digital communication technologies and thus refrain the expression of their plasticity. At the same time, these cases demonstrate that such notions were temporary constructs, evolving together with a changing context—notably resource availability.

Initially, playing, idle chatting, and other activities were perceived as a waste of resources, taking place at the expense of proper uses. This standpoint within the affected communities drew on general, negative attitudes toward play and leisure, according to which the youth were distracted from spending their time more productively, getting an education and a job. In hindsight, however, we know that playful and social uses of early digital resources pushed technical development in new directions and gave chief impetus to two digital media industries: online games and social media. For instance, while PLATO eventually failed as an e-learning platform, its communication tools paved the way to social computing and groupware (Dear 2017). Lotus Notes is a direct offspring of PLATO Notes (Woolley 1994), while "Talkomatic" inspired other chat devices including Bitnet Relay and its Internet-based successor IRC. Microsoft's *Flight Simulator* was originally developed on PLATO, and *Empire* was seminal in the domain of multiuser online games (Dear 2017). Several key people in the software industry, including Ray Ozzie, former chief software architect at Microsoft, fulfilled course requirements by developing for PLATO.

Along the same lines, while Bitnet was originally intended as a file sharing infrastructure for the academic community, this functionality was eventually taken over by Internet protocols (Gopher, FTP, the Web). On the other hand, two applications stemming from communication practices once labeled as misuses (the ListServ mailing list manager and the Relay chat program) were in such demand that they were ported to the Internet (Grier and Campbell 2000; Latzko-Toth 2010). The IRC protocol in its turn came to serve as an underlying technical layer in numerous commercial "webchats" and served as the matchmaking infrastructure for major online games including Blizzard's through its Battle.net chat network. Furthermore, the introduction of new governance features within IRC networks through the use of bots has been established as standards not only for IRC networks—such as freenode, a key infrastructure for free software development nowadays—but also for chat platforms targeted at the general public.

Indeed, if judged by economic figures, computer games and online chat have eclipsed some of the activities that at the time were deemed to be more serious and important. The opposition between play and education dissolves when game design is inscribed in university curricula and regular career paths have been established in the field (Kucklich 2005; Scholz 2012). In a similar fashion, real-time text messaging has become a norm in social media and even in the workplace. Recreational uses of digital resources, at first marginalized, ultimately became the new "norm." Usage that is constructed as a transgression at one point in time might lead to changing the very coordinates by which that value judgment was made, thus presenting itself as the proper, prescribed usage of the device in question.

Notes

1. Digital technologies can sure be designed to be nonplastic too, as exemplified by digital rights management (DRM) devices, but then this is typically perceived as a betrayal of the ideal.
2. Using Caillois's (1961) typology, they convincingly framed IRC as a game and chat as play.
3. "General guidelines for bot usage on *.iastate.edu servers," document posted to Wastelanders (Undernet operators' mailing list), March 30, 1993.
4. Drawing on Von Hippel's concept of innovation community (Von Hippel 2005) and Tuomi's concept of "network of innovation" (Tuomi 2003), we call *community of innovation* the hybrid collective (Callon and Law 1997) gathering users, developers, and various actants, focused on the creation, improvement, and expansion of an artifact or a set of artifacts within an articulated ethical framework.
5. See Vertesi (this volume) for a discussion on affordances. On "unfinished artifacts," see Maxigas (2015); on "incompleteness by design," see Garud et al. (2008).

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