Transnational, Never Neutral: Regulatory Politics and the Deployment of Technological Systems

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ABSTRACT
In this workshop paper I describe the effects of a national-level security policy on the design and deployment of a complex technological system in an international user setting. The paper uses Bowker and Star's concept of "torque" [2] to explain the individual and institutional conflicts and work-arounds that surround its use. The paper concludes with discussion of the effects of regulatory environments in both studies and deployments of ubiquitous computing technologies in transnational settings.

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Transnational technology; politics and technology; scientific collaboratories; space exploration.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Collaborative computing technologies are increasingly moving into transnational settings. But while the dream of ubiquitous computing and computer-supported cooperative work involves computing environments without borders and the transnational movements of people, goods, information and devices, certain aspects of place-ness are still deeply imprinted upon these technologies and affect their patterns of use. Built in particular political regimes for particular political ends, technologies must incorporate and embody the restrictions and regulations to which their producers are beholden. This paper examines one such technology and one such regulation to show how a national policy that is ostensibly about security can affect not only the design but also the use of this technology by transnational actors. Although the principal designers and users of the technology, a robotic spacecraft, are an international team of scientists, the agency responsible for building the robots, NASA, inscribed them with particular political values according to a regulatory framework that structure their operation, scientific collaboration and discovery.

The politics of technology is a well-established topic in Science and Technology Studies, where it is taken for granted that "artifacts have politics" [12], although exactly how these politics are expressed is analyzed differently by different schools within the field [i.e. 1,8,13] Work in Human-Computer Interaction is also beginning to address this space, especially with respect to the design of international and transnational technologies [6,7]. This paper contributes to this literature by showing how a faceless and often absent actor such as a federal government can affect, through regulation, the daily work practices of a transnational technologically-mediated team.

Methods

This paper draws upon a multi-year immersive ethnography with an international spacecraft team of approximately 150 active members. Sources for this paper include observations of meetings, interviews with team members, and private conversations. The author's facility with European languages enabled her to obtain first-hand accounts from foreign team members eager to share their stories but who may have felt uncomfortable voicing their concerns to NASA employees. Additionally, it involves an auto-ethnographic component: as a non-American citizen herself, the author experienced many of the effects of this regulation personally. She was required to maintain compliance with these regulations during the course of her research, informing participants of her citizenship, avoiding regulation-sensitive material or conversations, and maintaining compliance practices specific to her home and host institutions when visiting other mission-related sites.

WHAT IS ITAR?

ITAR, or the International Trafficking in Armaments Regulations [5] was first adopted by the United States government shortly after World War II to preserve technical national defense secrets. The regulations cover the "export" or leaking of information related to the technical construction of systems related to national security and defense such as military weapons, nuclear technologies, ciphering and encryption. Despite their Cold-War heritage,

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it is often unsurprising to learn that space technologies, even commercial telecommunications satellites, are subject to the same restrictions. [3,9] Indeed, regulatory frameworks to control the "export" of technologies are still under active debate and construction in a variety of national settings [see 4]. As it restricts the sharing of technical information about devices that are often shared and operated in concert with multiple international partners, ITAR severely restricts foreign nationals' involvement with spacecraft and satellite technology, among others.

The repercussions of export control violation are severe. During an attempted collaboration between the private American company Hughes Aerospace and a Chinese satellite company in 1999, a mistakenly faxed document gleaned fines of several million dollars. The situation has only tightened since the events of September 11, 2001 and the subsequent Patriot Act. The regulation is a mixture of specific but outdated, and fairly open language, perhaps written in an attempt to allow for flexibility to keep up with the pace of technological change, which frequently outstrips the pace of change in congressionally-approved documents.

Criticisms of ITAR abound, both within and outside the United States [see, i.e., 9]. Several countries, notably France and Australia, have publicly rejected American collaboration on scientific projects due to their disapproval of ITAR and the bureaucracy it requires. Scientists also claim that the regulation ultimately does more harm than good in terms of safe-guarding American weapons technology. Restricted from forming partnerships with American companies who might provide a small piece of a weapons' puzzle but retain the technical details at home, the foreign members of the spacecraft community interviewed for this project admitted that their countries invested in local Research and Development to promote their own home-grown technologies. This, many of them noted, had actually proved advantageous to their nations' own mission planning, as they could start a system redesign from scratch using new technologies and tools, instead of being entrenched in the older engineering designs and practices that informed the American systems. Thus the regulation may produce the very effect it tries to mitigate: the diffusion of high-technology research and development to American competitors.

The spacecraft under study is subject to ITAR restrictions, although it carries key instruments obtained under technical license agreements by European collaborators on the science team. In spite of their essential technical and scientific roles on the mission, these and other non-American members of the team are denied access to key systems, documents, and even on occasion *their own technical plans* for troubleshooting the instrument under American law. For example, during the primary mission, the French and German operators of one of the spectrometers were cordoned off into a walled office away from the engineers who controlled the spacecraft, from whence they were allowed to remotely but only partially access the machines that would let them command their instrument. Without a printer, they tried to borrow an old commercial printer that sat abandoned in another room, and were promptly chastised for using a piece of equipment that was not cleared for export-control. When their own instrument malfunctioned, the German team that built the spectrometer was required to stand outside the room while NASA engineers debated how to fix it; similarly, the Indian national graduate student who wrote the software to support a spectrometer provided by an American state university was prohibited from debugging his own code once it had been delivered to NASA.

ITAR IN PRACTICE

ITAR is most visible to the analyst in the work practices that structure the mission. Like the technologies of bureaucracy during the South African Apartheid regime described by Bowker and Star [2], ITAR requires a complex bureaucracy of paperwork and legal personnel to turn categories into rigid boundaries complete with dangerous transgressions. Also like the technologies of apartheid, the enactment and enforcement of ITAR regulations on the ground produce what the authors have called "torque": defined as "when a formal classification system is mismatched with an individual's biographical trajectory, memberships or location." [2, p.223] This is not uncommon given that the mission involves scientists at NASA centers but also private companies, public scientific agencies, public and private universities, each with different goals, mandates, and infrastructure for managing security regulations. This torque is experienced both on an *institutional* and an *individual* level, as the restrictions required by ITAR conflict with categories and requirements that users are subject to in other bounded spaces.

Institutional torque

Locally, institutions must enable the critical work of the mission while remaining ITAR-compliant. This results in often-complex organizational labor arrangements that structure the work practices of the mission and affect it on every level. At each location visited during fieldwork, ITAR was respected and enforced, enacted with mechanisms from bright red badges and security escorts, to restricted rooms or machines. Further, because the operational side of the mission is heavily ITAR-controlled at a NASA Center, maintaining a distinction between scientists and engineers, and 'the science' and 'the operations' side of the mission, is critical for the mission's continued legal compliance as a whole. The entire organizational structure of the mission and the roles that can be played with respect to the technology thus results from the regulatory framework.

Despite extensive training, team members across the board commonly report difficulty in consistent interpretation of the regulations, which are frequently described as contradictory, unclear, and conflicting with their institutions' goals and mandates. Specifically, they often explain, the regulations have not been updated to reflect technological developments essential to current spacecraft systems designs and operations. For example, if a string of computer code is said to be ITAR-sensitive, does that restrict the line of code, or the software package, or the computer it is running on, or the building that the computer is in, or the entire institution in which the computer running the code is located? More complex still, yet a core activity in contemporary collaborative operations, does a line of code running in a software package on a machine located in a room at a particular institution restrict remote team members from being on a telephone or video-conference line with a team member located in that room?

While the regulations present challenges in consistent interpretation, this does not mean that institutions adopt relaxed postures towards them: instead, because actors can use discrepancies that arise in local interpretation as a resource to fuel inter-institutional competition, individual actors and institutions are disciplined into conformity and reveal a level of perpetual anxiety about unknowingly breaking the rules. Discovering that another location does not follow locally-adopted procedures can open the door to accusations of incompliance, often to further local institutional aims; thus it was common practice for one institution to level accusations of non-compliance against another to gain status in the overall organization's eyes. ITAR was also often used as an excuse to guard local institutional secrets in the development of competitive contracts for forthcoming technologies. As one scientist insisted, their partner institution within the collaboration "*loves ITAR because they use it as a weapon to keep things proprietary*."

Inter-institutional politics are thus played out through the application of ITAR, or through work-arounds that develop to enable the work of the mission. For example, one lab at a public US university produces location-tracking streams essential to the daily operation of the spacecraft, but the majority of the graduate students are Chinese. The lab therefore hired an undergraduate US citizen with the responsibility of logging into the NASA server to transfer the key data to their local system such that the foreign students in the lab could legally process it. Other participating institutions evolve complex setups whereby their key data is transferred to servers on campus, because their universities will not permit restrictions against foreign nationals involvement in scientific research for educational reasons. Team meetings are held at neutral facilities like university campuses to encourage the broadest possible involvement of science team members and their students, although international colleagues are always required to leave the room if something sensitive, such as new releases of mission software, is presented. Thus the protection of particular spaces and competing institutions is sought and employed as a resource to protect and enable the research team's work.

Individual Torque

ITAR can be especially uncomfortable for team members as they come into direct conflict with the communalist ethos that guides the team's interactions, and their belief in the open community of scientists. This is particularly strenuous for team members because the categories and interpretation of the regulations are likely to shift. One such case of "acute torque" (2, p.219) and the resulting suffering it prompted occurred when a scientist who worked on the mission for several years, Pat, had their privileges revoked due to changes in institutional status. Several team members worked hard to resolve this conflict, but it was several months before Pat could resume participation on the mission. The torque occurred because while Pat's status in the *bureaucratic* category of team membership had shifted, Pat's membership in the *social* category had not. This created the discomfiting sense of conflicting requirements and movements from each category of membership: specifically, balancing rigorous exclusion from mission activity on the one hand with the science team's expected practice of sharing data and results on the other. Conflicted, Pat nonetheless sent a copy of a draft paper out to the team's mailing list out of a sense of loyalty to the team and a belief that it was not the teammates that were the problem but national policy.

Pat's discomfort reveals the acute torque associated with belonging to a group whose membership is based on openness and inclusion [similar to 10], embedded in a network engaged in competing practices. That is, NASA's oversight of the mission operationalizes a vision of the spacecraft as an American asset, in tension with the scientists' ties to and impassioned belief in an international scientific community. Pat's experience is not unique; many foreign nationals shared with me their perceived limitations of the inclusion-based language of science team members based on their experiences of running up against NASA institutional exclusions. As Bowker and Star document how the bureaucratic sorting-out of white from non-white both presents "politically and socially charged agendas … as purely technical" (1999, p.196) and inscribes notions of value and mobility onto South African apartheid-era bodies, foreign nationals on the mission internalize ITAR's policies on the grounds of the very category of the "purely technical." They write ITAR onto their bodies as they are instructed to shield their eyes, plug their ears or simply leave the room, regardless of how pliantly or docile they behave or how central to mission operations their work is.

This does not go unnoticed by their colleagues. Reflecting on this state of affairs, a lead team member spoke out angrily at a meeting,

I'm embarrassed by this. Fully a third of our payload comes from Europe ... and we still cannot involve these teams from overseas who enabled this mission ... . The foreign nationals on this team are too used to being treated like second-class citizens, and too polite to complain about it as much as they should.

In spite of dissatisfaction with the regulation within this scientific community, the team must comply with export control or face the shut-down of their mission. A tug-of-war over who is allowed to dictate the categories of inclusion – the team, local institutions, or national regulations – therefore affects the mission's team dynamics and their collaboration practices alike.

DISCUSSION AND IMPLICATIONS FOR HCI

I draw three preliminary implications from this case study for the HCI community. First, very pragmatically, choosing the local sites of development and deployment of computing devices is critical to their success. Those working on transnational projects outside the United States may have an easier time working collaboratively, especially in countries that already have sympathetic technology transfer agreements, such as the European Union. Technology developers who work internationally are well-advised to ensure that they are compliant with that country's – and their own's – regulatory procedures.

Secondly, technologies bear the imprint of their local regulatory procedures. One does not need to look into outer space to see this at work: cell phone transceiver modes, restrictions on certain classes of materials in manufacture, and software encryption modes are subject to similar regulations. Both composing [4] and implementing these regulations requires aligning heterogeneous organizations and actors as technologies move from their sites of production into the world. Transnational technologies must therefore support the needs of individuals who move in and out of invisible regulatory boundaries, maintaining compliance within each one. Attention to not only local regulations but also those of an international user base is essential during the construction and testing of technology for optimal deployment, and to avoid situations of torque that cripple the technology or the activities it is meant to support when the restrictions inscribed into the technology and its operating procedures conflict with those in play at the sites of its use. There may indeed be "many internets" [7], but moving between them is never a seamless prospect.

A third, methodological implication concerns the *study* of technologies in use in transnational contexts. User studies have become increasingly common within HCI to examine how technologies are used in everyday life. As we have seen, the institutional and individual torque that export control regulations inflict on this team produces and approves work practices and institutional norms that become central to the experience of the technology itself. Examining the workflow of this group at any single location without an understanding of export control would make local processes seem impenetrable or even outrageously counter productive. HCI researchers may have to go elsewhere than just the local site of deployment to understand how their technology will be used in practice, if they are to better design complex technologies for use in transnational contexts.

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