Future War for Fun and Profit: Authority, Bureaucracy, and Masculinity in Defence Industry Software Development

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Future War for Fun and Profit: Authority, Bureaucracy, and Masculinity in Defence Industry Software Development

by

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A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF STRATEGIC STUDIES

GRADUATE PROGRAM IN MILITARY AND STRATEGIC STUDIES

CALGARY, ALBERTA

JULY, 2016

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Abstract

Technological innovation is at the heart of many discussions of understanding military practice, and it is increasingly important to understanding the relationship between states, militaries, and civilian actors such as corporations and citizens increasingly shaped by militarization. One group of technologies affected and whose development has been conditioned by these discussions is simulation software.

Based upon four months of participant observation research at a defence contractor and software development company in Calgary, Alberta, this study explores how contingencies of professional practice in the software industry, authority, corporate hierarchy and reporting practices, gender, and the nature of simulation contribute to developing products for military use. This study suggests that these contingencies not only reproduce and reinforce certain gendered, authoritative, and professional stereotypes during production, but that understanding these stereotypes and their linguistic, aesthetic, and structured facets contributes to understanding the relationship between militarization and the production of technology.
Acknowledgements

I would like to thank the following people in no particular order for their gracious, patient, and inspiring contributions to my education and this thesis:

Sabrina, Susan, Tim, Harris, Alex, Jacqueline, Adam, Jim, Rob, Gavin, Holger, Terry, Maureen, John, Donna, Shelley, Nancy, the QEII Committee, Chris and Patrick
To all who would speak of potential and possibility…
Table of Contents
Abstract ........................................................................................................................................... ii
Acknowledgements .......................................................................................................................... iii
Dedication ......................................................................................................................................... iv
Table of Contents ............................................................................................................................ v
Introduction ....................................................................................................................................... 1
On the Rites and Rules of Agility: Secrecy, Expectations, and Knowledge in Defence Industry Software Development .................................................................................................................. 24
  Paradoxes and Professionalisms of Secrecy ..................................................................................... 26
  “Stand Up” Meetings and the Material and Social Configurations of Secrecy ......................... 38
  Communicative Acts and Defining Context for Software Development ................................... 43
  Development Priorities and the Smoke and Mirrors of getting it “Good Enough” ............... 51
The Performance of Branding: Bureaucracy, Capitalism, and the Articulation of Innovation ........................................................................................................................................... 55
  Gordy: Charismatic Authority and the Performance of Corporate Culture .............................. 60
  CANSEC and the Performance of Branding and Business .......................................................... 66
Tortoises and Heroes: Gender, and the Unknowing and Knowing of Software Testing .......... 90
  The Life of Testing........................................................................................................................... 92
Masculinity and Skilled Labor ......................................................................................................... 96
  Leadership, Gender, and the Skilled and Unskilled .................................................................. 99
  Other(ed) Lives in the Margins ....................................................................................................... 105
  Testing as an Afterthought ............................................................................................................ 109
Tension, Rationalities, and the Structured Space of Reasoning .................................................. 112
  Sustaining Divided Rationalities in Everyday Life ....................................................................... 120
Seeing the State in the Margins ....................................................................................................... 131
  Tension, Necessity, and Sustaining the Margins in the Whole .................................................. 133
  Contingency and Subject Rationalities in Sustaining the Margins ........................................... 138
  Automation and the Regulation of Subversion .......................................................................... 141
Promises of the Market: Liberalization, Militarization, and Mythology in the Development of Simulation ........................................................................................................................................ 150
  Presenting the Global and the Local ............................................................................................ 154
  Situating Design Individually, Collectively, and in Collaboration ........................................ 161
  Neoliberalization in War and Peace .............................................................................................. 172
  Defining, Marketing, and Simulating the Objects of Expertise ................................................ 178
Militarizing Everyday Life in Commentary and Development of Simulation .......... 195

Conclusion ................................................................................................................. 207

References ..................................................................................................................... 213
**Introduction**

I never expected to discover an interest or an ideal space to conduct research on scientific and corporate cultures surrounding simulation in Calgary, a city known for a flourishing economy founded upon oil. C4i Consultants – a software engineering company focused on simulation, at whose offices I would later conduct my field work – was surprised at my interest in simulation, apparently unexpected from Calgary’s local university. Governments, militaries, and private groups have defined the project of simulation with varying forms, objectives, and experiences in mind. These have included war games and exercises, tactile simulations used to train individuals to fly planes, drive tanks or operate machinery, and even simulations of the experience of commanding large groups of soldiers.

I first arrived at C4i’s offices in northeast Calgary to find myself situated in the heart of Calgary’s northern commercial sector; numerous equipment and tool manufacturers, other defence contractors, delivery warehouses and minor offices of government agencies litter the region, packed into strip-mall office parks and beige, brutalist architecture. My time in this space always felt transitory – the route I took to C4i’s offices everyday did not even have a sidewalk for pedestrian traffic; a selection of restaurants inspired by local immigrant communities and global fare dot the places between commercial space, drawing primarily on lunchtime, after-work crowds of white collar professionals to stay afloat. I attempted to prepare myself for what I thought could be an overwhelming confrontation with corporate and technoscientific lifeways that I had only read about up until that point – whether in the oblique conformities of office structures, including cubicles, board rooms, and pastel-colored walls, contrasted and
differentiated by reference to emblematic decoration characterized according to national or industry norms (Kondo, 1997: 49-50). Instead, I faced a confusing mix of excitement and disappointment as I encountered these conformities and stereotypes of office structure first-hand. Rows of identical cubicles articulated into labyrinths of project teams and ad-hoc spaces for meetings and designs, muted red and blue walls, and occasional stacks of unused or overused electronics characterize C4i’s office space. In contrast to the banal fixtures of the office setting, I also experienced entry requiring an escort and sign-in each day, and a badge indicating the visiting, othered status that I wore – diligently, despite my occasional scoff at the practice – during the entire length of my stay. These fixtures demarcate unique contexts of production and consumption of technology production – a suffusing of the technocapitalist enterprise with an adornment of the state’s need for security. However, once inside, I confronted a maze of cubicles, copiers, and offices housing executive employees; it is a description that I may have used to describe just about any office space in any city.

My extended stay in the office garnered me the guarantee of a desk, and – for the most part – free reign to wander and engage with employees. My expectations had made a map from the territory - I felt as though I had set down, surrounded by all my gear, close to a native village with my dinghy slowly sailing out of sight (Malinowski, 1922: 3). This was as virtual experience as I have ever had; I had been conditioned by descriptions of stereotypical offices filled with rows of cubicles, sterile offices, and numbing pastoral walls – I was exposed to the imaginary of office space and disappointed when I encountered this imaginary in expected ways, perhaps a suitable irony to begin my study of the production of military simulation. This space, between the imagined
ideal of practice in description and training, and the experience of reality in professional practice is where the existence of simulation can be situated best, in the borderlands between the expectations and expressions of reality.

The end of the Cold War signalled the end of government and military direction of the specifics of military simulation. Complementing traditional, live-action war games by military entities, government investment, expertise, and objectives were articulated through private entities such as the RAND Corporation. This period still saw heavy government oversight and input at every stage of the production of military simulations oriented towards simulating the effects and impact of nuclear war – the separation between public and private was murkier in this period, with active participation and in-residence input from the U.S. Military (Lowen, 2007). Instead, private corporations such as RAND were charged with speculation and design of new simulations, while the military provided a constant environment of desire and need for specific phenomena to simulate, under the leadership of individuals such as Herman Kahn (Ghamari-Tabrizi, 2005; 2004). The public-private partnerships that have developed since the end of the Cold War in pursuit of military simulations, those that attempt to model, train, and represent the world for military needs, have rarely been explored (Ghamari-Tabrizi, 2004).

In 2003, C4i Consultants, Inc. was founded in response to a need for Arabic translations of already-existing simulation software for the Saudi Arabian military. These efforts would eventually spawn MILSIM, a comprehensive, scalable simulation suite designed to train command and control officers. Today, MILSIM is entering its sixth iteration, and is now available in English, Arabic, French, and Portuguese, with
customers ranging from the Arabian Peninsula to North America. C4i’s expansion since 2003 has resulted not only in new versions of software to tackle new problems, but in efforts to integrate new forms of simulation and information management into their software. For example, efforts to integrate C4i’s simulations with those of Bohemia Interactive have been used to create a large scale military exercise that can be toured from the perspective of a single soldier. These advancements, and the products created from them have also motivated C4i to explore other applications for simulation, leading to the creation of EDMSIM - a training simulation designed to prepare and test emergency disaster response plans for governments and private entities.

This project does not chronicle the content of these products, or the users who are engaged with them. Instead, I argue that a wider understanding of the environment in which these products are produced will provide insight into the complex interplay of political, behavioural, and linguistic phenomena that characterize not only the civil-military relationships inherent in producing military simulation, but also those that underpin the creation, design, and development of simulation and software in the defence industry. This broader understanding of the communicative contexts, and articulations of linguistic and political phenomena will provide an explication of the forces and resultant practices that drive technological innovation. As well, contingent groupings of cultural life – whether aggregated at the level of transnational interaction or demarcations between civilian and military, in this case – are in tension within C4i; the desires of military bureaucrats and the capabilities and availabilities of engineers without any military training are two manifestations that demarcate the divisions between civil and military. Development at C4i is conditioned by interactions between various sectors of
structured responsibility; one set of classifications which sum up these areas of responsibility are the roles of designers, developers, testers, and business developers. The demarcation between military and civilian becomes more difficult to define when former military personnel are assigned civilian roles (such as design oversight) in the production process that are meant to draw on military expertise, such as approving the functionality of a feature to assess whether that feature meets the need of a military requirement. These roles overlap and do not remain static, necessarily so in a company whose full-time employees number in the low tens, and whose business needs can require certain employees to fly around the world on short notice to give demonstrations of software.

The interaction between these groups and how these interactions condition the priorities and topical areas for development have led me to focus not only on the production of software, but on the production of those who produce; that is, the training and orientation of desired skills and individuals to articulate a perception and mode of practice ideal for crafting military simulations. Understanding the contexts and conditions that are considered ideal, suitable or appropriate for civilians and military personnel contributing to these projects will provide clarity in how to articulate an understanding of the difference between the concepts of “military” and “civilian.”

Previous ethnographies of scientific communities show not only how science produces scientific facts (Latour, 1979), but also how it inculcates new and current members of the scientific community to see the production of scientific facts in certain modes of appropriateness or correctness (Traweek, 1988: 74-105). These modes or logics of perception and practice feed not only the production of new members of a community, but they also orient and condition the “material” or “products” of a community – they
determine who is “right” to produce something, who is “correct” in making assertions about something or who determines certain qualities in the process of production. At C4i, these “producers” refer to the diverse group of directly and indirectly participant subjects involved in constituting and “making real” the “idea” of C4i’s simulation software, including software developers, testers, and designers. The existence, reification, and reproduction of these groups in hiring practices, professional associations, and in how articulations in the office space relate the groups together create the conditions for production of simulation software at C4i. These boundaries, or lack thereof, between responsibilities and assigned roles create the conditions for understanding how knowledge can be configured, utilized, and manifested for and through capitalist enterprise. My research question to address these areas is: how do the methodologies and tools for discourse and production in software development generate notions of “ideal” products; and how do these practices influence the constitution of those who produce and the perception of and intelligibility of the concepts and products of simulation?

It is necessary to step outside the strict confines of military and professional practices surrounding simulation, in order to approach the lifecycles of producers and products. We should also consider not only producers and products, but ideal producers and products. The ideal, in this case, forces confrontation with intention, and the difference between form and expression in design, in use, and in production. The ideal configures perceptions of what features must be left out, which are not experienced “correctly” by customers, and what contributions are to be seen as “useful” to the project of constructing simulation – all factor into a construction of the “ideal” of crafting and using not only simulation, but software more generally. This project considers the
producers and products of C4i as existing within wider cultures of professional scientific practice, of software development, and as a part of the broad spectrum of defense contractors that make up the defense industry. Therefore, answering my research question draws my project into conversation with anthropological literature that speaks to the formation and reproduction of scientific communities, and studies that understand the products of science as constitutive of the dispositions and practices of the members of scientific communities.

Ethnographies on the creation and conceptualization of collective practice and the self in scientific communities have previously focused on the active production of new (or existing) members through analysis of the conjunctures of personal and scientific cultures narratives (Traweek, 1988; Gusterson, 1998). These ethnographies have covered the intersection of credibility and the economization of career scientists with a focus on articulations of technology, textual technologies such as citation, and the cohered forces of “factness” in the determination of truth of a scientific fact (Latour, 1979: 187-223). Latour’s ethnography of an endocrinology laboratory attempts to capture the machinations of science as a reflection of networked nodes of associative power, whether human or object. Latour argues that science is as much as resultant from the practice of scientists as from the consequences of perpetuating the power and meaning bestowed upon artifacts of text, experiment, or economic success (Latour, 1979: 43-87). Ethnographies of scientific practice have also explored the contrast of public and private expectations, and the ethical and motivational quandaries among weapons scientists (Gusterson, 1998: 38-67; Cohn, 1987: 687-718). These ethnographies concentrate more heavily on how the constraining circumstances of socialization and materiality form
unique contexts for ethical debate in constituting the self and “good” work in the scientific community; these works also address how scientific communities articulate justifications for the products of experiments or engineering in the context of opposition and support from communities considered external to everyday scientific practice (Gusterson, 1998: 191-218). In analyses focused on praxis, they have argued for a more systematic, holistic conceptualization of the self and the body in medical practice (Mol, 2002: 119-150). Such ethnographies address the inclusion and exclusion of objects and subjects of scientific practice – how the “body” is constituted in medical practice, for example, determines how doctors are able to conceive of relevant diagnoses. These ethnographies articulate an argument for understanding science as performative, in the actors’ decisions and reification of certain articles and materials of scientific practice as constitutive of all possible responses within such practice (Mol, 2002; Butler, 1990). Such ethnographies have also charted the official and unofficial discourses of ideal career trajectories among particle physicists – as well as the gossip and rumor which can perpetuate and constrain these discourses (Traweek, 1988: 74-125). These ethnographies all share an approach that schematizes the everyday and long-term career practices of scientists and those who are involved in scientific practices.

Specifically, my project will engage more thoroughly with explanations for and situation of everyday practices within narratives that express a desire for certain points of contact in the workplace, uses of tools, and constructions of frequently-read guidelines for software construction. These narratives will contrast with observations of the tensions that arise in the course of expected versus actual results, and how new and existing employees are conditioned to produce, communicate, and solve problems by resolving
these tensions in ways that speak to both the ideal and “realistic” results of practice. My approach aligns closely with how Hugh Gusterson utilizes narratives that address motivations to work on nuclear weapons, and those on the tensions and resolutions of ethical discourse to discuss the “becoming” of nuclear weapons scientists (Gusterson, 1998: 38-67). In addition, my project is also motivated by Sharon Traweek’s discussion of idealized narratives of career paths for particle physicists. For Traweek, the “becoming” of a physicist is tied to perceived, dialectically, and associatively wrought categories of “good” and “bad” physics, and a conception of the places and people with whom physics may be considered to be “done” at all (Traweek, 1988: 74-125). I will utilize these discourses on the “becoming” in different scientific practices to discuss the role of – for example - emphasis of certain programming practices that are used to define principles such “good” or “bad” style in programming.

Studies pertaining to the construction of simulation for militaries provide a significant inspiration in my project’s analysis of the practices surrounding decisions on what “should be” simulated. These studies also inform my analyses of how my informants conceptualize “accuracy” in simulation, and how construction and testing of ideas for new simulatable features come to be conceptualized as “working” - within the context of the entire program and use environment. My project will draw on discussions of the “virtual” as a concept to aid in framing an understanding of working within and in construction of a simulated environment, and on discussions of the historical use of simulation in a military environment. Studies in this area have been focused on a broad range of issues, from the introduction and creation of simulations at the RAND Corporation (Ghamari-Tabrizi, 2005), to the use of popular entertainment in the
mobilization of civilians, soldiers, and developers of simulation to “virtualize” the soldiering experience (Allen, 2013). Discussions of virtualization and virtual theory have become more prominent in analyses not only pertaining to military simulation, but with the development of military technologies which mediate sight and perception, such as night vision (Robben, 2013), drone warfare (Price, 2013), and fighter planes (Der Derian, 2000). Within a non-military context, most studies have primarily explored the impact of virtualization in the construction and maintenance of online communities and online virtual worlds (Boellstorff, 2008).

Underlying many of these studies is an attempt to - as Neil Whitehead and Sverker Finnstrom have put it - understand “the way in which the imaginary becomes significant in creating meaning in the chaotic context of war zones” (Whitehead and Finnstrom, 2013: 1). The offices of C4i are far removed from many, if not all current battlefields around the world – however, this is precisely the point of a discussion pertaining to the virtualization of military projects. The dissemination of perceptions and practices which manifest primarily in military contexts into wider publics through entertainment, and through military-civilian investment partnerships for developing new simulative training regimes, have increasingly provided for projects that contribute to the militarization of culture. Now, war has left the battlefield and has entered the workplace.

Today, C4i’s software developers and executives encounter phenomena such as death, disease, and difficulties of battlefield communication as configurations of light on a screen. These configurations are informed and constrained by the requirements of militaries, the limitations and possibilities imposed by past, present and future computing power, and the authority and knowledge necessary to state that a simulation has achieved
an accurate enough picture of military practice to be utilized effectively. Conjunctures of interest and knowledge – both military and civilian - and a corporate mandate to create “Smart, Simple Solutions” have mobilized resources and demand for C4i’s contribution to a broader culture, described by Sherry Turkle as a culture interested in “providing technical solutions to the mystery of the mind” (Turkle, 1984: 308). C4i’s software is not used merely to garner interest in military lifestyles for recruitment purposes – as was the case with the previously largest study on the software developers involved in creating the America’s Army video game for the United States Military (Allen, 2013). Instead, C4i’s MILSIM has been designed to train officers in the development of awareness, management, and communication skills deemed necessary to marshal, deploy, and utilize soldiers on a battlefield. In short, MILSIM is designed to train officers in the art of war.

As a result, C4i’s design, development, and testing employees have been exposed and privy to the anxieties and uncertainties perceived to be inherent in modern military command. C4i’s project is one that shoulders the literal task of encoding these anxieties and uncertainties into a format capable of familiarizing a commander with the array of skills that Carl von Clausewitz described metaphorically as “streams [which combine] to form rivers before they flow into the sea” (Clausewitz, 1976: 144). Thus, for Clausewitz, training command and control is an exercise in “[familiarity] with those activities that empty themselves into the great ocean of war” (Clausewitz, 1976: 144). C4i’s task coalesced out of the Saudi Arabian military’s experience with an inability to make such familiarity legible in training – an art of war lost in translation. This example of the lack of simulation software translated into Arabic as a driver of the demand for C4i to develop a new product, was also used by the company’s president to explain to me and a
prospective investor the unique gap that C4i fills: C4i pays attention to the differences in linguistic understanding that are necessary, cross-culturally, to better conduct war through simulation. “Saudi Arabian and Egyptian dialects have different words for tanks,” the president opined as a self-evident justification as to why C4i’s genesis and continued work with Middle Eastern militaries continues to provide lucrative opportunities to sell software.

Today, the requirements of business, of governments, and of a staff in need of direction for development, have made the task of explicating and encoding war a far more managed, unstable affair than Clausewitz’s universals imply as the ideal of programmatic training. The needs of militaries do not have as much direct purchase upon private industries producing materiel for war as they did in Clausewitz’s post-Napoleon Prussia. Today, military needs and desires are weighed within a world system more aptly analogized as an ecological system than one of clockwork – one of neo-liberal economic policy, and a diffusion of the state’s monopoly over the ends and means of violence (Duffield, 2001: 9-10; Harvey, 2005). C4i’s place in this diffusion is not fixed, but constantly contested. Discussions of “business development” and how best to position products, people, and perceived technoscientific superiority were daily affairs in C4i’s main office. One stark expression of the culmination of these discussions and the ambiguity inherent in achieving results from them was C4i’s attendance at CANSEC – Canada’s largest military-industrial trade show. On the show floor, I was able to witness the large-scale pageantry that contributes to both solidifying and undermining certainty for continuing business – and therefore, continued production.
An ever-looming threat of a world without sales of C4i’s flagship software has driven C4i to contest other areas of violent potential with the production of capacities for generating virtualized certainty. The possibilities – both in the variety of potential emergencies, and in the diverse, ad-hoc means of responding to them – for simulating the often unpredictable wrath of nature led to C4i’s creation of EDMSIM, an emergency disaster response simulation. This second product is designed not only to train decision-makers to perform in ad-hoc, chaotic “emergency operation centers,” but also to test the plans of these decision-makers in a way that may validate or invalidate past and future decisions. EDMSIM capitalizes on a different set of concerned imaginations, those that are uncertain about the impact of phenomena such as tornadoes, Ebola outbreaks, and nuclear meltdowns. One software tester described to me the “unsettled” feeling of creating and testing an Ebola outbreak scenario in Seattle, a feeling she described as a morbid over-familiarity with the details of how an outbreak “should” take place.

EDMSIM was developed to root out and cast light upon uncertainty itself or, as it was described to me, the “unknown unknowns” of emergency situations. The “unknown unknowns” as they were called, were invoked as a metaphorical enemy in their very existence; in a demonstration meeting with a business executive who was “testing out” a presentation, these “unknown unknowns” become a prominent figure against which C4i’s EDMSIM is positioned to erase uncertainty. Within EDMSIM, the enemy is a much more ambiguous figure than an opposing, human force in war. In this space, C4i has capitalized upon and generated a different set of semantic, communicative, and syntactic structures to realize an entirely new figuration of meaning that defines the spectre of uncertainty in terms of natural disasters. Pre-figured enemies now become follow-on
effects of chaotic disasters – fires spring from the wake of a tornado, and the ability to cordon off traffic access becomes an essential asset in containing unknown consequences.

These self-contained worlds of virtual certainty are a far cry from the enormous calculation-sets that were driven by supercomputers in the early years of the RAND Corporation’s experiments with simulating the paths of individual photons (Ghamari-Tabrizi, 2005: 135-136). Limitations on computing power once constrained simulations of RAND scientists in the 1960s to what Sharon Ghamari-Tabrizi called “worlds of artful intuition” (2005: 124). During that period, simulation developers were required to pick and choose variables for inclusion in simulations. Designing a “good” simulation was driven both by developments in mathematical models that allowed certain forces - such as weather dynamics or material strengths - to be utilized as statistics within wider virtual worlds, and by new targets; increasingly powerful nuclear weapons, and a shifting political landscape made simulation an exercise in politics, engineering, and in “escaping reality” (Ghamari-Tabrizi, 2005: 138, 140-141). Today, choices over what variables to include in simulation are no less diverse, but they are driven as much by the pursuit of monetizing and monopolizing specific simulatable properties as they are by the limits of computational power.

C4i’s self-described “lightweight solutions” to simulation make collapsing the distance between fact and fiction a more diverse enterprise, as both programs are designed to be used on older computer hardware. C4i’s mandate to bring “simple” solutions to market has driven business across the globe, with customers in the Philippines, the Arabian Peninsula, and within Canada among the most prominent. “Scenarios,” and “Exercises” can be prepared with several weeks’ notice, and new
features can be slot into three-week “sprints” in development cycles to ensure that C4i is always ready to present something “meaningful” to each customer. This process drives the acquisition of increasingly localized information to, in turn, create a virtual environment that is intelligible to those who C4i are in business with or would like to do business with. Maps must be geo-located, pinned to points of reference for interpretation by a geographic database underpinning both simulations, content and expression meet and are reconstituted to suffuse “real” space with a set of meanings that can be acted upon to achieve the goals of simulation. This transformation of the “territory” into the “map” of simulation constitutes a shift in semantic legibility. Ultimately, this shift is one of a phantasmagoric transformation of ideal to actual, where users are provided with a simulated plane of existence to enact meanings drawn from the institutions paying for C4i’s software who set the terms and objectives of simulation (Deleuze and Guattari, 1987: 85-86; Der Derian, 2001: 79-82). In this space, I will argue, it is mythologies that represent and order the world for such institutions that are transformed, through simulation, into an experiential platform for solidifying the world and interactions within as these institutions see fit.

The process of developing or continuing to develop a platform to realize simulation has driven much of my project. Usages of space, programmatic style, testing regimes and negotiated meanings of the ideal, the feasible, and the actual, have led me – in part – to ask what it takes to constitute the virtual. Negotiations of available resources and desired progress on one product or another drive certain features to realization before others; for certain customers, some features just have to be “good enough.” In such an environment, training and managing the trajectory of new employees can be a confusing
venture. New tools for communication and coding have wrought in-roads for new software developers to manage the overwhelming confrontation with a system of interconnected black boxes in programming languages, each with a specific function, each interdependent with others in specific ways. Navigating these in-roads is managed from above and below, with task-sets for new developers that are designed to familiarize and test familiarity with standardized programming formats – but also with the competing interests of different products in mind. Here, contributions can be tracked with graphs of hours clocked against projects, estimates of time to completion, and historical data that can show each step in the process.

Fundamentally, this is an ethnography of communication – it is an attempt to show how language, discourse, and the virtual have come to constitute new lifeways for human beings (both real and simulated) since the end of the Cold War. The people working inside and out of C4i’s offices have families, friends and commitments to things other than the production of new simulations for militaries and emergencies. These commitments produce conflicts of opinion, create attributions that have weight in design decision making, and cause expertise to coalesce around certain people, certain kinds of code, and through unabashed displays of certainty. Approaching commitments, styles, and forms of communication in the workplace brings my project into contact with a body of work that can be broadly classified as linguistic pragmatics. Studies that fall within this classification argue for an interpretation of language as more than a tool for relaying meaning or messages – instead, language is something that does. Language, as something that not only articulates meaning to others, but also as something that provides the context and space for the constitution of meaning may, be thought of as a space of
relational indexes, icons, and signs (Peirce, 1960). Language is a space where different registers, contested semantic markers, and constraints upon discourse interact to produce something as simple as the idea of the phrase “I do” as an integral constitutive element of the act of marriage (Austin, 1962: 7-8). The complexities of intention, contested meanings and the changing interests expressed in language have produced studies more recently, for example, on the interplay of differently expressed moralities – each bound to different styles of articulation (Keane, 2008). These theoretical frameworks have driven the examination of language in conjunction with the ideas, modalities, and meanings that language produces and sustains through use. This project will engage this literature in conversation with a wider body of anthropological and historical literature exploring other representative and ordering practices and narrativization, such as myth (Lévi-Strauss, 1963), governmentality (Foucault, 2007), performative practices sustaining everyday life and gendered norms (Goffman, 1959; Butler, 1990), and the symbolic and economic phenomena that have come to dominate the assignation of value and idea of capital since the 1980s (Harvey, 1990; 2005).

Aside from the obvious linguistic connotations of the use of programming languages among my informants, I will also chart the discourse that takes place outside, between, and around code. I investigate discourse that generates and contests new professional practices and performances, commitments to and awareness of design in programming, attribution and characterization of completeness and expertise, and the generation and use of terms referring to virtual entities and acts in designing and diagnosing simulation. Within these discourses are constraints that determine expected and ideal characterizations of embodiment for practice in the workplace. These may take
the form of, for example, rhetorical dispositions classified as “vision” – often attributed to senior executives who set long-term goals for design – as one part of a dialectical mode, in which also exists utilitarian rhetorical strategies utilized by engineering design staff in the pursuit of “feasible” goals and “realistic” development tasks. These strategies and their accompanying sites of discourse generate assemblages of dispositions; individuals are mapped out on centralized, virtual hubs that inform perceptions of attribution, and historical trends in productivity. Entire teams can be oriented towards or away from certain members’ knowledge in response to shifting priorities that generate new epistemic needs for new features.

Tracing these phenomena through daily participation in the office space was difficult at times: I was confronted with the feeling that participant observation “was designed to facilitate an understanding of small, face-to-face societies…where a stranger could easily be absorbed into the flow of everyday life” (Gusterson, 1997: 115-116). Yet, participant observation felt inappropriate in my pursuit of a space to “be absorbed” into in the daily life of an engineering firm. There were times where this was a consequence of my lack of empirically demonstrable skills in programming or other industry-recognized skillsets, and other times this was a consequence of a lack of understanding on my part of what skills an anthropologist could contribute in an environment that I had previously seen as highly specialized. Throughout my fieldwork, I was forced into an existential crisis with my lack of “participation” in participant observation. I felt outside of the specialized technological domains of C4i’s workers.

However, as a result, I found myself more attracted to the opportunities that my freedom of access and ability to move freely afforded me, I could move with the flows of
bodies and information that circulated the office. I could sit for hours to observe the
hermitage of a developer’s life, and I could afford the relaxed opportunity of a walk
around the block and informal interviews with some participants on slow days.

My research in the office space drew me into the contingent travel responsibilities
of all senior staff. A week into my time in the office I learned of C4i’s attendance at
Canada’s largest military-industrial trade show, and later in my fieldwork I was able to
attend an exercise utilizing C4i’s software with one of Calgary’s local reserve regiments.
These exigencies of business, and the spontaneity of my attendance allowed me to grasp
at the transnational (and often trans-continental) life that many of the business developers
and executives of C4i lead. I was privy to a casual conversation that sent one executive to
the Philippines on several days’ notice, and I was able to garner insight into the dynamics
of those who straddle the divide between technical specialty and sales associate – those
who may be sent across the world to run a simulation because a local business developer
has trouble using a computer.

The employees who constitute and are constituted by these practices within the
C4i office make up the majority of my participants for this study. The rest comprise a
team of young software developers at the Agile Surface Engineering (ASE) group at the
University of Calgary – a group of summer interns working on a project that C4i
contributes funds and design time to. This project involves writing software to tie
together a group of technologies that C4i hopes will make up the “Emergency Operations
Center” of the future. These technologies, and the developers who work on them, are
engaged by C4i in terms that were described to me as an “industry-academic
partnership.” Terminologies used to describe this relationship echo those of the
aforementioned military-civilian relationships increasingly and more visibly entering the public eye since the end of the Cold War. C4i is able to use the “knowledge” of the developers in the Agile Surface lab, while providing “direction,” “vision,” and the “real world knowledge” of how emergency operations centers function to steer development towards features that C4i finds “realistic” for application in “real-world” environments. C4i’s software, EDMSIM, also powers the mainstay of the ASE lab, a large Microsoft touch-table designed by the lab to be used as a strategic environment from which to map out and direct flows of people and information, and to “stimulate” the emergency environment.

Tensions created by C4i’s input on ASE’s everyday work are made more apparent in semi-monthly demonstrations, where ASE members describe and rationalize design decisions for senior design, engineering, and executive staff at C4i. These moments highlight a tension between the perceived requirements of business – the generation of profit and usability – and those that are seen to be “academic,” requirements that are driven by “whatever is interesting.” This inherent conflict, as perceived and replicated within meetings between C4i’s and ASE’s various representatives, will help to frame part of my discussion of how C4i and other partners navigate what Der Derian calls the “military-industrial-media-entertainment network” (Der Derian, 2001). This terminology was used by Der Derian to describe the influx of artful imagery, language, and analogies to fiction – with references to “Star Wars,” and to Tom Clancy novels among others – into the debate, characterization, and public display of new developments in warfare beginning shortly before the end of the Cold War (2001: 12-18). However, I also take these networks with more subtle connotations, such as the impetus to train militarized
ideals of command and control to operate civilian agencies; C4i creates software outside of a military context, but with virtual and actual depictions within simulations that are built, and inspired inherently from the expertise and financial base of military projects.

In chapter two, I will engage the organization of secrecy, methodology, and the material expressions of knowledge at C4i. These facets, I will argue, are conditioned by tools of expression, such as C4i’s centralized reporting and scheduling software, Team Foundation Server, and the adherence to engineering methodologies in the form of Stand Up meetings. These meetings, and other bureaucratic procedures such as adherences to Canada’s Controlled Goods Program, comprise a set of organizational principles that structure not only C4i’s office space, but the appropriations and allotments of knowledge and expertise in the process of production.

In chapter three, I will explore the performances and practices of executives drawn from my observations of C4i’s attendance at CANSEC, Canada’s largest defence industry trade show. Further, I will situate these observations within a wider discussion of the constitution of and performance of authority through charisma and the formal and informal contingencies of bureaucracy. There, I will investigate how corporations constitute an idea of space in conjunction with the performances of executives as corporate presentations of the self (Goffman, 1959).

Chapter four will examine the roles in development accorded to testers and other positions at C4i that are considered marginal, both in authority and in representations of value, compared to the core of developers, executives, and business development employees. In this chapter, I will explore the performatives and contingencies of gender and how gender comes to be associated with notions of unskilled labor in software
development more generally. At C4i, it is these marginal positions that provide the foil and challenge to the dominant logics inherent to developers and the logical models built through programming that constitute C4i’s software. In iteration and automation, testing provides the means of subversion of the dominant logic of developers from which developers are able to cohere a response which smooths out aberrations in software found by testing.

Finally, in chapter five, I will investigate the relationship between C4i and the world through an examination of how C4i participates and helps to constitute the transnational character of a neoliberal marketplace from the perspective of a defence industry corporation. Further, I will also explore how this liberalization of the market has taken place in a broader context of militarization, and how C4i’s development of products for the civilian market is shaped by military models for solving what were previously seen as civilian problems. In this chapter, I will also examine how simulation, as a platform for standardizing, presenting, and engaging with the mythologies of institutions that C4i seeks out as customers, contributes to the development of C4i’s authority over the objects and interactions that C4i seeks to simulate.

This ethnography will trace virtual and actual pathways of interaction, simulation, and motivations that constitute the opportunity and desire for engineers, ex-military officers, and other members of the public to participate in projects of or contingent upon military simulation. In the chapters that follow, I will approach this task from a set of distinct, but interrelated ecologies of interaction to tie together bodies, machines, and exigencies of creating regimes of practice for military and civilian agencies. I will explore what Donna Haraway describes as a key feature of the “cyborg” society, where
people are “not afraid of permanently partial identities and contradictory standpoints,”
although in contradiction with her statement that “the political struggle is to see from
both perspectives at once” (Haraway, 1991: 154). I explore a space where “vision” is to
see multiple perspectives as one, to marry the technoscientific successes of military
simulation with a re-imagining of enemies both foreign and domestic as all-natural.
On the Rites and Rules of Agility:
Secrecy, Expectations, and Knowledge in Defence Industry Software Development

Confusion, uncertainty, and desperate calculation are states of mind that have characterized desires and efforts to craft perfect solutions to military woes. Militaries and publics have, in the past and present, sought refuge in the perceived certainties of simulation when confronted with the strange, the overly familiar, and the unthinkable. Efforts at simulation of military desires have produced everything from the Prussian war games of the 19th century (Clausewitz, 1976: 144-146), to the worlds of nuclear war, wrought with computational brute force from the 1950s onwards.

Historian of science Sharon Ghamari-Tabrizi describes how the “unthinkable” scenario of nuclear war prompted a proliferation of war gaming scenarios and simulation that attempted to end confusion, and bring clarity to the “unthinkable” (Ghamari Tabrizi, 2005). Today, the visual spectacle of personalized, virtualized realities are commonplace in entertainment and military practice; they allow confrontation with the physical experience of IED explosions (Dao, 2010), the demands and constraints of command, and the dexterity necessary to operate planes, trains, and tanks. Science, technology, and imagination have infused military life with an ambition to replicate, experience, and conquer the uncertainties of war in safety. How this ambition is enacted and sustained in the technologies and minds producing simulation is a matter of both material, organizational, and linguistic contexts.

Exploring the production of simulation requires an examination of the interplay between the strictures and symbols of the state’s need for security, the methodologies used to describe and analogize technical, programming terminology, and the shifting priorities and objectives of business executives looking for that next sale. The needs of
simulation in particular are wrought through collectively-constituted notions of visualizations of the particulars of professional practice in war and in disasters; The production of simulation is itself a fraught practice; there are tensions between a structured hierarchy of commands and entities within an objective-oriented context, and the perceived need to engage a user whose practiced operation within the simulated environment is idealized, but deeply uncertain.

This chapter explores manifestations and expressions of the production of military simulation that are articulated in a context that is comprised simultaneously of the need for adherence to technological desires for military practice, engineering methodologies for achieving efficient production, the bureaucratic and performative exigencies of production situated within corporate capitalism. This chapter also ties together bureaucratic and linguistic relations of analogy, priority, expertise, and the structured, bureaucratic rituals that enshrine these relations in software development; all of these relationships condition the production and presentation of military and civilian narratives in simulation.

In this chapter, I will explore the interplay between bureaucratic structure in a corporate work force and the situation of the individual within that structure in order to contrast collective and personal performance. I will also focus on how these bureaucratic structures engage the individual in appropriate performances of inscribed hierarchies and provide insight into how authority and power are exercised upon the individual in relation to the project of collective production. In order to do this, I will examine attempts at secrecy, the role of engineering practices in shaping my informants and my own understanding of progress and completion, and how the uncertainties involved in meeting
the needs of executive salesmen and software developers creates a “genre of practice” conducive to balancing the narrative and functional needs of simulation (Hanks, 1987). These constraints take the form of performances and maintenance of bureaucratic structure through workplace rituals designed to affirm and contest the reproduction of methodologies of work and the assignation of personal labor. One ritualistic practice in particular – the Stand-up meeting – will be investigated as a central framing practice in constituting the ideal and collective semantic context of production situated within corporate bureaucracy. This chapter suggests that the constraints placed upon and involved in configuring the contexts of discourse – those that are perceived essential to conducting good engineering work, and to producing good simulation software – are realized in a contested space of competing logics of practice, where reporting practices and the exigencies of business provide the conditions in which technical labor must perform.

**Paradoxes and Professionalisms of Secrecy**

When I first arrived at C4i’s offices in Calgary, I was surprised, but also overwhelmed by the free access to most offices, meetings, and staff members (of which there were about 25) that was given to me by the president of the company, Gordy. My readings of anthropological and popular narratives of the environment of defence contracting had left me ready to expect little, if any, access at all within corporate walls, let alone those in the business of defence. The production of a secrecy surrounding defence work began in the public eye before I had even stepped through the door of C4i’s offices. I had been conditioned by my expectations of the defence industry’s engagement with production for militaries – bound to government bureaucracies. I had expected to be
confronted with a tightly-constrained environment in which my behaviors and attitude towards the use and circulation of knowledge on defence would be strictly monitored. Further, I had come to envision a strictly utilitarian environment in which the necessity of accruing capital overrode any nuanced discussion of the constraints imposed by exclusive focus on the use of technology in a strictly military context. I had some of these concerns complicated in the course of my field experience at C4i, while others remain as fitting stereotypes that overlay software development with a veneer of orientation towards the masculine, jocular politics of defence work.

This largely unfettered access forced me to consider how to actually enact my proposed methodology of participant observation in this environment. Initial comments made by my thesis supervisor and other academics to whom I showed my proposal also concerned the issue of access – whether or not organizations with military ties would permit a breach of the normally secret goings-on of military contracting. I did not encounter the rigorous regime of “sigma clearances,” “red zones,” and restricted, “need to know” information as Hugh Gusterson did in his examination of a nuclear weapons laboratory (Gusterson, 1998: 68-72). Simulation and communication software for Canadian and international militaries does not, apparently, elicit the same level of inculcation into the “secret world…separate from the everyday world inhabited by the rest of us,” the world that keeps nuclear secrets safe (Gusterson, 1998: 68).

C4i occupies what might be described as a marginal role in the production of technologies for military practice. C4i maintains an increasingly prominent position within the defence industry as a whole – as a software development sub-contractor and as a purveyor of robust, inexpensive military simulations – but C4i’s software does not elicit
an immediate association with the morbid grandeur that can be said to apply to organizations producing weaponry, military vehicles, and other technologies directly implicated in the production of death and destruction. Techno-realist narratives like those of Tom Clancy and investment in melodramatic interpretations of “realistic” sketches of the use of military technology have produced an easily reproducible stereotype of a corporate world of tacitly closed affectations that do not seek out engagement with the questions of conflict, instead focusing on practiced efficiency in seeking out capitalization of the means of war (Der Derian, 2001: 16-19).

For the duration of my project at C4i, this perceived problem of access was more a question of bureaucratic procedure, rather than an encounter with a strict, imposing regime of “moral autarchy” – what Gusterson describes as the defining relationship between those whose elite status requires exposure to information that may lead to questions about the purpose of work on nuclear weapons, and the knowledge of individual scientists producing nuclear weapons (Gusterson, 1998: 90-91). I found that many of the icons and symbols of secrecy were maintained at C4i – such as a door requiring card entry or a guestbook requiring non-employees (including myself) to sign in and out every day – only in an effort to maintain minimum compliance with Canada’s Controlled Goods Program (Controlled Goods Regulations, 2010).

The Controlled Goods program is designed to prevent Canadian companies, who might be producing products considered “sensitive” by the Canadian government, from selling their products to individuals that the Canadian government deems unacceptable (Controlled Goods Regulations, 2010). This program is separate from the Canadian government’s secrecy clearance levels that are directly applicable to work within national
defense, military or intelligence work. Instead, the program occupies a middling role in maintaining the Canadian government’s control over products and technologies that are “sensitive,” as judged by a potential for military application. The Controlled Goods Program sits near the edge of the boundary of the “secrecy paradox” described by Joseph Masco in his work on nuclear weapons (Masco, 2010: 433); this paradox characterizes the “publicity” and public circulation of knowledge around what has been deemed “secret” – it simultaneously creates a demarcated space for secrecy and a paranoia of insecurity essential to maintaining the category of “secret” (Masco, 2010: 433). Similarly, these fashioned symbols of structured control of knowledge within the lobby of C4i’s office – arguably the most public space in C4i’s offices – maintain the publically engaged performance of secrecy through material symbols that index and circulate semantic knowledge about ‘what secrecy looks like’ to a public that may have infrequent contact with the strictures of defence work. These symbols, and the architectonic relation of individual to a receptive, but hierarchically ordered spatialization mark the interior of what could otherwise be a considered a corporate realignment of a space in which to receive domestic visitors. This spatial hierarchy, though made subtle by the small fixtures of the card reader, and the innocuous appearance (in an otherwise non-descript black binder placed upon an end table) of the sign-in book, are crucial adornments that engage an index of privacy for both the individual engaged in attempts at access, and in articulating C4i’s own material manifestations of a desire and requirement of privacy. Individuals in this context, in supposing that they travel beyond the key-card managed door, are greeted with a challenge to their own privacy in the form of a book requiring identification not only by name, but by organization. Further, this book attempts to track
an individual temporally through the requirement of a “in” and “out” time, forcing individual agency into the confines of a temporally surveilled, bureaucratic device for the purpose of scheduled maintenance of C4i’s commitment to “private” work space. The sign-in book replicates the tension between the personalized reification of the concept of privacy for the individual against a collective, bureaucratic surveillance, and the converse of the “challenge [to] the rights of the collective person that is the nation state,” or in this case, the corporation as a publically-accountable collective personhood that is intimately, bureaucratically entwined with the nation-state (Herzfeld, 2009: 138).

Canada’s Controlled Goods Program is on the edge of this boundary between the reification of the individual citizen’s “right” to privacy and the collective “rights” of the afforded for the purposes of accountability in the public sphere. This program occupies a unique position within this relationship, as it is situated within the most marginalized bureaucratic space devoted to ensuring both industrial privacy and accountability simultaneously, because it occupies the lowest threshold for demarcating secrecy in the context of a relationship between the state and its citizens. The circulation of information needed to maintain Canada’s Controlled Goods Program does not require the same level of publicity that is required to maintain the threatening disposition of nuclear weapons production. Instead, at C4i, the Controlled Goods Program is situated within a daily practice of secrecy that suffuses C4i’s civilian and military projects with the public, bureaucratic legitimacy that is required not only to sell C4i’s projects, but also to interact with and do business with the wider community of defence contractors. I was able to receive this clearance half way into my four-month fieldwork, and the transition provided
me an opportunity to understand the demarcations between different discourses that circulate and characterize knowledge within C4i.

Once employees have received Controlled Goods clearance, I was told that the company mandates that all employees begin the process to receive at least “secret” level clearance, the second level of defense classification in Canada. This “requirement” for C4i employees does not stem from the president or executives of C4i’s wishes to gain access to higher levels of segregated information. Instead, the requirement was described to me as a “convenience,” a way to ensure that any C4i employees involved on a project are able to consult, view, and provide advice on any projects that C4i may be considered for. These relations of secrecy determine C4i’s ability to conduct business in the defense industry; outside of these considerations of “access” for C4i to employees and knowledge, secrecy at C4i is a banal exercise of performative routines that circulate and maintain a discursive context essential to classifying work as “defense” work.

The production of a banality or routinization of the typologies indicated by bureaucratic practice – and the economic practices drawn from or caused by bureaucratic practice – has been a consistent and fundamental way in which social theory engages with the how bureaucratic and legal frameworks of governance create meaning for individuals and collectives. Max Weber addresses one facet of banality through bureaucracy through the creation of “legal authority” from depersonalized, abstract values that determine written codes of law (Weber, 1968: 217-219). Further, in relation to modern capitalism, he expands this logic to evaluate how the precision and consistency of bureaucratic administration governed the rationalization of a transferrable concept of value in “money” through the practices of “accounting” (Weber, 1968: 164-166;
Giddens, 1971: 179). Through Weber, it is possible to understand the creation of stable, transferrable symbols of generalized economic relationships. Understanding these symbols, such as those conceived of as relating to “ownership classes” in contrast to “commercial classes,” provides culturally-specific means through which to understand the bureaucratically reified alienation of individual workers from the means of production (Weber, 1968: 302-304; Giddens, 1971: 165). Precisely identifying the spaces in which the bureaucratization of everyday practice is performed provides an essential elucidation of the space between Weber’s separation of “class” and “status.” Similarly-constituted lifeways that define “status groups” – manifesting separately from economic phenomena – are the means by which “ideals” are circulated and utilized to generate group practices of inclusion and exclusion (Giddens, 1971: 166-167). However, I argue that Weber is too strict in his separation of the constitution of lifeways and the definition of social status as separate from economic practice.

In the context of modern capitalism, Weber does not give enough weight to the determinant power of interactions with bureaucratic structures that do not merely organize the authoritative and appropriative configurations of economic life (Weber, 1968: 217-223). Rather, they constitute the organization of knowledge in the creation of perceptual and linguistic forms that reproduce specific forms of power in maintaining notions of value and purpose. In this way, I parallel Foucault’s notions of the constraining forces inherent to discursive forms. More specifically, I take seriously the possibility of bureaucratic structures to exercise power over individuals and in the constitution of collective discourses through the “rules of use” for statements, and the “space of correlations” to which enunciations within statements refer in producing meaning in
contexts that are bureaucratically organized for the production of capital (Foucault, 1972: 90-91, 100-101). In this context, banality is not inflected with a negative connotation of unoriginality, but instead its production creates a functional reference for consistent relation to how “value” must be determined for individuals situated within the “commercial class.” These individuals – defined in C4i’s context as individuals other than Gordy, C4i’s president, and Bill, the vice-president – perform a form of labor that is oriented and educated by the bureaucratic classification of appropriate duties towards specific interactions that are explicitly separate from active engagement with secrecy or specifically understanding the context of use for products produced for the defence industry.

As a reflection of the totality with which these bureaucratic practices constitute perceptual forms that condition the social environment entirely with regards to economic practice, it could be argued that these practices begin long before individuals arrive in the workplace. The technical education that is required to attain a job within a software development or engineering firm, regardless of a focus on defence, begins this alienation by situating technical education (especially in the case of engineering programs) outside of the semantic contexts that configure problems for engineers to solve. Instead, particularly in engineering, this education is oriented – past the point of attaining literacy in mathematic and linguistic practices inherent to understanding technical problems – towards inculcating perception of and familiarity with organizational frameworks and bureaucratic structures that are utilized in the context of corporate application of technical engineering skills.
Means through which to approach the semantic contexts from which technical problems are understood – from a lack of inexpensive means to draw water in marginalized communities on the African continent at one extreme, to producing software for military communications planning on another – become situated, in practice, within the framework of “root cause analysis” (Wilson, Dell, and Anderson, 1993). Root cause analysis is a method of problem solving that has been applied widely in fields such as medicine and engineering – my focus here will be on its application in engineering. This type of analysis focuses not on addressing the symptoms of a problem event that must be addressed, but instead upon addressing the “root causes” of events and creating solutions to prevent such events from occurring in the first place (Wilson, Dell, and Anderson, 1993). As a result, this type of analysis presents a rigorously univocal approach to the construction of problems that can be shared among technical workers for the purposes of understanding a problem. This approach strips away and reconfigures the “space of correlations” that form a semantic relation of individuals experiencing a “problem” in a specific discursive context. It produces a separate rationalization of the properties of the problem’s discursive form that allows for engineering to be performed upon new correlations allowed for within the enunciative standard of engineering practice. The enunciative standard to which I refer is the linguistic index that is utilized in describing engineering problems – amongst engineers – in order to conceive of and articulate a problem in technical terms. The discursive qualities that these performances must conform to in social interaction over the course of work contribute to the spatialization of the workplace, to creating appropriate articulations for divisions of labor,
and to the production of individual identity in relation to economic interaction, as a reflection of interaction with these forms.

Within a more specific context of everyday work of individuals, the articulation of linguistic forms that function pragmatically in material contexts as bases for mechanical production or processual organization or as enunciations that, quite literally, “do” work in the context of software produce logics of practice inherently bound to the bureaucratic and organizational frameworks that were used to inculcate these forms originally. Problems in this context are made banal through dearticulation of one discursive form in favor of creating another that can be operated upon in the context of engineering practice, and situation of this practice as essential to efficient and appropriate application of technical knowledge. Banality is a functional stereotype that confines the semantic potential that can be drawn from defence work to accounting for everyday personal practice in production. It draws indexes of daily life away from the “unstable semantics” of confronting the individual and collective performances of privacy and accountability that may be inflected by stereotypes and narrativizations considered unnecessary to an individual’s work (Herzfeld, 1992: 72-73).

For the purposes of my argument, understanding the production and maintenance of this notion of banality as a functional reflection of organization of practice in the workplace can be extended to understand the relation of an individual’s work to an ideal of work that is indicated in communal discussions and is outlined broadly in job postings, from which, some individuals acquire work in the first place. However, these ideals of work are not merely overviews that inscribe responsibilities and notions of “duty” upon individuals who work within bureaucratic regimes. Contrary to Weber’s assertion that the
bureaucrat is bound to the performance of work merely by the sense of legitimacy afforded by the rationalization of a bureaucrat’s position (Weber, 1968: 217-218), I assert that centralized modes of interaction – both with work and with other employees over the course of work – reify this sense of obligation within a shared form that is surveillable, is reflected upon by senior colleagues, and is used to guide action in the workplace to move closer to an ideal sense of workplace functionality.

Interaction with platforms that centralize workplace discussion, or those that centralize workflow and classification of tasks, serve to extend the “sense” of obligation into reified forms that constrain identification with one’s work to a set of provided-for categories that an employee must interact with to make sense of performative responsibilities. Here, I extend Heyman’s concept of “thought-work,” which Heyman confines to the rationalizations that individuals make about work performed within bureaucratic regimes to “characterize society, polity, and economy” for the purposes of creating “specific thinking-situations” (Heyman, 1995: 264). I assert that these rationalizations, far from taking place exclusively in some form of individual cognition, are necessarily socially constituted through the various modalities of social interaction between employees, clients, and the tools that individuals use and share to centralize and co-construct meaning in the workplace. I utilize and extend the notion of “thought-work” here, instead focusing on a more broad conception of intersubjective rationalizations because these rationalizations are not merely part of everyday social life. Instead, they are relations that are, in part, inscribed by a bureaucratic regime detailing a division of labor that inherently separates the work of individuals, but they are also relations that are enacted in the context of everyday social relation between individuals in the workplace.
The constraining force of the material relation of bureaucratic definition to action and rationalization in social life is what makes “thought-work” a useful category of analysis; it is not merely agreement on shared definitions despite differing responsibilities, but agreement through inscribed and material configurations of these responsibilities that individuals must confront in the course of everyday life.

In agreement with Keith Murphy, I argue that interaction in the workplace, and specifically in the course of designing and producing discreet “things,” is a process that is embedded within different interfaces of interaction, only one of which is face-to-face communication (Murphy, 2012: 1967-1968). These different interfaces have their own conventions and actionable potentials for relating semantic context to individuals, and they can be reflected upon by those in senior positions to understand how work is progressing or whether work on specific tasks has been completed. I shall show, throughout this chapter, how different modalities of interaction, reflection, and reification of principles in the workplace come to condition the production of meaning for both my informants and myself. Further, I will place the coalescence of these reifications and semantic potentials – that are made possible by transmodal reifications of bureaucratic norms – in parallel with ethnographic analyses of “ritual” practices to show how these moments of interaction condition the production of referential discursive frameworks from which employees draw upon communal identifications of value.
“Stand Up” Meetings and the Material and Social Configurations of Secrecy

Once I arrived and had been granted a desk of my own for my stay, I found that the maintenance of secrecy did not play a significant role in the decisions of engineers and executives. The everyday demarcations of secrecy are not visible for most C4i employees – employees need not wear a “visitors” badge when working in the office, and carded entry only separates the external door of C4i from the outside. Once inside, the maintenance of “controlled goods,” and secrecy must be prompted in questioning—particularly by anthropologists who had not received Controlled Goods clearance yet. I faced confrontation with the everyday exercises of secrecy each morning, practices that my informants did not have to adhere to. Instead, once I started to move from desk to desk to talk to software developers about observing work first hand, I found that secrecy became hedged in a set of statements comprising an everyday discourse of secrecy, most often expressed in phrases like “Oh, do you have Controlled Goods? Just let me check with Tony to make sure I can show you.”

Without prompting from the uninitiated, secrecy is excised from the daily lives of employees – ritualistic adherence to the banal practices of secrecy were maintained for me by clipping on a badge each morning and signing in and out of the office – and maintaining discursive markers that would segregate military and civilian work is unnecessary. However, what was clear about these brief moments of tension in my questioning is that the maintenance of secrecy within the workplace – upon prodding – becomes associated with specific categories of internal-external divides that transcend the everyday experience of individuals contributing to projects. In this way, knowledge about “goods” covered by the Controlled Goods Program is placed within a hierarchy that I
came into conflict with when I attempted to access it without clearance. The Controlled Goods Program, and invocations of its authority to demarcate knowledge into appropriate or inappropriate spheres, can be likened to the “symbolic expression and transcendence of conflicts” that ritual has been said to allow for in the “production of a sense of community” (Gusterson, 1998: 153; Turner, 1969). The Controlled Goods Program, and the interactions – such as those in which I was rebuffed by informants – in the workplace that are configured by its designation of certain knowledge as “controlled,” are indicative of “authorization of knowledge and hierarchical authority of knowers” that Gusterson relates as a characterizing factor of how knowledge is demarcated during the production of nuclear weapons (Gusterson, 1998: 155). However, clearance through the Controlled Goods Program is only one of the ways in which knowledge is taken in by classification regimes that are performed through collective practices in the workplace.

“The only thing you can’t see are our Stand Up meetings each morning,” I was told by the company’s Controlled Goods Officer and Quality Assurance (QA) director, Tony; these meetings chronicle the previous and current day’s tasks – occasionally presented in technical terms – and were deemed “sensitive” to my “uncontrolled” status. What is important about this determination is the boundary that was placed on my ability to access certain characteristic discourses that are used to collect and disseminate information on production scheduling and the status of features in the software. Tony’s declaration of this restriction was delivered to me in hesitant terms. He took a moment to think about the situation, as outside visitors are not normal fixtures around the office at C4i. This was a situation that Tony was unfamiliar with – if I had already received allowances from the president to have free access to the office, then what more was there
to restrict from me? The once-daily exercise of Stand Up meetings offered Tony a nominative, categorical event in everyday tasks that could be bounded to an active practice of secrecy. Tony’s dual roles as Controlled Goods Officer and QA director afforded and legitimated his use of two, separate sets of referential indexes – of secrecy and proper methodology during production – in his “creative construction” of a practicable discursive space for secrecy in an environment otherwise sterilized of such markers (Tannen, 2007: 104-107).

Stand Up meetings – a morning event held for each project underway – were, at times, extremely informal; developers (programmers actively working on features to ‘develop’ the software), testers (those who test the software to find defects), and the project managers (who are often executives with varying responsibilities, only one of which is management of a specific product’s design) gather in a meeting room and form a circle around a table, from where each individual takes a turn (moving around the circle, to a computer in the center) at presenting completed work from the previous day and planned tasks for the current day.

Stand Up meetings represent, first and foremost, the most centralized experience of bureaucratic organization practices that all employees (besides director and executive level employees, save for Danny) engage with on a daily basis. I argue that it is here, more clearly than in any singular event in which all employees engage, that embodiment and reification of communal understanding of workplace obligation and expectations for interaction are circulated and reflected upon. In this way, the Stand Up meeting produces a collective embodiment of understanding not unlike the way that Victor Turner describes the concept of “communitas.” Victor Turner described the concept of “communitas” as
not unlike Emile Durkheim’s concept of “solidarity” (Durkheim, 1893); it is an active social phenomenon, usually short-term and associated with rituals in which “free relationships between individuals become converted into norm-governed relationships between social personae” (Turner, 1969). More specifically, I liken the Stand Up to a ritual that instigates “normative communitas,” through which the relationships of individuals to one another is given a normative framework through which social action can be directed, resources can be marshalled for continued existence of the community and the “communitas” (the sense of relatedness that individuals experience towards one another within a community) can be sustained through normative practices (Turner, 1969: 131-132).

In concert with my assertion that the Stand Up operates as a functional ritual through which knowledge is situated within a hierarchy of knowing, it also reifies knowledge that is presented in this environment and bestows this knowledge with a classification of communally “accepted” or “complete.” It is these moments of assessing shared progression towards the ideal goal of a complete and saleable product that reassert and circulate the shared set of discursive markers and performative indexes of identity that constitute the sense of relatedness that comprises the employees’ communitas.

However, the Stand Up as ritual is not strictly confined to the realms of the “speculative,” that which generates “imagery and philosophical ideals” as Turner asserts in his description of communitas (Turner, 1969: 133). Primarily, through the review and assignation of tasks, the Stand Up meeting reaffirms the worldly practices of employees and constructs a discursive frame from which individuals draw knowledge on what practices to direct attention to next. Through these practices, I would analogize Stand Ups
as akin to a divining ritual in which knowledge – gleamed from everyday work practices that are inscribed in the centralized software interface through which employees interact in Stand Ups – is configured within a central location under the surveillance of the entire community. Then, through the assessment of a team leader in conjunction with discussions of the contingencies that individuals may be experiencing in the course of their work, forecasts of available ideally available labor and assignations of ideally-finished work for the next meeting can be determined. As these determinations are made, individuals commit to completion of rightly-divined tasks that are usually self-determined, but always in accordance with the referential index of divining that is the centralized software environment from which knowledge about proper community activities can be taken. I utilize this analogy in argument for a perception of Stand Ups as a unique event that organizes the perception of the community. It is in the Stand Up meeting that individuals come to understand relationships to authority – in that they are assigned tasks based upon completion of others – to the purpose of the software as a whole – in that they receive a summary of the latest uses of the software that condition the scheduling and priority of tasks – and to their purpose as an individual in realizing the software with these tasks and the purpose of completing these tasks in mind.

At Stand Ups, individuals present work through a centralized software environment (aptly named Team Foundation Server), designed to schedule and break down tasks in various stages of completion. This centralized environment is complete with a central “hub” – where team members can view aggregated statistics about colleagues hourly contributions, and can glean information about a colleague’s progress on work – and a “dashboard” – where each feature or “work item” can be assigned,
assessed for completion, and situated in a list of other features that are actively being worked on. Stand Ups are constituted with a separate set of discursive markers that demarcate a unique “reporting context;” an individual’s work is appropriated in presentation and endowed with a collective awareness and acknowledged completeness only in this environment (Volosinov, 1986: 115-125). This appropriation comes about in the process of an individual’s presentation of a specific task, which is displayed as a unique entity with a description of functionality and how many hours have been logged during work on a task. Once displayed, such as when C4i’s technical writer, Jane, presents what chapters of the software’s documentation were worked on the previous day, all team members and team’s project manager offer advice or instructions for continuing work during the current day. These commentaries may grant Jane time with other team members to have complex, technical terminology explained so that Jane can write documentation or they may indicate to other team members that Jane should refocus writing efforts on other chapters, in order to meet deadlines. Outside these meetings, all knowledge held a limited fixity, problems and tasks were always in-transit or open to discussion (particularly to anthropologists who could not attend Stand Ups).

**Communicative Acts and Defining Context for Software Development**

In this way, Stand Ups exhibit what Deborah Tannen has described as the “creative construction” inherent in fashioning a context of “reported speech” (Tannen, 2007: 106-107). Individuals do not creatively construct a discourse in attempts to report the speech of others, but they actively utilize the tracking software and reporting style of Stand Ups to mediate their work into a particular set of logics – of “doneness,” of “ready
for testing,” and of work that must be shifted to the “backlog.” These logics hold powerful sway in directing action. The software interface used to direct every team member’s work structures these logics by forcing each member to designate the status of tasks and assign “hours completed” to tasks, in order to move “finished” code down the pipeline to testers for an assessment of “doneness.” Each of these logics is bound to a category in the centralized tracking software, and each – when changed – articulates a different set of indexical responses that are mandated by the stipulations and ideal practices of what, in engineering practice, is called “Agile” methodology (Beck, et al., 2001).

Agile methodology encompasses a set of organizational and professional practices (such as the daily Stand Up meetings) that are meant to make software companies better able to “pivot,” and to develop software in an ongoing process. This is in contrast to the “Waterfall” methodology (Royce, 1970), which places emphasis on large, separate product releases; Agile focuses on maintaining support and development of a product after the product has been released. Responses to changes in classification under each set of logics (whether “active,” or in the “backlog,” or “in progress” or “ready for test) may, for example, include a project manager asking a developer to switch tasks to “bug fixing” after noticing that the developer has “checked in” code for a previous task. Once a task has been assigned to one employee, another employee cannot make changes to the various statuses of a task. As a result, the knowledge involved in crafting any one feature could be bound and only accessible to certain personnel at any one time. In assignation, each task, and the development of the project as a whole is artificially restricted to the knowledge afforded by one individual’s expertise, and that individual’s ability to respond
as expected to collective, logical categories that are provided by the TFS software environment.

This artificial constraining of practice through a common software interface results in the construction of a unique monologism in professional practice; this is in contrast to Mikhail Bakhtin’s notion of “dialogism,” which describes a constant process of interaction and re-articulation in logics of communities, of novels and authors, and in the interpretation of everything from literature to appropriate social etiquette (Bakhtin, 1981: 252). At C4i, this interaction between logics is prevented by artificially restricting interactions with the logics of professional practice (those mandated by the TFS interface) to a set of categories that may be utilized interchangeably without legitimation from anyone other than the individual employee assigned to a task. In this way, C4i creates a “standard” for completing, commenting on, and showcasing work, where each employee’s contribution is read in terms of metrics provided by TFS. In the morning, I could observe Monty working to adjust the interface for his contribution to the military simulation project (designed to take in data on units from other simulations and display these units on a central map), and in the afternoon – after Monty had uploaded his code to a central server and designated his adjustments “ready for test” – I could observe Nara discover the contribution on a list of “items ready for test” to download and begin testing.

Instead of gathering a holistic picture of how projects were progressing at Stand Ups, I began to use my freedom of movement and access to everyone’s work spaces to piece together a map of production and common work relationships from a set of disparate logics and timelines spread across multiple projects. I once likened this to Monty and Mular (two junior software developers on summer internships) as my “office
“gossip” approach to piecing together an idea of production. During my first month conducting research at the office, I was even able to update several of my informants in the office on new developments on projects (whose team members may have only been ten feet away). As an example, I asked Sam – a software tester working full time on simulation software – what she thought about one of the summer interns switching over to the same project she was working on and found that Sam had not heard yet, despite the shift occurring earlier that week. I observed disparate sections of software that I would not normally be allowed to view in Stand Ups, because the decentralized atmosphere of work outside of Stand Ups afforded a less constrictive, discursive threshold of secrecy. I had several encounters with ad-hoc, nonchalant questions about my clearance from several developers. Even after I stated that I still did not yet have clearance, almost all were unconcerned about allowing me to sit and observe programming work. By viewing each contribution to an otherwise sensitive project in a disparate vacuum of monologic interactions with centralized software, and without the imposing markers of secrecy to prompt withdrawal, I was able to evince a picture of what stage, what features, and how “well” a project was progressing at any one point. There was no totalizing picture of technical relationships that I was afforded by milling about from desk to desk – I was even able to observe, with Tony’s permission, active testing of communication software for the Canadian military.

In Michael Silverstein’s terms, I was removed from the unique “signaling media” used to construct a specific “speech event” in my inability to attend Stand Ups and view the process of inculcating team awareness (Silverstein, 1976: 13-15). Stand Ups occupy a rigorously defined notion of a speech event; an “overt goal” in the “socially shared
system of…purposive functions” is clear for Stand Up meetings (Silverstein, 1976: 13); behavior at these meetings is mandated by a set of guidelines provided by professional manuals and methodological guides to “Agile.” When referring to Stand Ups, I use the term “signaling media” to refer to the monologic software system that directs perception; the physical movement around the meeting table that adds to the ritualization of Stand Ups; and to the collective awareness of a project that is achieved in presentation, commentary, and acceptance of a fellow employee’s past and current work. My absence in Stand Up meetings prevented my sharing in the system of purposive functions afforded to employees who were there to present on the previous and current day’s tasks; my presence could not be accounted for in terms familiar to “Agile” methodology – there is little mention of anthropological observers in engineering methodology handbooks.

Through the utilization of my own, unique “signaling media” – a term that I use more broadly to describe the conversational style that arose when I sat with developers and testers in cubicles to observe individual work – I developed a set of “referential indexes” that allowed me to grasp some of the technical complexity of programming for simulation and communication. This conversational style is one that arose out of my attempt to tread lightly upon individual employees’ work while I conducted observation. Oftentimes I would wander into a set of cubicles, notebook and pen in hand, to quietly ask one or more of the employees if I could sit, observe, and occasionally ask questions. In the beginning, I was very quiet with my approach. I did not know anything of the usual performatives and conditions of the working environment that were most comfortable to my informants – whether individuals preferred to work with head phones on, with two computer monitors or one or whether my presence was irksome. At the beginning, I was
keen to learn as much technical information as I could; I wanted to come as close as possible to my informants’ understandings of software that I could. Over time, however, I began to restrict my questions to what I perceived of as moments of frustration during the problem solving process that developers normally adhered to. When stuck on a particular problem, I would watch developers often utilize Google searches, various websites such as Stack Overflow, and the Microsoft Developer Network to comb through various descriptions given for particular formations of code – and the problems that others have associated with these formations – in order to try and find a means to develop a solution. On Stack Overflow, for example, this is the purpose of the site’s existence; developers may submit descriptions of problems and snippets of code for the developer community to investigate, and answers to a given problem are voted upon. The best answer, the one with the most votes, is displayed most prominently on the page for other developers to utilize as a solution. These moments of frustration provided me with a method to question a problem or success in terms of the contingencies that led to a particular problem or success; I may not have been able to understand each machination of programming as such, but I was able to trace – with my informants’ focus on this frustration – the series of interactions leading to perceptions of either success or failure.

Moments of success or failure, and my method for understanding where and when to instigate my questioning are not unlike how Clifford Geertz describes an interpretive approach to understanding culture grounded in the concept of “thick description” (Geertz, 1973). For Geertz, “thick description” is the interpretive mode and adherence to interpreting culture as a “text,” that which allows a researcher to discern “a twitch from a wink” (Geertz, 1973: 6-7). It is a means, through which, to cohere an understanding of
the “stratified [hierarchies] of meaningful structures” in terms of which actions may be understood not simply as physical actions, “rapidly contracting his right eyelids,” but as “cultural categories,” through which meaning is conveyed and context is established for action (Geertz, 1973: 7). For my experience with developers at C4i, what became important for me to understand is the difference between an individual searching the internet as a distraction from the frustrating contingencies of work, and the context of utilizing the internet as a tool in which to investigate solutions discussed in the wider community of developers when individual efforts proved futile.

The “referential indices” that I developed comprised relations of feature descriptions to analogies used to describe how features were to be implemented. I also encountered relations of expertise defined by Monty and Mular’s propensity to associate particular senior developers with certain sections of code – in order to gain familiarity for asking questions. And finally, I encountered relations of priority of design, determined by the sometimes “chaotic” demands of business executives, whose promises to new clients resulted in shifting features up and down in a development “queue.” Variance in these relations allowed me to piece together different profiles of, for example, how aware different developers were of a colleague’s progress on a specific task or how my questions to different developers could elicit differing analogies that would show how technical information was conveyed to those without technical expertise. These indices allowed me to map out what must be conveyed in technical terms, what must be conveyed in plain English, and what must be conveyed somewhere in-between – as was the case at C4i’s booth at a tradeshow, where prospective customers had limited technical knowledge and were attempting to understand what is “special” about C4i’s software.
Relations of expertise allowed me to explore when and what knowledge became bound to individuals for the purposes of accessing and circulating expertise on projects. These relations of expertise allowed me to observe how “creative construction,” the phenomena that I previously attributed to the collective awareness function in Stand Ups, is performed when seeking to construct a unique “reporting context” – that of a problem that requiring an expert’s attention (Tannen, 2007: 105-107). Jerry, one of the senior developers, was able to describe his active projects to me utilizing programming terminology by guiding me through the different points of contact (shown to me on-screen) that his new code activated and changed. These “analogical schematics,” allowed me to see how certain “methods,” “calls,” and “variables” were architechtured to achieve a semblance of what Jerry called “good style.” I did not limit my perception of these analogical schematics only on my informants’ verbiage. Jerry, and in particular Monty, developed analogies of programming functionality that required me to follow cursors and fingers on a screen, directed from site to site of coded activation meant to walk me through the functioning landscape of code. There were times when I simply could not penetrate the technical terminology that was necessary to describe a particular function; in these cases, Monty most often attempted to create a completely programming-free analogy of a problem. Programmers themselves have a problem-solving tool, built into their primary coding platform Visual Studio, called “code stepping,” in which a programmer places “break points” into code, which can then be “stepped through” one at a time to show progressions in logic through a program.
Development Priorities and the Smoke and Mirrors of getting it “Good Enough”

Shifting relations of development priority were a theme that heavily influenced C4i’s military simulation software specifically. In my first month at C4i, the company was preparing to showcase their software at CANSEC, Canada’s largest military contractor trade show. At this time, C4i was largely attempting to showcase the ability of their military simulation software (called MILSIM), and their emergency disaster planning simulation software (called EDMSIM) to integrate with a complex three-dimensional simulation (called Virtual Battle Space) for the purposes of decentralized, large-scale simulation. With the same simulation running on all three pieces of software, the purpose of the demonstration was to show that a customer could interact with units provided by any simulation through any of the three simulations’ interfaces. As with all software development, however, this effort produced a lot of defects. Monty and Mular, who had just started at C4i, were tasked with “bug fixing” duty. Development proceeded according to what bugs arose as the testing staff proceeded through the list of features required for the demonstration. These bugs included individual soldiers and civilians in Virtual Battle Space gliding (as opposed to running) across surfaces in the environment, vehicles that would jump forward and back while driving in a straight line (as opposed to driving smoothly), and an inability to interact with or damage soldiers and vehicles that existed only in one simulation in the common three-dimensional environment.

Solving all of these problems two weeks before the demonstration appeared – from my uninitiated perspective – to be insurmountable; the experience of the simulation was clunky and unintuitive. Not one person could sit and interact with the simulation, play through the intended scenario, and move from one simulation to the other without
some kind of fatal error or glaring, visual defect. In fact, this was the case, but it was not as disastrous a realization as I had thought. Instead of directing development with an eye towards perfecting these features, business executives – those who would be demonstrating the software – organized development tasks to produce a group of features that were “just good enough” to comprise a highly-orchestrated, non-interactive simulation. This effort, called the “smoke and mirrors” approach by the business development director, George, is an example of what William Hanks calls a “discourse genre,” which Hanks describes as a purely textual form of “historically specific elements of social practice, whose defining features link them to situated communicative acts” (Hanks, 1987: 668). While Hanks’ discourse genre is limited to a purely textual form, I see interplay of C4i’s narrativizations of simulation – in the simulation narrative, the workers’ discussion of the trade show, and other discourse surrounding the simulation – to coalesce as a discourse genre that constitutes a means to create a simulation that is just “good enough.”

In summary, what C4i achieves, in adherence to this discourse genre is a simulation walking the line between appropriate engineering practice and the need for sales. The historical constitution of this genre in C4i’s development cycle grew out of a “script” for the simulation scenario; a fire breaks out in a small English town – immediately, ambulances, fire trucks, and police cruisers race to the scene (provided by EDMSIM). Simultaneously, a small counterinsurgency war is ongoing in the hinterlands near the town – contrasting large, mechanized warfare, and small groupings of counterinsurgents – between two opposing forces (provided by MILSIM and Virtual Battle Space). This script provided the context of communicative acts that were required
in the development process to realize “good enough” functionality to achieve this context, while the rest of development was directed towards smoothing out bugs in surrounding features to provide adequate cover to glaring defects. Through this conflicting set of development priorities (making something work as opposed to making something good enough), a novel form of highly orchestrated, directed perception could form for observers of the simulation out of the chaotic context of conflicting discourses in development.

By the end of my fieldwork, my experience with simulation had taken on much the same decentralized character that my participants deal with on a daily basis. I had learned not to focus so blindly on one type of product or type of simulation; instead I had been pushed to recognize the variable, decontextualized environment that software developers and testers operate within. Developers and testers are regularly moved from project to project over the course of a year. From communications planning software, to military and emergency disaster simulations – with entirely different code bases – my informants were often unaware of what an adjacent colleague was working on. Once I began to attend Stand Ups, I realized just how integral these moments of collective awareness were to allowing developers, testers, and designers to momentarily grasp a “bigger picture” of projects that appeared chaotic and disconnected in isolation, with tasks that required extreme specificity without any knowledge of surrounding code or fellow team member’s scheduling. The collective awareness achieved by the discursive “reporting context” of Stand Up meetings constructed a cohesive narrative that allowed each team member to situate isolated logics of practice within an overall “genre of practice.” This genre took on new characteristics across products, constrained by the
unique relations of analogical capability, relations of expertise, and relations of
development priority that manifest different capabilities for developers and products to
meet requirements, be “marketable,” and achieve success. In the end, it appears,
simulation is what you make of it.
The Performance of Branding:
Bureaucracy, Capitalism, and the Articulation of Innovation

During my first week amongst the executives and engineers at C4i, I was invited to an end-of-week gathering at a local brewery – close to the offices of C4i. The brewery itself is fairly new; it was originally founded by a pair of immigrants from India, and has been known in Calgary for many years as a producer of “affordable,” if not very good, beer. Each Friday at C4i meant a new attempt at bringing the office together over lunch or over a late-afternoon meal. These meals were often held in high-spirits in the board room. Take-out was passed around the table, idle chatter and murmurs between colleagues filled the room and Gordy almost always began with a rousing exhortation of the company’s latest prospects and potential customers.

Paid for by the company, these lunches were thought of by Gordy as a way to give back to his employees for their hard work, but also a way to instill a certain valuation of “corporate culture” among the staff. In the first of these boardroom lunches I attended, Gordy dimmed the lights and fired up the projector to screen a ten-minute clip of a TED talk that outlined ideal management principles and management lifestyle choices that could help to encourage better awareness of the various markets that executives may be steering their companies within and concepts such as “timing” – crucial to understanding how to create a company that could stand the test of time. In this meeting in particular, Gordy wanted to instill an understanding that, often, “companies can fail because they do not come to market at the right time.” That is to say, that a corporation may have an excellent product, but that it is this notion of understanding the “timing” of bringing a product to market that Gordy truly wished to explore in showing this particular video to the other employees. These lunches and activities echo how
Dorrine Kondo describes her experience at a Japanese work ethic retreat; it was a reinforcement of ideals considered appropriate not only to proper demeanor and ethic in the workplace, but also to living a “happy” life. These ideals are instilled through disciplinary exercises such as repetitive chanting and bathing in cold water to overcome discomfort in favor of “purity” (Kondo, 1990: 78-83). However, unlike Kondo’s experiences, the participatory factor at these lunches was muted at best. Following Gordy’s espousal of the company’s latest prospects he would open the floor to any questions and comments pertaining to the group’s latest effort or project – usually, an awkward silence would immediately follow. Eyes around the room met in a shared moment that displayed the inherent communicative tension that often rose between executive employees and the technical oriented staff, composed of engineers and testers.

It is this communicative tension and its structuring of space, the responsibilities of employees, and a perceived notion of who is able to communicate on what subjects that I want to explore in this chapter. This tension is communicative in its capacity to manifest in the space between individual understandings. In this chapter, I will explore these forms to present an understanding of how C4i creates and maintains a professional presence and image in interactions with the defence industry, and an understanding of how the demands of this professional presence strain the expectations of development staff who are tasked with creating the technical demonstrations that are required for “performance” on the floor of a defence industry trade show. C4i’s orientation towards attitudes that create a capacity for committed employees, but also employees whose well-being is part of the corporate culture that C4i wishes to promote, is geared towards what is called an “open office culture,” and an “open corporate culture” – part of creating a focus at C4i on
work, but also on the lives of employees. This trend orients C4i’s corporate conception of wellness towards other programs geared towards employee health and wellness as a means of placing a premium on the lives of employees as an important contribution to the bottom line (Berry, Mirabito, and Baun, 2010; Hillier, Fewell, Cann, and Shephard, 2005).

This chapter investigates the perspective of those situated at or near the top of the hierarchy of the firm. I will elucidate an understanding of how this perspective negotiates a particular aesthetic and mode of perception that is necessary to making technology and the process of production intelligible to executives and business development employees – those who must articulate the technical possibilities of simulation software as “marketable” qualities.

Fundamentally, this chapter is an ethnographic investigation into how corporate directors instill and market the values of capitalism within the corporate and in marketing of products. This capitalist mode of production is inherently guided by, and constituted by, the organization of corporate enterprise through bureaucracy. This corporate bureaucracy fundamentally addresses the relationship of the individual to the collective, and how this relationship is conditioned at various stages in the bureaucratic hierarchy by configurations of authority and power. Furthermore, the articulation of a bureaucratically-driven division of labor and the configuration of a specialized charisma for the purposes of producing leadership create the conditions for these hierarchies to be made intelligible to those situated in relation to C4i externally in the marketplace, as well as those situated internally in relation to the everyday functioning of bureaucratically-determined categorized technical labor.
This chapter is not meant to be an indictment of the means by which industry executives circulate and perpetuate particular regimes of neoliberal economic order and the symbols, linguistic structures, and organizational frameworks that marginalize some perspectives and promote others. Instead, this chapter will argue that within the context of production, these narrativizations and circulations of symbolic and interactional forms create the possibility of “marketability” for C4i’s software at the outset. These symbolic and interactional forms are fundamentally drawn from the *necessity of a capitalist enterprise to identify with bureaucratic norms* – those that allow for the authority of executives and managerial directors to take in and bring the logic of the marketplace to bear upon one configuration of technical labor involved in software production.

As a consequence of the functional reliance on these bureaucratic forms – in the interest of creating notions of innovation, creativity, and “necessity” for a product in the marketplace – there results a form of regulatory kinship that facilitates these spatial and narrative articulations through informal ties that help to circulate “like” individuals through different firms to maintain this intelligibility on a personal level. In Irving Goffman’s terms, these “performances” in the “presentation” of the self rely upon a reproduction and maintenance of interactional and symbolic forms that create belief and trust in these performances – inherent parts of “practicing” the capitalist enterprise (Goffman, 1959: 20-21). These performances are key to establishing the symbolic and a charismatic regime of authority that are used by executives to generate their legitimacy as “representatives” of the marketplace internal to specific corporations.

Max Weber’s and Michael Herzfeld’s interrogations of the symbolic, formal, and informal practices of bureaucratic enterprise will be utilized in this chapter to understand
the tension inherent in maintaining an established order over a collegially-oriented production staff whilst simultaneously situating oneself and “one’s company” within the regulatory charismatic practices that are required to maintain the “presence” of the firm in the marketplace (Weber, 1968; Herzfeld, 1992). That is – how does a firm work both as a ‘vertical,’ hierarchically structured bureaucratic entity, while at the same time incorporating ‘horizontal,’ solidarity-affirming activities like the Friday lunches described at the beginning of the chapter? While some may see these activities as fundamentally contradictory, I would argue that both the creation of vertical structures and horizontal practices is essential to understanding how authority is created through hierarchy and how value is created both in allegiance to the corporate brand and in instilling a desire to create products that work to further the bottom line of the corporation.

These narratives overlay the process of technical innovation with constructed “needs” of markets and idealized end-users who – through the success or failure of a product – may never come into contact with technology that is continually iterated upon from theoretical suppositions of an ideal practice of command (in military simulation) and emergency response (in emergency disaster simulation).

Through this chapter, I will argue that the production of market forces and of ‘salesmen’ adheres to these spatialization and interactional regimes in order to be legitimized as contributors; these practices essentially distance the production of technology from users and from the methodological needs of software development to meet the perceptual needs of viability, profitability, and success as an industrial firm. I will also argue that these legitimizing, charismatic performances are maintained in forms
that are internal to C4i. These internal performances are essential to creating the perceived necessity of a bureaucratically enforced division of labor, one that creates the conditions for categorizing “insiders” and “outsiders” in leadership and authoritative practice. It is a division that presupposes the revelatory capacities of executives in “making the sale” and in maintaining an “insider” knowledge of the marketplace, one that leads to a privileged authority on when and where to situate resources for the purposes for creating the conditions for a “sale,” and therefore C4i’s continued existence.

**Gordy: Charismatic Authority and the Performance of Corporate Culture**

Gordy’s internal presentation and legitimization of himself as C4i’s president is a crucial factor in the communication of his desires with regards to continued production. It is also a crucial mechanism for reinforcing the allegiance of subordinates to the “charisma of the office” – that charismatic authority that is routinized by association with a particular office, and not located specifically within an individual’s ability to exert charismatic authority as a means to legitimization (Weber, 1968: 248). Gordy’s creation of this “allegiance” is not merely as simple as subordination to his (admittedly limited) understanding of the technical labor inherent to software production. Instead, Gordy’s production of legitimacy is articulated at the confluence of a multiplicity of differently-oriented capacities for decision making, each of which Gordy must cultivate through a managed presentation of the self that legitimates his continued authority over the material and immaterial decision making practices that make production possible. These differently-oriented capacities within C4i can be categorized as the various levels of productive labor allowed for in the bureaucratic organization of C4i’s corporate structure.
There is, for instance, a different set of assurances and discussions that must be had with senior directors at C4i (Bill, George, Tony, and Danny). These discussions assure their continued participation in the collegial body of “directors” and “executives” that make a living in the reproduction of Gordy’s revelatory authority through organizing labor and space to achieve interpretations of Gordy’s idealistic desires in a material environment. The collegiality inherent among director-level employees is representative of the different appropriations of economic power afforded to these employees who manage the implementation of the “formal rationality” that is utilized to bring technical knowledge to bear from within a production-oriented bureaucracy (Weber, 1968: 269). In Weber’s strict classification of collegial bodies in relation to authority, C4i’s director-level employees constitute a “functional collegiality with a preeminent head” (Weber, 1968: 272) – in so far as the presentation of Gordy’s “revelatory” decisions on when and where to position C4i “in the market” are dependent upon directors’ tacit agreement on these decisions. The “loyalty” expressed by these directors is bound directly to the continued operation of the functional capacities that are managed by them, such as Tony’s management of quality assurance or George’s management of the business development (read: sales) staff.

In contrast to Gordy’s legitimization among directors, his presentation of self to other employees – usually through informal, boardroom lunches and other informal gatherings of staff – is articulated in such a way as to create, for employees whose exposure to “the market” is minimal, a perception that C4i’s orientation is “good” or “correct.” In this way, Gordy supplants his “personal” presentation of self with one that represents the entirety of the bureaucratic category of charismatic leader; in this space,
Gordy makes a case not only for his personal stewardship of C4i’s production, but for the “characteristics of the task” that Gordy performs (Goffman, 1959: 77).

Gordy’s use of TED Talks and consultancy presentations often explore the characteristics of good “innovators,” “leaders,” and the qualities of those who “read diversely” – one presentation in particular mentioned these to be essential components to understanding the creative capacities inherent to good leaders. These TED Talks and presentations are an example of how Gordy removes his personal capacities for justifying the presentation of the charismatic leader, and how he defers to how these capacities are presented in public talks meant to espouse the benefits of ordering one’s life around principles considered positive among executives and corporate leaders. Further, in conversations with others after various design meetings and “road mapping” sessions, Gordy was constantly referred to as presenting the “visionary” perspective, the perspective that charismatically orients production towards an ideal that is supposedly embodied by one individual at C4i – Gordy. Gordy’s selection of syntax, vocabulary and a specific set of pre-figured responses that he sets as appropriate in the context of his presentation convey the innate authority that his envisioned “purpose” for C4i’s represents. This presentation of Gordy’s presidential role is reflected in his choice to present corporate culture lectures and TED Talks oriented towards teaching executives how to better understand the “pulse” of the market, and how to orchestrate the “perfect timing” for introducing a product to market.

In Goffman’s phrasing, Gordy is utilizing these communal moments to inculcate a “favourable definition of [his] service” – that is, the service of being president (Goffman, 1959: 77). The specific indexical relationships that these lunches begin to map out in
metaphors drawn from managerial rhetoric are meant to link the disparate world of “Business Development” – the exclusive domain of executives – and the “engineering” or “actual” development taking place at terminals throughout C4i’s office every day. The expected responses and other affectations that these indexes reproduce did not often gain much ground with engineers, developers, and testers. Silence permeated the bulk of these experiences, often punctuated by momentary buttressing of Gordy’s encouraging monologue by George or Danny. These moments do not undermine Gordy’s intended presentation. Instead, as put by Weber when discussing the capacities of advisory collegial bodies, these moments “lead to a tempering of the exercises of authority in the direction of rationalization” (Weber, 1968: 273). Gordy’s vision of an “open” office culture, where each employee is as aware and in touch with the needs of the “business” as an investor might be, fails to gain purchase with non-executive employees not because it is an incorrect vision. It fails because it is the only means by which most non-executive employees engage with the set of indexical relations considered positive and laudable by the business development employees.

Outside of the environment of Friday lunches and other informal opportunities for Gordy to showcase his success at attaining the “vision” he sets out for the company, employees do not have any means to engage this information. As I discussed in the previous chapter, my efforts to piece together how active work on projects was contributing to the overall sales and branding efforts at C4i were outside of the normal fixtures of information circulation at C4i. Often, when asking employees what they thought about the development, for example, of features such as updates to MILSIM’s aerial mechanics as a reflection of shifting priorities, many did not know why priorities
would have shifted at all. News about potential customers and active developments on projects such as updates to EDMSIM to handle flood modelling in order to garner support for purchase of EDMSIM in the Philippines did not reach the ears of almost anyone who was not actively involved in the project. Even during Friday lunches, Gordy’s language about potential customers was vague – he did not appear to want to be extremely specific about the nations that C4i was attempting to sell to. Often, he would refer to these places in regional terms only. This lack of active circulation of the contingencies and uncertainties of maintaining and generating clients can be understood as a separation of the labor involved and a wish to not violate the veil of charisma that generates Gordy’s authority over these matters, but it leaves many employees without a means to effectively articulate allegiance to or even understanding of the orientation of C4i’s business practices.

These failures to generate semantic legibility for subordinate technical staff speak to the ways in which Herzfeld explains the necessary “secular theodicy” that bureaucracy creates (Herzfeld, 1992: 10). Gordy’s orchestration of these informal events attempts to present the ideal circumstances of success and failure for the corporation. The presentation of lectures and recent company successes serve to manage the uncertainty of the capitalist enterprise. By managing this uncertainty through events like Friday lunches, and in other contexts such as when Gordy is brought into a meeting to provide a “visionary” perspective, it reaffirms the generalizability of the ideal circumstances in which the identity of a corporation and of executive authority are constituted. Herzfeld’s conception of “secular theodicy” treats these exercises as “principles of identity” (Herzfeld, 1992: 10). These trappings help to enshrine the “formal accoutrements” of the
narrative that places the ambiguous process of “business” above the executive “elect as an exclusive community” (Herzfeld, 1992: 10). Here, Gordy and fellow business development staff are relegated to the “characteristics of their actions,” where “individual sins cannot undermine the ultimate perfection of the ideal they all share” (Goffman, 1959:77; Herzfeld, 1992: 10). These meetings are, therefore, not intended to create awareness of the skills and strategies available to technical staff in the pursuit of a “successful” business or product. Instead, these lunch meetings serve to create the basis of legitimacy for Gordy’s office in metaphorical terms, removed from his daily practice through bureaucratic, secular rituals such as pronouncements on recent (or promising) indicators of company success and enshrinements of common ideological thread that all employees share: the production of capital. These methods are how business is produced. Through the imposition of vertical hierarchy through the creation of Gordy’s charismatic authority and through the horizontal measures through which these notions of authority are disseminated into value that employees attribute to Gordy’s role.

Within the presentation of TED Talks, and other speeches that extol the virtues of “executive-like thinking,” lay the ritualistic forces of officially-sanctioned and circulated metaphor that Herzfeld describes as essential to the creation of the bureaucracy of the modern nation-state (Herzfeld, 1992: 9-10). The imagery of success, perpetuated in these exercises of executive authority, link the official narrative that Gordy understands as engagement with other corporate bureaucracies to the agonistic moments of everyday practice – those that strive towards the collective goal of “capital production” and the more “intimate bases of reliance,” through which individuals come to terms with experiences with success and failure (Herzfeld, 1992: 8-9).
Outside of these informal “pep” sessions, many of the technically-oriented development staff will never engage the topic of sales of the company’s developed software in those terms exalted by Gordy at these lunches. The usage and context of terms such as “timing,” “doneness,” and even the placement of planned features for C4i’s software – determined in conjunction with the engineering employees – can be reconstituted by executives for purposes such as allaying the worries of ongoing customers, by promising to add features sooner than expected without consultation. I observed a prominent example of how these disconnects between the aspiration for certain or promised capital, and the technically-situated, shared understanding of everyday experience during my third week at C4i, an opportunity for observation that I learned about during my trip to the brewery with the rest of the staff during my first week.

**CANSEC and the Performance of Branding and Business**

CANSEC, Canada’s largest defence contractor trade show takes place every year in Ottawa, Ontario. Officially, it is a two day event, in which executives representing companies from across Canada – and from the Canadian branches of American companies – gather for a showcase of the latest and greatest in technologies designed for military use. It is a chance not only for other executives from other organizations to engage with and see new products up close (or in action), but also for local employees of Canada’s Department of National Defence and locally-based members of the Canadian Forces to do the same. This method of showcasing new products is highly exclusive – only for those executives and government personnel who have registered and provided
proof (in the form of a business card) showing affiliation with one of the “approved” companies in attendance. My own attendance was secured with the help of one of C4i’s testers, Sam.

Sam was a marvel to me when I first began to spend full days at the office. I first met her in C4i’s “test lab,” a space containing a smattering of retired desks and prop-up tables recycled from previous uses to act as support for the some fifteen computers functioning as test machines. When I first entered the test lab, I was hit with an overwhelming blast of warm air. The numerous computers in the test lab were active almost 24 hours a day, and were manned almost exclusively by Sam. Sam’s testing work had her rolling in her chair from computer to computer, sometimes stopping for one click at one computer or for an extended session to set into motion, fix or reset a particular scenario. Sam’s job appeared – at first – to be frustrating, time consuming, and also appeared to be a job ideally suited for a team of people, not an individual. In the days leading up to CANSEC, Sam was frantically testing and attempting to make her way through the list of features in both MILSIM and EDMSIM that would be showcased on the show floor.

When I first spent time in the test lab, Sam’s acceptance of my presence was tenuous at best. I was still in the process of formulating an idea of how best to gain an understanding of how C4i’s software operated, and many of my questions were posed to elucidate some of the basic features, functions, and work flows of the software. Sam’s responses were hurried and simple, her tone suggested that it was frustrating that I did not have a basic understanding of the basic principles of, for example, how to move different units in the simulation, and how to navigate the interface of both EDMSIM and MILSIM.
What I did not know at the time, is that Sam’s frantic testing was only half of the work she had to complete in the lead up to CANSEC. Sam was also employed as C4i’s resident “graphic artist,” a job that required her to drop whatever testing duties she was swamped with to work on designing C4i’s various product logos, graphics for promotional materials, and of course, the C4i business card that I used to gain entrance to CANSEC.

Sam’s labour in this context can be expressed as one of the foundational reactions to bureaucracy that are part of the inculcation of positionality, certainty, and success or failure as part of C4i’s wider corporate culture. Within the hectic schedule and inconsistent request for and application of Sam’s artistic skills lay the possibilities for her often frustrated and hurried responses – relating to the metaphorical ideal of bureaucratic success in capitalism that is on display for Gordy and other executives at CANSEC.

Under the strains of C4i’s productive centralization, Sam occupies a space between insider and outsider; as both tester and part-time graphic designer, Sam is tasked with bringing the metaphorical ideal enshrined by bureaucratic organization to life through two sets of labor that compete for her time. These two responsibilities bring her more frequently into conflict with the ideal of a frictionless operation of bureaucratic practice that – for all non-executive employees – directly translates technical skill into unambiguous capital. Sam’s tenuous position in confrontation with the oft-frustrating perils of strictly organized labor speak to what Josiah Heyman describes as the “thought-work” that helps lower-level bureaucratic employees make sense of personal experiences with conflicting manifestations of the bureaucratic ideal (Heyman, 1995: 263). Sam’s frustrated thoughts on her constantly-chaotic and demanding schedule – fraught with frequent changes of task – are regulated through the enactment of the bureaucratically-
ordained labour that constitutes her participation in the pursuit of the bureaucracy’s projected idea. The assignation of two, taxonomically separate fields regulates her disposition through the metaphor of “busyness” and brings her intimate experience with the demands of her labor into semantically legible categories that are allowed for in the centralized bureaucracy of corporate production. Her frustration and contact with the friction of the bureaucratic process is made possible because she, quite literally, does two jobs. This does not mean that she works many hours in excess of the eight that many in the office self-regulate within – even though she did occasionally assist with and attend demonstrations of C4i’s software after-hours and after a day of work. Instead, it is the inscription of the organizing metaphor of bureaucratic practice upon her own frame of reference that conditions Sam’s experience of the added stress of “two jobs.” The centralization and conceptualization of labor in a corporate bureaucracy provides for specific, itemized responsibilities that, ideally, will fit into the average workday. Therefore, the narrative that is provided to her, and the imagery that constitutes her self-image in this centralized environment is inherently drawn from the expected relations of commitment that define the ideal of each practice she is committed to. Sam’s work on my business card took the better part of an hour. My business card was replete with a designation that indicated that I was part of the “business development” department of C4i. This notably vague role included executives almost exclusively, and the various “representatives” who regularly operate in the foreign countries that C4i already conducts business with, or in countries with whom C4i would like to accrue new business.

The production of business cards for my entrance to CANSEC was considered a non-issue by Gordy. He saw no issue with bending the CANSEC organizers’ rules of
bureaucratic procedure that were meant to limit attendance to the show to the involved corporations and specifically invited guests, such as Canada’s Minister of National Defence at the time, Jason Kenney. Also representative of this fact was that my faux business cards were printed not on card stock, but on flimsy, glossy, photo paper, adding an extra dimension of dubious meaning to my association with C4i’s attendance at the show. The space between a necessity of conformity with procedure and the ambiguous authority granted to Gordy, in making an executive decision to grant my attendance, is reflective of the democratized, decentralized notion of trust that is placed in companies who are granted attendance to CANSEC. The ability of Gordy to bend the rules of the ideally-strict bureaucratic behavior are indicative of what Herzfeld describes as the loose semantic content that can be drawn from the structured, persistent symbols that define bureaucratic practice (Herzfeld, 1992: 26-28). The persistent symbol in this context is the business card, representative of association with the organizational framework defined in C4i’s structuring of labor. The mere presence of a business card, normally only attainable through officially-sanctioned participation in the productive complex of hierarchical organization, is repurposed to allow situation of an anthropologist – if only through a structured, physical manifestation of the business card’s centralized meaning in bureaucratic practice – within. Here, Gordy is capable of bending the – ideally – strictly-controlled metaphor of the business card and its functional capacities in securing communication and identification between corporate environments. He is capable of this because of his capacities as the “preeminent,” charismatic authority that constitutes the authoritative loyalty expressed through his subordinates’ labor in C4i’s office each day. Gordy is, for the purposes of defining the boundaries of functional bureaucratic
metaphors, able to define the appropriations of economic activity within the bureaucratic space that organizes around his expression of charismatic ideal (Weber, 1968: 248-249).

Each company that is invited to CANSEC is, in part, responsible for a certain constitution of the industry as a collective whole. The “behavior” of each company is mediated through attendance at, promotion of, and maintenance of the collective notion of what it means to operate independently and in conjunction with the wider defence industry in Canada. The oscillations in an adherence to collective practice, and therefore a collectively constituted notion of exercising authority amongst, and independent of one another, allowed, for example, Gordy to step away from the bureaucratic strictures of the CANSEC rules and the accepted practices of inter-corporate relations to envelop me and my behavior within the collective practice of the industry.

CANSEC is put on each year in Ottawa, Canada’s capital city. In previous years, the show had been staged at a convention center in Ottawa’s downtown core, a stone’s throw from the seat of the Canadian government. The year I attended was the first year that the conference had been moved to a large convention center near the airport. This new convention center, and Ottawa’s airport, are situated near the south edge of the city – this move isolated the show from daily life in Canada’s capital, excising the industry’s performance of its collective identity and identifying behaviors from a more densely constituted public gaze in Ottawa’s core.

This phenomenon is particularly indicative in the response of protesters of the show to the change in location. As a momentary aside, I should mention that this is information that I did not receive until my second day on the show floor, when it was relayed to me that the previous year’s show had been picketed by some “hundreds” (to
use the word of one of C4i’s attendees) of protesters. This year’s show was picketed by a significantly smaller number. As I was whisked past the corner on which the protesters stood, I counted five individuals. More than half of this small cohort were female, appeared to be at least middle-aged, and were repeatedly derided by members of both C4i’s contingent and others visiting C4i’s booth in various ways. One particularly salient comment struck me when we arrived the first day, just before the official opening of the show, at eight in the morning. Noting the lack of protesters at the beginning of the first day, one business development executive exclaimed, “Oh, they must not have had their morning Starbucks yet.” Shared as a laugh between colleagues, the comments were derisive, but not malicious. After we had arrived on the show floor that day, a small storm rolled in with buffeting winds that sent the protesters’ canopy tumbling down the street, followed by several underprepared protesters in hot pursuit.

Another set of jocular moments of poking fun were delivered soon after, on the show floor, between members of C4i’s contingent and several executives of another company who had dropped by to say hello to Gordy and Bill (C4i’s Vice President). These “dropping by” moments and the opportunities they provided to far-flung executives to catch up and spend time with old friends, colleagues, and fellows were described to me by Vince, C4i’s business development representative in Ottawa, as one of the foremost reasons why anyone attends the conference at all. It is this “goal” of sociality at the show that I was reminded of often, when I would ask either Bill, Gordy, Vince, George or Danny (C4i’s contingent) who it was that had just walked by with a wave or who it was who had just stopped by to ask about what any one of C4i members had been working on since last the two had spoken. The informality of these “dropping
by” moments, and the stress that was laid upon the overall informality of the show as facilitating these moments, contrasts with the other opportunity that the gathering of executives and business professionals offers: a chance to put onto paper and sign any deals that have been negotiated either in part or in full prior to the beginning of the show. Here, the espoused dual-purpose of the show is situated within two unique forms of the “thought-work” that reproduces and circulates the functional narratives of expectation for fulfilling corporate bureaucracy functioning on the show floor. The routinization of informality in corporate relationships expresses conditions executives in this environment to regulate each other’s practice as “like” kin in the pursuit of the same, idealized goal. Here, the pressure of the practice of labor in the office environment is removed so that socialization can reproduce the industry’s familiarity with the individual charismatic authorities that constitute the industry as a definable “whole.” In this way, the persistent symbol – to use Herzfeld’s terminology – of the successful charismatic leader is constantly reproduced in these engagements, without coming into conflict with the “actual” success or failure of any one of those authority’s corporate bureaucracies (Herzfeld, 1992: 28). It is this consistent framework of ritualized, spatialized charisma that is on display in the design of the booths on the show floor. It is found in the circulation of “intimate bases” from which to draw validation of an individual’s place within the larger “characteristics” of expression that are narrativized into the symbolic relationship of the charismatic corporate leader to the successful production of capital (Goffman, 1959: 79-80; Herzfeld, 1992:10). Communication between defence contractors, large and small, does not by any means cease outside of the confines of the show, but the show’s centralization of contact and standardized expectations for dress
and modes of expression provide a point within which to mediate externalities into a performance of collective industry identity.

This performance is not only wrought in the codes of dress, organization of spaces for meetings, and in the tacit notion of the “informality” afforded to socializing at the show, but it is also present in the way that the show’s space is aesthetically produced. This aesthetic performance involves a level of orchestrating visual spectacle that reflects not only an understanding of how to capture the imaginaries that bring new weapons and technologies to life on drawing boards and production lines, but that also reflects aggrandized, populist notions of consumer culture. These aggrandized images of consumer culture are perhaps best represented by the imposing presence of the latest model of a Light Armored Vehicle (LAV) on the show floor, a presence that was complete with the opportunity for show-goers and curious anthropologists to climb in and strap in as if preparing to trundle on down a distant desert road. Another, more salient representation was the plethora and variety of drones and drone-related accessories that appeared to comprise many of the centrally-located, larger booths on the show floor.

While strolling down the main artery of the show floor, I was initially struck by the notion of hierarchy that conditioned the show’s organization of space. Large, well-known companies such as CAE, Northrop Grumman, Boeing, and Raytheon were among the largest booths, and had been positioned next to or opposite one another along the main hallway of the show floor. This hallway had much the same appearance that one might expect in a shopping mall; each booth welcomed visitors in like a store front, with a number of pillars that enclosed a square or rectangular space with the company’s logo emblazoned upon the walls and beams overhead. Within, and by stepping up over the lip
of the barrier between a change in flooring, a visitor or customer is greeted by comfortable carpet to stand on and is surrounded on all sides by glossy promotional materials. Well-lit display cabinets feature artfully positioned facsimiles or individual samples of everything from a new, planned coastal patrol vessel for the Canadian military, to a glass display case containing the latest series of ammunition artfully aligned in a row and polished to a reflective sheen. This manicured and carefully articulated presentation of the means of war appeared surreal to me at first, as if drawn from artistic depictions of the defence industry in film, on television, and in the less-than-generous rhetoric of those who criticise the opulence and elitism of the industry. These presentations of weapons, weaponry, and technologies that will be integrated into the lives of soldiers could not be more removed from the contexts of their intended use, save for dramatizations on posters and in promotional videos that showcase new products with imagery drawn straight from action movies.

These aesthetic presentations do little to draw the industry closer to its subject matter, and this fact is only bolstered by the appearance of attendees, predominantly white men dressed in suits. They impose a level of stylized formality upon the exchange of means used to conduct war, and they stylize the production of arms in a way that romanticizes the use of these means in a way that serves to socialize executives and other members of the industry into a culture of professionalism that sanitizes the practice of war for the purpose of making the discourse of industry possible. This practice of socializing through aesthetic practice to inculcate a notion of professionalism is akin to how Lanita Jacobs-Huey describes the role of training hair stylists to refer to hair care products “scientifically,” in order to create a professional aesthetic to which stylists may
adhere in order to render authoritative discourse possible between clients and stylists (Jacobs-Huey, 2006: 31-39). There, Jacobs-Huey describes this process as one that simultaneously creates a professional sphere from which stylists become a point of reference for the “science” of hair care; the creation of this aesthetic is based upon the display of professional certifications, discourse on the “chemistry” of hair care products, and upon legitimizing the professionalization of hair care (Jacobs-Huey, 2006: 32-34).

The practice of this aesthetic strips away the political, the mundane, and the inherent morbidity of war in order to shift attention away from the practice of war and towards the production of war. This practice of stylization and socialization is similar to the way that James Der Derian describes the performed mimesis practiced by the British and American militaries in the 1920s during the “Salisbury Plain” war game, and the “Desert Hammer” exercises at Fort Irwin in 1994. This mimesis is the re-enactment of caricatures of military practice, caricatures that are drawn from historical conflicts and inscribed as practices that the state and citizenry are indebted in the historical creation-myth of the state (Der Derian, 2001: 35). These caricatures, in peace time, serve as the only practicable means by which a military establishment and the soldiers that make up that establishment can inculcate an understanding of the military’s iconic role in maintaining the achievements and continued existence of the state within the minds of soldiers and civilians. Without these caricatures, the nation and the military are confronted with an uncertainty of purpose, or in Der Derian’s words, “faced by the uncertainties of life, we seek a virtual security from the dead, incurring debts that can never be repaid” (Der Derian, 2001: 35). The performance of “virtual security” in these cases is that of the war game, and the training exercise. Both the Salisbury Plain exercise
and the Desert Hammer exercises were designed as “experiments” to test what were considered new forms of warfare. Both were replete with observers, who would later chronicle the exercises with fantastical imagery that, while not wholly practicable in pursuit of tactical military gain, did infuse the exercises with a perception of “progress” towards a technological realization of an unassailable security for an eternal nation. One quote, drawn from one of B.H. Liddel Hart’s reports on the exercise at Salisbury Plain for the Daily Telegraph, is particularly telling of these attempts to create virtual certainty.

And the passage by Stonehenge [by the armored column] had also a symbolic effect, for there the gods of the prehistoric past could be conceived as watching from their long-abandoned altars the procession of the mechanical gods of modern man – both equally the creation of man, but the one expressing the static mentality of the past, and the other the ever-changing, restless motion of the mind today (Hart, quoted in Der Derian, 2001: 26-27).

Preparation acts as re-enactment in tribute to the ancestral achievement of sovereignty by long-dead heroes. By conducting these exercises, both nations show that they are still maintaining the “good” cause and the determined certainty of those involved in the birth of the nation. In this way, the “good” of the cause becomes associated with its certainty and its predictability, while “evil” becomes associated with the notions of uncertainty, fear, and the unknown (Der Derian, 2001: 35).

CANSEC is, just as much as these other exercises, a practice that generates this virtual certainty. However, this is not a virtual certainty performed through a re-enactment of the violent achievement of sovereignty. It is, instead, a mimicry of another enabling facet of this pursuit of military certainty, that of the industrial organization required to produce the means of this military practice. CANSEC’s show floor acts as one virtual space in which to parade the “mechanical gods” of today, paying tribute to the “static mentality” of past weapons producers with a procession of highly diversified,
ever-changing iterations of the “ideal” that first left the production line in support of the “ideal” of the nation. Refinements and stylized presentations of everything from bombs to backpacks are especially more effectual when further removed from the contexts of deployment and use. Such tributes further abstract the moral and ethical purpose afforded to weaponry in order to create a token of virtualized certainty – one that situates the practice of war within another corpus of practices that pay tribute to the achieved certainty of the wealthy, those of capitalist enterprise. CANSEC’s performance of these practices is telling in the design of booths to resemble store fronts, in the presentation of products as providing “value for your dollar,” and in the exercise of courtship designed to secure a purchase from a customer.

These designed impositions of the imagery of capitalist enterprise serve as a means to solidify a simultaneous indexicality and iconicity of the space of CANSEC’s show floor. This “iconicity” is that defined by Charles Peirce in his examination of the different linguistic categories that can be said to structure and exchange meaning in language, not only through spoken or written word, but in symbolic and metaphorical exchanges in visual representations (Peirce, 1960: 276-277). For Peirce, an icon is that which displays “firstness” in its capability to convey meaning; this “firstness” is the quality that, in representation, allows an icon to directly convey meaning without need for interpretation (Peirce, 1960: 276). This direct conveyance of meaning is the direct participation of the icon in the conveyance of meaning; this is to say that there is no interpretive function standing between a receiver and a conveyance of meaning. This could be as simple as a photo of an individual; the photo is directly communicative of the representational capacity inherent in its sign; nobody needs to teach someone why a
photo is a representation, it is clear, and therefore, an icon. By contrast, “indexicality,” or an “indices” refers to a sign of a “second” character, that which “focuses the attention” on meanings that follow from a sign. For example, a knock at the door is an index, it indexes the meaning that someone is at the door, that the proper response is to answer the door, and that the individual at the door is not an individual who otherwise has access to the space.

For the purposes of my argument, I understand the show floor as a unique manifestation of both of these principles, as a method of indexing different professional realities in a space made iconic by the materialization of these indexes as icons of “trade.” I argue that these expressions are iconic, as well as indexical, because the creation of booths on the show floor is meant to create an icon of an index. The representation of weaponry in a unique professional context to the salesmen and executives of the defence industry solidifies a space for the performance of the indexes of the uses and appearance of military weaponry as natural to the space. To these executives, the display of these phenomena is iconic because it is instantly graspable in terms that enable executives to navigate the space utilizing indexed meanings that would otherwise not be appropriate to the use of military technology. It is not symbolic, the third order of representation discussed by Peirce (Peirce, 1960: 228-229), because these displays and the navigation and interaction within booths do not point to the indexes and contexts of use of the products on display. Instead, it creates a material manifestation of the indexes solely appropriate to executives, salesmen, and the business of selling these items as products.
For example, C4i’s display on the show floor is not meant to display any functional capacity of their simulation software as it would be used in an operational environment; instead, it is meant to showcase the value of C4i’s software in the software’s ability to integrate with other products in the industry. What is important is not C4i’s ability to simulate, but the ability to show that their simulations are manifested on the show floor in conjunction with other products; this showcases the indexical capacity of C4i’s software to be treated as a product, and not as a simulative representation of military practice. As it was related to me on the show floor: “the market for military simulations is already very crowded.” Part of C4i’s goal at CANSEC was to show that MILSIM and EDMSIM operate effectively in coordination with the other standards of products in the industry. Therefore, in the organization of the space of C4i’s booth, and other booths, iconicity comes from the spatialization of material structures to make an icon from an index, to make it obvious to a passerby that C4i is not merely representing a capacity to create simulation software, but that it is simulation software as indicated by integration with other products in the industry.

As I explored the show floor, moving from booth to booth and occasionally within, I was struck with the uncertainty of how I might respond should I be approached within a particular company’s “store.” I was struck with the uncertainty of whether I would be questioned with regards to that company’s offerings, whether I represented someone who was interested in acquiring a company’s product or whether I would be expected to act as a representative of C4i (as indicated on my badge) for the purposes of securing new partnerships with whatever company’s booth that I had wandered into. These moments of fleeting anxiety also followed me back to C4i’s booth, where I recall
experiencing nervousness at the prospect of being asked about C4i’s products and what I could responsibly respond without cutting in to the capitalistic endeavor that C4i had come to espouse to interested parties stopping by the booth.

The creation of this professional aesthetic also serves to orient other defence contracting companies in relation to one another through the creation of industry-based awards, for example, that are given out by defence industry magazines such as the Canadian Defence Review. These magazines serve as sites of industry engagement with the world at large, military or civilian; reporters from these magazines attend these shows and speak at length with presidents and CEOs about the purpose and history of a company – whether well-known or unknown – to showcase a company’s “profile,” about up and coming products, and about justifications for focusing efforts at innovation in one area of technology or another. These articles that chronicle the faces and names of industry, and why these faces and names are worth paying attention to, sit alongside broader articles oriented towards questions of the Canadian Military’s place within recent events on the geopolitical stage or articles written by active service members that opine upon topics that affect the military (such as women serving in combat roles). While not heavily circulated among the Canadian public, magazines such as the Canadian Defence Review note the “exposure to influential decision makers in Government, Military, and Industry” as a reason to pay for advertising – which can also be targeted further with access to Canadian Defence Review’s “editorial schedule” (Canadian Defence Review, 2016).

Another of Canadian Defence Review’s contributions to this aesthetic is the “50 Top Defence Companies” awards that are given out each year, several of which were on
display in the foyer of C4i’s offices. In 2015, C4i’s ranking was forty-two, up from forty-six the previous year. This list is determined by “an evaluation panel consisting of CDR editorial staff and independent advisors,” and is said to include an analysis of factors such as “economic impact,” “research and development initiatives,” “innovation,” “contribution to the nation’s security,” “national and international contract wins,” “excellence of management,” and “support of Canada’s military” (Canadian Defence Review, 2016). This list of factors, while vague enough to cater to a description of other industries, maintains a notion of professionalism in the defence industry that is bound to an understanding of the defence industry as grounded within a nationalistic framework that positions the best interests of industry alongside those of the Canadian military and government. An industry member’s biggest contribution to supporting of the Canadian military, in these terms, is being successful as a member of the defence industry and using that success to feed innovation and prowess into the Canadian military.

This notion of interpenetration and mutual dependency of public and private endeavours surrounding military practice is not a new one; from Dwight D. Eisenhower to James Der Derian, academics and public figures alike have commented on and analyzed the consequences of perpetuating the “Military Industrial Complex.” This “complex” is most easily identified by what has been termed the “revolving door” between public sector employment overseeing military, security or defence policy and private sector executive or board positions at defence contracting companies. When the Bush administration first took office in the United States in 2001, “it appointed thirty-two executives, paid consultants, or major shareholders of weapons contractors to top policymaking positions in the Pentagon, the National Security Council, the Department
of Energy, and the State Department” (Hartung and Ciarrocca, 2004). Likewise, these appointments go both ways. Some high profile examples include Air Force procurement official Darleen Druyun’s arrest for attempting to negotiate a position at Boeing, while simultaneously negotiating a contract to buy a hundred planes for the United States Air Force, and Pentagon acquisition chief Edward Aldridge’s appointment to the board of Lockheed Martin immediately after leaving the Pentagon (Hartung and Ciarrocca, 2004). On the show floor at CANSEC, this practice is not unknown, nor is it frowned upon or considered to be a hurdle to industry progress. As one anonymous executive opined, jokingly, to me on the show floor, “it is an incestuous little industry.”

This fact makes the preponderance of opportunities for “dropping by to say hi,” and “catching up” a more telling display of the sociality that is required not only to maintain the “revolving door.” It is also required to maintain continued adherence to the aesthetic practices that create the “industry” and the “profession” as intelligible practices to members and outsiders. A telling example of this phenomenon on the show floor came on the morning of the first day of the show, when a procurement representative from NATO stopped by C4i’s booth and struck up a conversation with Gordy and Bill. The NATO official briefly inquired about C4i’s location, in Calgary, Alberta, and about the impact of a recent election – in which a majority New Democratic Party (predominantly leftist) government came to power – on the economic situation in Alberta. In response, both Bill and Gordy referred with disdain to an example that appeared to exemplify their dissatisfaction with the change: a “teacher” had been appointed as the newest Minister of Energy (Cattaneo, 2015). The derision at this decision was aimed not at the specific individual, Margaret McCuaig-Boyd, and something ill-fitting of the individual’s
character, but instead at the decision to appoint anyone other than “industry insider” to the post. This is besides the fact that the individual in question, in addition to twenty years’ experience as a schoolteacher, also held managerial positions within schoolboards, positions on local chambers of commerce, and also owned and managed a small-business consulting firm prior to taking office. What is important about Bill and Gordy’s derision of the appointment quickly followed, with the claim that nobody but an industry insider would be capable of “connecting the dots” of the energy industry and the public sector regulatory regime. This notion of “connecting the dots” was explained to me as an ability to understand the unique “connections” and the existing business relationships between various players in the energy industry. This ideal requirement for a public sector official was not expressed as a technocratic qualification of a regulatory official overseeing an industry. Instead it was expressed as a measure of an official’s apparent inculcation into the sociality that make industry members intelligible to one another, and that which makes the practices that follow from these members intelligible as encouragement current practices in the industry. The disdain expressed by Gordy and Bill is not, therefore, merely a superficial dismissal of a political party whose beliefs that they do not hold. Instead it is a performance of an aesthetic ideal that creates the conditions of, and justifications for, certain forms in presentation and the imputation of certain forms of sociality between industry and government as essential markers for determining not only who is “in” or “outside” the industry, but also what is “good” or “bad” for the industry.

This set of practices that constitute the professional aesthetic of the defence industry are performances akin to how Judith Butler describes the “cultural matrix” of regulatory practices that create the discrete, intelligible, and intrinsically performative
categories of male and female (Butler, 1990: 23-24). Butler points to the ways that
gender, and specifically the binary of male, female, and the heternormativity that is
expected from this dichotomy, is not merely constituted by a set of characteristics drawn
from the body (Butler, 1990: 23). Instead can be understood as a situated set of
interrelated performances that link the body and a notion of gender to practices of desire,
hygiene, and medical expectation (Butler, 1990: 24-25). Situating gender within this set
of inter-relationships not only determines the norms of gendered practice once gender has
been solidified within the “cultural matrix” of practices, but it also provides for the means
to cohere a notion of what is deviant from the norms established by this matrix of
practices (Butler, 1990: 24). This deviance from the norm does not merely create a
category of “other,” it also creates the affectations, practices, and the aesthetic of
“normalcy” from which the “other” is situated into this “cultural matrix.” This cultural
matrix on the CANSEC show floor can be understood, in part, as the aesthetic achieved
through a decoupling of the functions of the means of war and the contextual use of those
same means, through situating those means within a framework of consumer culture. The
cultural matrix performed on the show floor also includes the practiced aesthetic of
executive business culture: the expectation of wearing a suit for executives, the
predominantly white and male appearance of the attendees, and a linguistic index that
constitutes expertise as a measure of inculcation into the sociality of the defence industry.

Deviation from the norms of this cultural matrix does not only produce the
“other” in such categories as “protester” or the dismissible teacher-minister, but it also
internally produces a gradient of culturally performed categories on the show floor.
Executives and directors are not the only members of companies to attend CANSEC each
year. C4i’s contingent, for example, was also comprised of a current project manager (and future business development lead), George, and C4i’s head of engineering, Danny. Danny’s background as a software developer and practicing engineer, and his role in overseeing the ongoing planning and implementation process on most of C4i’s active projects made him an ideal candidate to showcase the technical knowledge that C4i brought to bear upon the show floor. George, also with a background in engineering, and a former Major in the British Army, was also responsible for communicating technical information and for guiding show attendees through the motions of using C4i’s simulation software. Both George and Danny’s roles on the show floor are indicative of the internal division in performed categories that exist on the show floor of CANSEC. These divisions do contain within them a certain understanding of hierarchy in the categorical labels of “president” or “executive” versus “project managers,” or “leads,” but on the show floor this hierarchy is muted in a performative capacity that appears more as a horizontal division of labor, rather than a set of relegated tasks that are imposed from the top down. This hierarchy can also be described visually, as presidents and other top executives appeared to be exclusively clothed in suits, while the other employees of booths were often seen with tucked-in golf shirts and slacks – and, as it was suggested to me when I asked Vince about proper attire, “it’s not a big deal, but you will probably stand out more if you don’t have a suit.” This visual gradient became more noticeable when I learned that some defence industry trade shows – the “bigger ones” as I was told – also have a “family day,” wherein the children of industry employees are allowed to roam the show floor and handle the demoed equipment on display at the show.
George and Danny’s preparation for CANSEC in Calgary is telling of this understood, tacit division of labor. In the weeks leading up to the show, George, Danny, and Tony were managing the exhaustive pursuit of defects in both MILSIM and EDMSIM. George, not normally required to do any active bug testing, spent a great deal of time in the test lab with Sam discussing and witnessing defects first hand, while simultaneously designing the simulation scenario that C4i was to present on the show floor. Tony, while in charge of managing the quality assurance and bug testing efforts for all projects, is also the project manager for MILSIM, and spent a great deal of time testing with Sam in the lab to ensure that all the bugs actively being fixed by Monty and Mular were of the highest priority for what was to be shown in the demo. At this stage of preparation, Bill and Gordy were largely absent in the day-to-day work that took place in the test lab and in that of the developers charged with fixing bugs. This preparation also included adjustment of expectations of the demo as the show date moved closer, and adjustments to the scenario to ensure that whatever was shown was at least coherent enough to demonstrate the capability that C4i sought.

Within this preparatory environment, George, Danny, and Tony mediate the intended aesthetic construction of the simulation to conform to the performative practices of defense industry capitalism that must be adhered to in order for C4i’s products to be considered “good enough” for the show floor. As such, George’s role in creating a scenario that not only adequately displays the features that C4i wishes to laud as “innovative” or “new,” but also is sanitized of glaring software defects, situates the production of a tool for training for war within the acceptable aesthetic of the wider defense industry, but also refined imagery of capitalist consumer culture. George, as an
example, ended up denuding a majority of the interactive content that would otherwise be available for potential customers in order to orchestrate an “on rails” experience. This experience drifts from perspective to perspective in the simulation, without any prompting from those in control, in order to show off the various encounters that C4i thought represented the best that the software had to offer.

The relationships between the structuring of space, aesthetic, and responsibility are those that condition the playing field that C4i operates in. These relationships define C4i as a capitalist enterprise and representative corporation of Canada’s defence industry, but also as a software engineering firm charged with maintaining a balance between the organizational needs of technical staff, and the “visionary” trajectory offered by executive’s pursuit of the next sale. These relationships were fundamentally one-sided in a space such as the CANSEC show floor, where the conditioning of space and personhood is determined by an adherence to a professionalized aesthetic – one that triumphalizes sanitized depictions of war and the role of consumer culture in determining the imagery that conditions interactions with products on the show floor. This aesthetic pays tribute to nationalistic discourses that laud the militarized origin of the nation, and those driven by flows of capital to determine everything from proper attire to the division and categorization of labour between “executive” and “engineering.” Off the show floor, these relationships are distilled by the scheduled chaos of meeting deadlines, and the fine line that project managers must walk between micromanagement and shepherding of a product towards a “presentable” end state. The responsibilities of those at C4i who carry the weight of more than one skillset – such as Sam’s multi-faceted artistic talents coupled with her testing responsibilities – force confrontation with the idea that divisions of
labour only grow more specialized with the increasing specialization of a service-sector economy.

In the next chapter, I will explore the way these relationships are negotiated internally at C4i through a division between the core of development and what I will call the margins. These margins, as I will argue, represent a unique form of internalizing challenges to the dominant logic of developers during the production process. I will do this primarily by investigating the role of testers in creating an officially-designated space for the performance of subversion, and by utilizing the analytical lens of gender to investigate the meaning associated with skilled and unskilled labor. By investigating the role of gender in the workplace and how, at C4i, gender becomes less a means to divide labor among the sexes, and more a means to understand the nature of how labor is understood as representative of certain skills and not others, I aim to understand the process of marginalization in division of labor as a whole. I will utilize the lens of gender to understand how different conceptions of logic and ideas of how production should be conceived of contribute to dividing labor into categories that come to be associated with gendered space.
Tortoises and Heroes: 
Gender, and the Unknowing and Knowing of Software Testing

“Irony is about contradictions that do not resolve into larger wholes...about the tension of holding compatible things together because both or all are necessary and true.”

Donna Haraway, A Cyborg Manifesto

The nature of reality was always a fickle thing at C4i, despite C4i’s determination that scenarios reflect the ‘real’ day-to-day engagements of soldiers, emergency disaster planners. C4i was determined to test and develop software ‘useful’ to these actors. For a corporation fundamentally interested in appealing to perceived and desired consumer bases though, deviation from these stated goals, uncertainty and assumptions about reality were more the rule than the exception. These uncertainties and half-hearted commitments to supposed realities were clearest during the process of development, and in discussions surrounding the priority of features to be added to the software or the methods that would be used to test the facets of that software. In this chapter, I will explore the nature of testing as it applies to the creation and mitigation of uncertainty and the other positions that inject and mitigate uncertainty into the production process.

Interestingly, however, each of these positions is situated on the margins of the development process – as I will define and discuss later on.

Encounters with these uncertainties were the most salient in conversations with C4i’s software testers, whose job it is to uncover, log, and detail the various, inevitable defects that crop up during and after the development of software. These testers – Brad,

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Nara, Ben, and Sam – while simultaneously working on completely separate projects provided me with a picture of how software testing creates both the conditions and the means to perceive whether or not the “reality” of the software has been achieved. This is to say that testing, and the design of tests is the first encounter with the contextualized environment that the software will later become a part of. This process, and these test designs may more or less accurately reflect this desired context, the consequences of which will be detailed throughout this chapter. The means by which these testing constructs, their reception, and the relationships between testers and the rest of the production staff are maintained comprise a unique point in the production cycle where software’s status as a product is most in question. These individuals are charged with pushing the software to the limit, with finding the cracks in the foundational features, all the while identifying the smallest details, such as out of place commas or inappropriate color palettes for user interfaces. However, not all testers are limited to this regimen of bug hunting. Both Sam and Ben also shoulder separate responsibilities – Sam as C4i’s resident graphic designer, and Ben as C4i’s resident network administrator. This multiplicity of duties also helps to frame the perception of software testing professionally, as software testers are not often granted the same deference as developers in many discussions about the product’s design or scheduled implementation. Testing is seen in some discussions as a somewhat menial form of labor; repetitive tasks such as clicking the same buttons in an interface over and over, and creating entries in the team’s reporting software detailing how to reproduce a bug were sometimes seen as secondary functions to actually producing something that was ready to meet a deadline.
The Life of Testing

A tester’s day is one of organized repetition. The day begins by assessing what recently-implemented features are indicated “ready for testing,” and then a tester must assess each feature in terms of the validations given to determine the functionality of a feature. From there, a tester constructs what is called a “test case,” a set of written steps describing actions in the program’s interface that can be used as a practical guide to a repeated test. From there, it is a matter of simply performing the actions over and over again to search for “unintended” outcomes or outcomes that make the software stop functioning in part or entirely. Once found, these unintended outcomes are logged as “bugs,” and then sent back to developers for “fixing.” Upon fixing, these features are again tested to ensure functionality before “completion” can be registered for a specific feature. The schedule for a tester can often be interrupted by developers who might require testing for features that have “come up” and are not officially structured into the schedule of features for a specific cycle of development. Back and forth conversations between developers and testers could often crop up over more specific feedback that a developer might require about a bug, about the descriptions of bugs that developers work from to develop fixes, and about the timeline for testing for bugs on features that developers may want to push for as “more crucial” to continued development than others. This chapter will examine the structures of labor, subversive acts, authority, and organization of labor that arise around the act of testing and the other activities that
sustain and challenge the activities of developers at the ‘core’ of military simulation
development.

My previous chapter explored the ways that authority is exercised and
conditioned at C4i in order to reproduce and sustain the perception of hierarchy,
responsibility, and the notion of a division of labor that is considered essential to
efficiently producing software. These bureaucratic hierarchies are exercised through
events that collectively frame the association of certain kinds of labor with particular
individuals – such as Gordy’s presentation of TED Talks, and lectures focusing on the
logic of CEOs to other staff members during “informal” company lunches. I argued that
these framing events, and others, such as the interactions on the show floor at CANSEC,
serve to reinforce the social expectations of these hierarchies and to provide a means by
which the tasks of those at the top of this hierarchy relate the “purpose” of executive life
to attendant technical staff. I showed how professional practice was conditioned not only
by individual labor, but also by the organizing framework of bureaucracy that routinizes
particular kinds of authority in pursuit of the “value” imputed by money.

This chapter will explore the practices, participation in the decision-making
process, and the constitution of professional identity among one group of these
stakeholders in particular: software testers. Testing, and orientation of testing towards
producing something akin to the user experience in a professionalized, mediated
environment, is a practice that is rooted in investigatory, iconoclastic principles. Here, I
am defining iconoclasm in terms of the investigative role that testers play. In finding
defects in software, testers perform an iconoclastic action in questioning the authority of
technical logic utilized by developers. To question code is to doubt its capacity to be
functionally sound, and to force developers to create new means to represent these functionalities in code. Developers leverage thorough technical knowledge of coding practices to create functioning software, the same knowledge that testers almost always lack. Questioning the veracity of the implementation of this technical knowledge forms the basis of the function that testers perform; they are tasked, quite literally, with pushing the software to the limits and with breaking the software by using it for the purposes of understanding what is wrong with the implementation that the developers have utilized. Challenging the authority of developers is an inherently iconoclastic exercise. As the testers exercise an ability to question the technical knowledge from a space made possible by the status quo wrought by the perceived use of the technical knowledge of developers to achieve “productive” and “profitable” ends. The “production” of defects and bugs, and the description of errors, is a contested process over definitions, scheduling, and the voice of a tester in setting the conditions for possibility during testing. These facets of professional life for those who occupy a somewhat marginalized role in the production of software are essential to the construction of pieces of software. The situation of testers in the margins of development is a consequence of a begrudging acknowledgement of the uncertainty of a developer’s implementation. By committing a section of code, a developer asserts that such code “works,” as a measure of adherence to descriptions of what step-by-step functions a piece of code is meant to perform. These assertions are made in certainty, but a certainty that is hedged by the simultaneous development on other sections of the software, any of which – in interaction with another developer’s – may cause unintended defects or “bugs.” Much of the labor of development is spent attempting to locate the source of, and the solutions to, these bugs. One might
analogize this process to editing a piece of writing to ensure that the writing more forcefully, efficiently, and coherently creates a compelling argument. In this analogy, testers are readers of an argument, interacting with the argument and finding out of place commas, semi-colons, and misplaced variables that create confusion, incoherence, and “bugs.” As such, testers occupy a position of the uninitiated critic, pronouncing upon the veracity of the argument from a perspective outside that of the creation of the argument. Understanding the marginality in such a role becomes clearer when one understands the inherent conflict in this process. After all, nobody likes a critic.

While the focus in this chapter will be on testing and the creation of spaces during production for marginalized perspectives, I will also use this chapter to explore the concept of gender to show how different perspectives are marginalized in different ways. The scope of testing allows me to explore a bureaucratically organized regime of marginalization within the corporate structure of C4i, while gender will allow me to focus on the ways that different types of knowledge are segregated in the workplace and become part the whole of production in more subtle ways. My exploration of gender is meant to investigate how certain ways of knowing are othered through gender, and how approaches to inculcating certain kinds of knowledge in favor of others in the workplace may reproduce kinds of knowledge that reproduce inequalities, power differentials in authority, and the segregation of the workplace along sexed lines.

In this chapter, I will first argue for an approach to discussing gender that attempts to remove dichotomies between masculine and feminine as innate qualities of certain groups at C4i. I will ask: how do gendered concepts come to be associated with certain groups based upon social interaction, and the institutionalization of these concepts
in organizing labor and social life at C4i? I will then move into a discussion of how the practice of testing replicates these gendered contingencies and the structural qualities that form notions of ‘correctness’ and ‘incorrectness,’ and situates this practice in the bureaucracy of capitalist enterprise. After situating testing, I will expand this discussion of gendered labor to encompass other ‘marginalized’ labor in the practice of software development – labor that sustains the conditions in which developers are able to perform the core competency attributed to developing software.

To further this exploration of labor in the margins of C4i, I will also discuss the manifestation of gendered organization and gendered perceptions of labor at C4i. I will argue that gender is performed in the negotiated hierarchies and divisions of labor inherent to the production of software. Labour and hierarchy in this context reproduce, visualize, and inculcate the demands of an associated charismatic authority and a kind of legibility of reality that C4i’s attempt to address for use in military practice. Here, gender is not a specific set of traits or performances that can be identified with typical notions of ‘masculine’ and ‘feminine.’ Instead, gender is performed at the intersections between notions of skilled and unskilled labor, between craftsperson and consumer, between knowing and a structured unknowing.

**Masculinity and Skilled Labor**

The notion of masculinity as associated with skilled labor and the ‘craftsman’ is one that has a long history in articulating a gendered division of space not only in the home (where the stereotype of the ‘handy-man’ comes to mind), but also in public life and the workplace (Herzfeld, 2004; Kondo, 1990). Historical treatments of masculinity in
the workplace have invoked notions of hereditary knowledge, patrimony, and recall images of professional guilds in pre-industrial history (Milam and Nye, 2015: 5). Further, stereotypes of masculinity are not only sustained to segregate space from femininity and women. Developing an understanding of masculinity in association with “skilled-ness” takes into account national images of adherence to “tradition,” and the creation of oneself in the image of masculine stereotypes that are lauded in emulation and embodiment (Kondo, 1990: 232). Reproducing these stereotypes does not only reproduce the idea of masculinity to be emulated, but in emulation it also produces the associative status and desirableness of males that emulate these stereotypes. The consequences of emulation and embodiment do not merely replicate the image of masculinity as desirable, but it also becomes associated with the economic success and acquisition of material resources that become emblematic of the ‘achievement’ of a successful performance of masculinity (Herzfeld, 1985: 163-205). The edifices of successful performances of masculinity make the possibility for articulation of these performances in public space more visible through the exercise of economic power. Furthermore, these material achievements do not merely refer to monetary acquisition, but also the perceived desirableness of men who perform these characteristics in public life – opposite women. Narratives of individual struggle of craftsmen striving to embody these stereotypes in relation to diverse crafts simultaneously differentiate the idea of masculinity in diverse contexts while retaining abstractions of “struggle,” “ambition,” “creativity,” and individual ability to endure or

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2 Michael Herzfeld, in *The Poetics of Manhood* describes a particularly relevant example of this in his discussion of Cretan sheep-thieves, whereby the successful theft of a sheep (considered a material resource) by a Cretan man must not only be performed as an act of a completely economic nature, but also performed publically through song and dance to inculcate the values of masculinity associated with sheep-theft as culturally desirable within Cretan society.
exercise such characteristics in the pursuit of “self-realization” through craft (Kondo, 1990: 234-241; Cohen-Cole, 2009: 236-246). Particularly from the 20th century onwards, an association of masculinity with all manners of scientific practice and a perceived kinship between those considered to be involved in the craft of science produced a “convivial masculinity” (Milam and Nye, 2015: 10). This “conviviality” was defined by the “dinner clubs,” “salons,” and other interpersonal socialization spaces that were developed as places where (male) scientists of all varieties engaged in friendly, intense discussion; this socialization across disciplines provided, it was argued, “a sense of fellowship among diversely educated men…a cure for alienation in modern America and the fractured nature of its culture, society, and intellectual life” (Cohen-Cole, 2009: 258). Such environments sustained spaces to engender stereotypes of how educated discussion and sociality were to be performed among fellow skilled laborers of intellectual and scientific disciplines. Similarly, these spaces and the associative sociality created within them also created a perceptual and spatial segregation of masculinity in opposition to femininity as representative of a difference between skilled and unskilled practice. A demographic reality of fewer women within the academic environment that spawned the diversification and growth of scientific disciplines of this period, coupled with the intensification of sociality between those considered intellectually “like,” and the increasing economic power afforded to individuals drawing on these new educational potentials created a space where to be “intelligent,” “academic,” and “skilled” was to be masculine (Traweek, 1988; Harding, 1991; Haraway, 1996). In The Science Question in Feminism, Sandra Harding first raised the question of these very social structures of science as well as the social meanings they (re)produced (Harding, 1986). Donna
Haraway, in *The Cyborg Manifesto*, demonstrated how the definition of one half of a binary construct, like masculinity’s association with science, also meant the placement of its opposite within a larger matrix (Haraway, 1991). Contra the growth of an “intellectual” masculinity, unskilled practices and spaces that did not engage with this growth and intensification of sociality around individuals involved in this growth become the antithesis of these displays of masculinity. To be unskilled is to be unscientific, to be unscientific and to turn away from the “creative” life associated with this life is to be feminine. The association of the latter halves of these pairs with the feminine is not explicit; it is exercised communicatively, economically, and in the constraints leveled by the restrictions of bureaucratic divisions of labor in the organization of a corporate firm, such as C4i.

**Leadership, Gender, and the Skilled and Unskilled**

To utilize several examples, the most highly regarded and highest ranking members of C4i’s corporate hierarchy are members of the executive and directors of the various divisions that exist within C4i. All are male. These positions are not merely perceived to require specific sets of skills or experiences – such as Gordy and George’s multiple decades of experience as active members of militaries – but are also perceived to require the application of these skills in creative ways in the configuration and management of labor associated with these skills. The divide in sociality between director and executive members and the rest of the staff is stark; personal conversations between levels of the hierarchy were uncommon and personal association often remained confined within levels of hierarchy. Daily lunches with other employees often only took place
within similarly placed hierarchical groups – such as between Brad, Monty, and Mular. There were times when these divides would be crossed – often, developers eating lunch together would also invite members of the testing staff and the summer students. A singular exception to this rule appeared to be Danny, C4i’s engineering director. Danny repeatedly related to me his disdain for being drawn away from active, everyday development work in a management position, and I argue that one way of mitigating these feelings was his interest in eating with other developers, a method of maintaining a certain engagement with a perceived kinship relying upon the skills associated with development.

In contrast, Sam, Nara, Vera, Rachel, and Jane could rarely, if ever be seen eating with other employees in the office, besides with each other. Often, during lunch, Jane would attempt to organize a small walk around the area outside C4i’s offices with the other women in the office, a practice that was exclusively engaged in by the women of the office – besides one male anthropologist tagging along on several occasions. This gendered separation of space is not merely spatial or even practical in association between members of similarly-ranked positions in corporate hierarchy. Rachel, Vera, and Jane, for example, all occupy radically different positions in the hierarchy of skilled labor at C4i. Rachel, an accomplished engineer with decades of experience in the industry, Vera, a newly-accredited accountant and C4i’s all-around administrator, and Jane, C4i’s technical writer, associate not based on similarly-skilled experiences, but on a perceived similarity associated with gender. Rachel and Jane’s co-location, Sam and Nara’s co-location in the testing lab, and Vera’s separation from the rest of the office in the lobby further spatialize the office environment along gendered lines. Interactions, due to this
spatialization, are not completely constrained between genders, but co-location did
appear to engender more frequent interaction between employees simply due to the
ability to converse while continuing with work that required one to be situated at a desk.
Further, as an association with the divide between skilled and unskilled labor, it becomes
easier to understand what “unskilled” looks like in the context of software development
when identifying this divide through the lens of gender. Despite Vera and Rachel’s
technical competence and accreditation in technical disciplines, their positionality in
relation to exercising these skills is still defined in opposition to the ‘actual’ skilled labor
of developers tasked with the ‘actual’ development.

While Rachel was heavily involved in the design process that was later passed to
developers, she described to me several times that a typical and overall ‘general’
description of the relationship between ‘designers’ and ‘developers’ was one of
separation. Design is passed to developers, who then develop, and then this work is
assessed by designers. Rachel’s externality to the development process is gendered by her
association with a specific set of skills that are external to the technical competence
required to participate in development, skills that are exercised at C4i exclusively by
men. The tension between these notions of skilled and unskilled labor are sustained by
the fact that the role of the developer is typically perceived to be highly individual,
‘hermit-like,” and it was related to me on numerous occasions that the tendency for
developers is to be cut off from “everything” during work; headphones, isolation, and
gruff sociality were the most common stereotypes I heard applied to developers. These
stereotypes serve to reinforce the hierarchical separation of developers from the rest of
the staff, not only in the performance of a labor that is, generally, very individual, but it
also reproduces the gendered divide and the notions of what skilled and unskilled labor are representative of in the organization of the production of software.

Exploring the tension between these structured, spatialized, bureaucratically managed, and practiced divides of labor, notions of skill, and the gendering of this divide will serve to thoroughly explore how testing and other ‘unskilled’ labor at C4i sustain and reproduce these divides in practice, but also constitute essential practices that maintain the context for exercising skilled labor in the first place. There would be no development without design, after all, and certainly not without the administration required to sustain a corporate bureaucracy and the necessary testing regime required to produce software that not only ‘works,’ but works in the context of whole, continuous use by users. The separation and division of these stereotyped labor practices that replicate notions of skilled and unskilled are essential to the notion of capitalist enterprise and the bureaucratic organization of capitalism. Further, as valuation of these divisions of labor often follow gradients can be said to be directly proportional to perceived level of ‘skill’ associated with certain positions, the relegation to an ‘unskilled’ position is not only a matter of organizational practice, but also replicates notions of value and subordination of those deemed ‘unskilled’ to those deemed to be ‘skilled.’ Sustaining the subordination of unskilled labor to skilled labor, as determined in valuations that do not necessarily have any objectively verifiable qualities outside of the organization of capitalist enterprise from which these valuations are drawn, sustains the divisions along gendered lines that come to be reproduced due to an association of ‘skilled’ positions with masculine qualities.
Sherry Ortner describes these divisions, subordination, and the valuation of labor in public life with the analogy of “male is to culture” as “female is to nature” (Ortner, 1974). For Ortner, “culture” is “engaged in the process of generating and sustaining systems of meaningful forms (symbols, artifacts, etc.) by means of which humanity transcends the givens of natural existence, bends them to its purpose,” and “controls them in its interest” (Ortner, 1974: 71-72). The subordination of “nature,” the natural, unskilled and uncontrolled existence of humanity’s “default” state to “culture,” therefore presupposes a valuation of an ability to “control” the means of nature and subordinate these means to a culture’s ideals as innate and – perhaps ironically – as a natural course of human existence (Ortner, 1974: 72). Capitalist enterprise, especially in relation to technological labor, presupposes this logic and very explicitly places a monetary value upon the ability to exercise control through skill. Divisions of labor, hierarchies and the authority that is afforded to higher echelons of hierarchy inherently replicate these valuations in material forms and sustain the association of male to female as skilled to unskilled. Universally subordinating skilled to unskilled is more symbolically and materially saturated in individual existence than ever, with pay-scales, bureaucratically-defined affordances of authority, and artistic representations that reproduce these valuations as superior. By investigating the practices of testers and other positions at C4i not considered to participate in the ‘actual’ labor of development, I will show how these valuations and the sustained tensions of subordination are not only gendered by demographic representation, but also in how labor external to development is inherently gendered as part of maintaining this tension. Subordination and valuation in this context is inherently gendered, as notions of a divide between notions of masculinity and
femininity come to be associated with socialities, material conditions, and achievements associated exclusively with ‘skilled’ labor that is considered the ‘core’ of production.

The role of the tester allows for an exploration of these tensions between those with authority in the production of software and those who are subject to such authority. Testers are purposefully positioned, conditioned, and organize their time to act as both insider and outsider, as both producer and user. As user, mediator between the professional and the private, and as the performers of what can be considered some of the “menial” labor of software development, testers are uniquely positioned in the tension between the market and the technical implementation of technological innovation. Further, as the divide between professional and private also replicates the division between the skilled labor required to produce products for the ‘unskilled’ consumer, this positionality of the tester as a structured externality also replicates the same gendered division between skilled and unskilled discussed previously. In this context, testers professionalize the femininity that is perceived in the unknowing user; iterations of software are repeatedly passed to the unskilled in a continuous process that is, by design, segregated from skilled production. Ironically, it is exclusively from this position of structured unknowing that challenges to the logic of skilled labor can be made; this process was referred to several times during my fieldwork as a means to uncover what “biases” of developers might be preventing successful design and implementation of functionality. As such, subversion of the valuation and subordination to this skilled, ‘core’ labor is allowed, but only within the demarcated space circumscribed and hierarchically subordinated to the ‘core’ of development. Testers challenge the daily practice of functionality inscribed through programming by performing functionality
‘incorrectly.’ By discovering bugs in utilizing software in ways that developers did not intend or did not account for, testers perform a subversive everyday practice that is then inscribed through means legible to developers who then iterate upon these subversions to ‘correct’ the problem created by incorrect performance. This subversive process can be likened to the way that Judith Butler describes the inscription of bodily metaphors of wholeness, intactness, and purity in opposition to practices considered taboo, immoral or polluted (Butler, 1990). In her discussion of the connection between performing gender roles correctly, she argues that homosexuality, and the association of AIDS with homosexual individuals, is an example of how performing gender roles “incorrectly” can lead to narrativized associations of pollution and related negative consequences that Butler calls “stylized configurations” (Butler, 1990: 192). The repeated performance of testing to discover “incorrectness” is, in this way, a process of iterative subversion and subsequent reassertion of the performative norm of what “correctness” looks like to software developers, and how this notion can be engaged with to reproduce this notion in the minds not only of testers, but in the minds of the users that the testers represent.

**Other(ed) Lives in the Margins**

Testers are not the only positions that occupy the margins of software development. Coupling my discussion of everyday life in the margins with an investigation of gender will allow me to fashion an investigation that also includes C4i’s technical writer, accountant, human resources manager, office administrator, and the on-contract, human factors engineer. These positions, and those of testing, all occupy labor that is outside direct contribution of code to C4i’s software. Discussing all this labor in
the context of those external to ‘actual’ software development helps to situate an understanding of the performance of this labor as a collective configuration of the valuation of the hierarchies that drive software development as a whole and in a context of defence contracting.

While Rachel, C4i’s human factors engineer, does contribute to high-level discourse in design and serves to engage the experience of users through the visual interface and workflow of the software, her position is perhaps the most contested confluence of craft and iconoclastic actions. Jane, C4i’s technical writer, occupies a unique position in that her daily practices are difficult to integrate into the bureaucratic organization required by adherence to engineering’s agile methodology. Finally, Vera, C4i’s accountant-human resources manager-office administrator is situated as the all-in-one answer to the mundanities of bureaucratic practice that sustain and reproduce the material edifices and initial social interactions that demarcate the inside and outside of production. These positions are not all gendered in exactly the same way, but all share an occupancy on the margins of decision-making and development practices considered to be most-directly involved in the craftwork of producing software. These positions, in addition to those of testers, produce the negotiated tension of production that is required to sustain reflection upon and maintenance of the environment in which developers, directors, and executives “sustain the eminence of their wit, their competence and their profundity” (Goffman, 1959: 101).

Reflecting this tension, Lewis Carroll’s What the Tortoise Said to Achilles is the inspiration for the title of this chapter (Carroll, 1895: 278-280). In his brief story, Carroll addresses the unstable space between premises and conclusions by having Achilles
address a tortoise in the course of a race. The story confronts the justification of deductive logic to argue that inferences arrived at by deductive rationalization cannot, in fact, be said to be justified from a context independent of the propositions involved in their deduction. This is to say that, for every premise that Achilles offers the tortoise as a deduced inference in justification of his deductively rationalized conclusion, the tortoise may continue to assert that the new premise requires justification with yet another inference. Therefore, the justifications for deduced premises inherently presuppose deduction; they are circular in that “they appeal to the very principles of inference that are in question” (Barnes and Bloor, 1982: 42).

At C4i, the role of the tortoise is given to testers, charged with challenging the relation of premises to conclusions of the deductive logic at work in code crafted by developers. Testers perform tension in forcing reflection upon justification. Testers ask if it is justifiable to assume that outcomes in software, that are said to ‘work’ by developers, by testing these outcomes through the premises that are said to lead to these outcomes. Given a set of “validations” – a set of tasks and related responses to tasks that progressively determine the ‘functions’ that software performs, the assumptions of which developers craft code to reflect – testers are tasked with repeatedly justifying the desired outcomes of these validations through enacting these validations one at a time. The repetition and iteration in testing here is a performed subversion of the dominant logic and authority attributed to a developer’s technical knowledge of something as ‘working.’ This process determines whether or not the deductive inferences that developers have crafted to satisfy a particular outcome are, in fact, correct – and in some cases, whether these inferences are the most efficient ones available. In this case, it is an
institutionalization and bureaucratization of the same subversive process that Butler argued was at the core of responses to ‘misfires’ of dominant narrativizations of gender rolls; there is a space made for performing “incorrectly” (Butler, 1990: 190-192), and then these ‘imperfections’ can be fixed to assert dominant logics in ways more appropriate to mass consumption.

I outline this process of testing as one of deduction, inference, and confrontations with the assumptions of these deductions because I wish to address the iterative, subversive iconoclasm that is inherent to this process produced on the margins of software development. Testers exist to challenge the practical rationality of developers, and seek to pose increasingly thorough challenges to this rationality as the inferences of software grow more complex, as the code grows larger. This orientation forces the configurations of code in software to prove functionality – functionality in a way that addresses the premises that users will pose to the software in everyday use.

In the environment of software development, testers are purposefully ignorant of how these deductions work. Instead, testers seek to rationalize whether these deductions work in the context of use, the social environment that develops between user and software through a user’s interaction with the interface of a piece of software. The margins of software development produce this social environment between user and software in a number of ways, addressing the functions of differently-coded deductions to assess whether these functions are justified for the users that C4i seeks to sell software to. The different organizations of marginalia in the context of software development each serve to speak the “truth” of context to the “power” of deduction as represented in the functions of software.
Testing as an Afterthought

The tensions that arise from efforts to ensure that testing is an integral part of development also reveal the nature and extent to which different strategies and professional trajectories can impact the production environment, and even the perception of what constitutes a defect or not. In the terms discussed before, a defect is a fault in the deductive premises that comprise the algorithms that make up a specific function in the software. At times, these perceptions were the most frustrating for developers, whose pressures to develop features on time and in working order were complicated by news from testers that an implemented feature conflicted with or had broken another feature of the software. These moments of tension were made more salient through the use of C4i’s reporting, scheduling, and task management software, Team Foundation Server, as lists of bugs were populated by testers who were constantly playing catch up with the latest version of software. This saliency is due to the shared nature of experience with the reporting software in the workplace. Team Foundation Server is the centralized interface that directs visualization of how tasks are described, assigned and categorized. This software is the material expression around which Stand Up meetings are organized and is how individuals articulate progress upon given tasks in the context of development cycles. Here is where the tension can be visualized most clearly, in the enumeration of how many bugs require fixing, how many have yet to be tested, and how many hours have been assigned to the completion of these tasks. This interface provides opportunities to comment or critique the work or workflow of others, the scheduling of a particular
development cycle, and provide a means from which to assess the performance of employees relative to the statistics provided by TFS to director level employees.

At C4i, testers were often one to a project, except for ITN planner, which Brad and Ben worked on together. This meant that testers were often outnumbered by developers, designers, and the executives that managed the project by at least two to one. This imbalance of labor in physical terms was not only indicative of the imbalance of resource allocation for testing software, but also was a more broad indication of the software engineering aphorism, “testing is an afterthought.” While this aphorism did not condition all relations between testers and other employees of C4i, the strain that its manifestations placed upon the testers demonstrated some of the practiced truth in it. The idea that testing is an afterthought reflects the inherent tension that I discussed above, namely that between the production of code that “works,” and code that “works” as a reflection of the user’s experience with the outcomes produced by code. Brad, for example, found himself repeatedly subject to discussions in which a designer or developer would indicate – even in group settings – a desire to inculcate a more stringent schedule of software demonstrations. This was expressed as an effort to remove some of the pressure from Brad that built up as deadlines loomed near the end of a particular development cycle. Oftentimes Brad found himself inundated with new features to test with a week left in a cycle, a task that Brad often described in terms of the additional pressure placed on him to ensure that the product be presentable during demonstrations that capped the end of a development cycle. Brad, during these times of increased pressure, confided that he occasionally struggled with the decision to log a new bug for fears that there would not be enough time before the deadline for that month’s code for
the developers to fix the problem. A new bug without a fix, logged against a feature
scheduled to fit into a particular development cycle, meant that the work for that feature
must be carried over into the next cycle. These hold-overs were not desired as part of the
engineering “Agile” methodology. Each cycle represented a new set of features that
would have their own bugs in need of fixing. A hold-over meant that Brad, in theory,
would have less time in the next cycle to devote to uncovering, logging, and re-testing the
bugs for that cycle, and thus the “agility” of the methodology would be compromised.
Brad’s situation in the tension of adhering to the ideal of encapsulated development cycle
and that of simultaneously adhering to his strict mandate of logging even the smallest
bugs promptly and thoroughly became more prescient during my time at C4i. During
demonstrations, developers were sometimes highly critical of the process by which Brad
would arrive at the definition and description of a bug, and therefore, the correct
performance of his labor in relation to enabling their own. Brad began to take notes upon
features and issues that he thought might receive extra scrutiny before a demonstration,
and during a demonstration he would document suggestions and agreed-upon
conventions that were developed during these critiques to supposedly stem the tide of
future misunderstandings in the future. Brad’s experience in these demonstrations were
central to the process of review and perception of ‘completion’ of a particular
development cycle, as it was Brad who would ultimately have to perform the ‘correct’
actions in the software with the entire team present to show that the software was
functioning correctly. A confrontation between a developer’s notion of ‘working’ and
‘broken,’ and Brad’s own were most in contention during these demonstrations, as these
events capped the development cycle and act as review periods to plan for the next. Most-
often, if something broke during a demonstration, it became the responsibility of Brad to explain why such a defect was only coming up right at that moment, and not previously in as a “known” bug.

**Tension, Rationalities, and the Structured Space of Reasoning**

This confrontation between a developer’s notion of “working,” and a tester’s notion of “broken” is less a confrontation between two different technical standards, and more a confrontation between two different styles of rationality that reflect upon and inflect the desired and actual outcomes of software development in different ways through everyday practice. Here, I take Edward Evans-Pritchard’s definition of rationality seriously in that it is, fundamentally, how the “particular conditions in a chain of causation [relate] an individual to natural happenings” (Evans-Pritchard, 1937: 67). In anthropology, the question of rationality has been an important one in establishing the methodologies necessary for understanding societies. The seminar collection on *Rationality and Relativism*, for example, points to the centrality of rationality as a mode of being in the world and dealing with crises, change, and interpreting and acting upon meaning in everyday life (Hollis and Lukes, 1982: 1-20). Clifford Geertz, in an attempt to understand narratives of meaning in actions as simple as a wink, argued for descriptions that narrativized rationality through “thick description” (Geertz, 1973: 3-32). And as I have already discussed, Evans-Pritchard’s contributions to an understanding of rationality have discussed the practice of witchcraft (Evans-Pritchard, 1937), and an ecological connection between understandings of time and space based upon calendar cycles that imbue interactions with meaning among the Nuer (Evans-Pritchard, 1940: 94-138). The
notion of rationality as a defining lens in this context is important, because it helps to provide a means through which to understand the specificities of the tension between developers and marginalized labor that I have discussed thus far. A rationality developed in the context of testing is what gives testers a capacity to describe bugs and broken features in terms that relate a user’s actions to the program’s interface and performance. A rationality developed in the context of programming these features, by contrast, is what gives developers the means to take in and unpack these relations within the context of code.

The tension between the definitions that each rationality takes as the basis for understanding is what leads to situations such as misunderstandings of appropriate description of bugs, how many bugs should be logged for one instance of unintended performance or even whether it is appropriate to log a bug at one point in a cycle or another. I also argue that this conception of rationality firmly encapsulates bureaucratic notions of a division of labor. A ‘division’ in labor is perceived where a separate set of skills or tasks is developed in relation to further specialization of the process of production. Within this specialization, I argue, separate notions of rationality become essential to keeping these divisions separate, and to defining the educational requirements for understanding the particular tasks in a division of labor. Thus, a difference in rationality between the position of tester and developer is an essential facet of defining the roles of tester and developer, and also helps to define the relative positions of developer and testers in the hierarchy of the enterprise. Since testers are meant to have a rationality that is devoid of the coding knowledge used by developers to investigate the
relational descriptions of broken features inscribed by testers, this positions the notion of a tester as one who is generally not as educated and therefore, unskilled and cheaper.

This organization of rationality helps to make clear the expectations at the lower levels of the hierarchy in production, and defines the pool of laborers that can qualify to participate in this rationality; there is such a thing as being overqualified for a job in this context. For example, I watched Tony sift through resumes during C4i’s hunt for a new tester during my fieldwork, during which he opined to me several times that individuals with certain advanced degrees would be unlikely to get an interview. Part of the reason for this, Tony rationalized, is that these individuals would not be satisfied in remaining testers for very long or in contributing to the long-term process of expanding and solidifying a more robust program of quality assurance at C4i. One of the starkest examples of this was a particular individual applying for a new testing position who had previously been a post-doctoral fellow in quantum mechanics at a university in Toronto. Tony could not hide his laughter at this particular resume, as it was clearly an example of an individual who did not ‘fit’ the idea of what Tony saw as ideal for adopting the rationality and capacity to grow the institutionalization of this rationality as a programmatic form in C4i over the long-term. Further, I argue that the notion of a tester’s rationality is also reflected in the other practices on the margins at C4i. For example, Rachel’s position of human factors engineer (or user experience designer) specifically interrogates and configures the interface through which users engage with software. Her decisions and advice are provided as reflections upon what a specific visual interface, and the steps between interfaces as a reflection of workflow, is meant to achieve in producing a context for the user to activate and engage with the functions coded into the software by
developers. These reflections can be as simple as prohibiting the use of horizontal navigation in interaction with data on a visual plane. They can become as complex as initially configuring the presentation of information to a user and deciding how a user will transition between different displays of information based on analyses of how humans interpret different visual cues and utilize hardware interfaces (such as a keyboard and mouse) to determine efficient, yet detailed enough interfaces for interaction.

Fundamentally, these analyses and the reflective and advisory reports that Rachel produces through them are interrogations of the way that deductive inferences applied in relation to one another in a specific software-hardware configuration function as a whole when considering the user as an essential component of functional capacity. In this way, Rachel helps to condition the dominance of deductive reasoning as made manifest in software by reasserting the social context in which that reasoning exists, to bring the “get it working” rationality of developers back into contact with the perceived whole of the function that the software is meant to perform in concert with the user.

Exploring Rachel’s role in this context will also help to bring a discussion of the differing rationalities that divide the working environment at C4i to the forefront. Rachel’s examinations of the user experience are not simply limited to eliciting feedback on questionnaires about whether an experience with C4i’s software is ‘good’ or ‘bad.’ Instead, Rachel’s training and her approach to her work emphasizes an analysis of the way that a human being, trained with a specific set of skills to perform a specific task, interacts with software that is meant to augment certain capacities of that task. This may involve an analysis of visual factors in the software’s interface, such as how far an individual’s eyes have to move between relevant data that could or could not be grouped
together; it may involve something as simple as the contrast of colors between
differently-categorized factors that the program wishes to display to the user; more
substantially, her analyses usually involve understanding how the workflow of an
individual’s task should be designed in the software – how many menus are required?
How many drop-down boxes or buttons should be pressed to achieve a particular
outcome? These are just a few of the questions that Rachel might include in an analysis
of software. From these questions, it is clear that Rachel’s contributions to the
construction of the software take place far-removed from the code that is written to meet
her specifications. Rachel’s perspective is one that almost never interacts with code at all;
in fact, she related to me that she wished she had more experience with some of the
software that exists to create software interface prototypes for design purposes – such
software requires some coding knowledge, however.

The idea of an entirely separate rationality at work in constituting Rachel’s
everyday work is simple to grasp in the terms of a division of labor, but also somewhat as
an analogy to the values of modern programming techniques. Parcelling out, packing up,
and black-boxing; these terms refer, in programming and perhaps in engineering more
generally, to an approach of breaking up the ‘whole’ of functionality of a piece of
software into smaller pieces (often called modules), which are then fitted together to
create software that is easily-navigable and is easy to understand for an individual not
familiar with the software’s code. This concept of design also allows developers to better
understand where to look for broken sections of code; each piece operates somewhat
‘independently,’ and can be addressed as such. I offer this analogy because it also extends
into a discussion of the concept of a division of labor that addresses the specialization and
development of differing rationalities that I discussed earlier. Taken from this perspective, it is ideal that Rachel be saddled with the examination of everything “outside” the actual code at work – her ‘module’ of work has been black-boxed for ease of integration with the work of individuals who, in Rachel’s own words, often “don’t want to” participate in the design process. In many situations, developers simply want to develop, as put by Rachel. Rachel described this split as easier on both parties, as Rachel related that allowing each, individual developer to make design decisions about the software could often lead to inconsistencies on the whole and a more tedious back-and-forth in attempts to create a more coherent whole for the software.

However, Rachel occupies a position in C4i’s hierarchy that is tenuous; she operates as a consulting contractor in conjunction with the lead designer on C4i’s ITN Planner project, a position that provides her a relatively high place in the hierarchy compared to the other set of rationality that I discussed earlier – that of testers. The separation of the role, responsibilities, and knowledge requirements of testers are intentional, once again to keep the repetition-intensive, menial labor of testing away from the responsibilities of those who ‘produce’ that which requires testing. This separation does not just lead to separate individuals performing these jobs, but to hiring of individuals with starkly different educational backgrounds – almost all of the testers I met (save for Brad, who holds an electrical engineering degree) did not have much post-secondary training. Nara related to me that part of the reason she took the job as a tester at C4i was because her husband was having trouble finding work. Sam, as I have mentioned previously, was trained formally as an artist at Calgary’s local art college and her training in this area has led her to be appropriated for other labor that would
otherwise require outside-hiring. What remains consistent across all testers is a lack of training in anything that could be called software testing as a discipline. This is not surprising, considering what can be perceived as the menial nature of testing, particularly first-hand, physical testing of software that involves a single individual repeatedly performing actions in the program to discover bugs.

Something that does require training, however, and something that I witnessed C4i attempting to institute during my fieldwork, was automated testing. Automated testing often requires knowledge of coding platforms that can be used to write “scripts,” which are basic pieces of software designed for specific environments, where the script automates a set of tasks that would normally require a human to perform. I will discuss this facet of C4i’s testing later, but what is important for the purposes of a discussion of the rationalities at play in C4i’s production is that, by default, most testers are devoid of even the technical knowledge required to program these basic scripting functions. Separating out testers as such allows for firm demarcation of their labor at the bottom of the hierarchy – they are simply meant to use the software repeatedly and then report unintended experiences with the software. Economically speaking, this is an entry-level position in software development. There are some developers who began careers as testers and later moved into development, but this vertical movement is rare. Testers are often specifically selected because a lack of technical knowledge would likely make an individual both unqualified for higher positions and thus make the desire to move upwards not particularly strong. A specific rationality and the constraints of the division of labor are felt most strongly by testers. Hired because of a lack of technical knowledge, in order to create testers who would be “satisfied with remaining as testers” – to use
Tony’s terms when describing one quality of an ideal candidate – testers have little recourse not only to move up the bureaucratic hierarchy designed to situate testers at the bottom, but also less technical knowledge that might be useful in articulating institutional changes to the way that testing is conducted during production. Tony often bemoaned the way that testing was often conducted at the last-minute, or not necessarily with the rigor that would be undertaken in other companies. Not only do most testers not have the knowledge required to articulate what might make testing easier, but this state of ‘unknowing’ also leaves testers with little power to articulate why a change in the way testing is performed would be beneficial.

Once this relation of rationalities is seen as a relationship of structured knowing to structured unknowing, it becomes easier to understand the relationships of power at play in the ability to make decisions during the production process. Segregations of knowledge and labor create the opportunity for like-grouped individuals to coalesce around particular identities that become associated with demarcations of labor. Developers are developers, testers are testers, business development is business development; these demarcations do not merely structure production, however, they also structure pay grades, authority, and the perceived value – both monetary and in relation to the prestige associated with success – of individuals in this environment becomes directly tied to the environments of structured knowing or unknowing that individuals occupy. Different rationalities in this environment, associated with situations of structured knowing or unknowing, contribute directly to the perceived value that these rationalities provide to what is perceived to be the ideal of the software development process.
Sustaining Divided Rationalities in Everyday Life

This orchestration and simultaneous existence of the different rationalities that inform the production process, from the margins and from the center, is a process of constant oscillation between individual and collective expressions of perceptions of objective goals for production. Through these understandings of production, employees at C4i do not only come to understand the success of contributions to collective products, but also what they are expected to understand in terms of technical complexity and the relation of these understandings of technical complexity to the whole of production, marketing, and completion.

As an example of the tension inherent in this relation between individual and collective work, I look to Jane, C4i’s technical writer. Jane’s position was fraught with the difficulty of producing completed chapters on features for products that were constantly undergoing changes. Her responsibility is to write up the user documentation for C4i’s software, what often take the form of troubleshooting guides, frequently asked questions about the software, and a general overview of the different features of the software. Writing in this context, much like in many others, is about a finished product. Jane was able to receive comments and garner editors from among the C4i staff, but would have to upend, gut, or completely change certain sections of her document when the features talked about in these documents changed, were cut, or when new features were added to the program. Further, Jane worked on all three of C4i’s main products at one time (ITN Planner, EDMSIM, and MILSIM). I would often hear her explaining her
plans for the day at the morning’s Stand Up in tentative terms; she would often have to put work on ITN Planner on hold if new code implementing specific features was not going to be added that day, and she would often supplement this incapacity by switching to work on MILSIM or EDMSIM. In addition to the contingencies of completion, those that affected Jane’s ability to start or continue work on a specific project, Jane’s work also depended on a certain amount of technical understanding of the functions of the software. Jane’s ability to translate the functional capacity of the software is directly dependent upon her own understanding of the software.

To get at this understanding, and especially with regards to her work on ITN Planner, Jane turned to Rachel. It began with initial overtures during various team meetings, with Jane relating the difficulty of writing certain chapters for the ITN Planner software due to a lack of understanding as to what the software was actually meant to do. Jane’s physical location also begins to matter to the development off this relationship, as her desk was immediately adjacent to Rachel’s, and Jane would often use her co-location with Rachel to pause for idle conversation about certain mundanities of everyday life with regards to family, other members of the office, or about the project that the two worked together on. Jane began to bring up her difficulties with understanding the software more frequently with Rachel over the course of my stay, and finally it was arranged so that Rachel would spend time with Jane and teach her about the context in which the software existed as a function of organizing and enabling a particular mode of planning for communication.

This relationship between these two individuals, both female, both occupying jobs that define the margins that frame the practice of software development, is not merely a
result of co-location, coincidence, and Jane’s difficulty. It is an expression of the very
division of labor that grants authority to Rachel, and the emphasis for Jane on learning to
explain to a user the features of the program in relation to the user’s understanding of the
job that the software is meant to enable. This division of labor is that which situates the
margins against the center, the developer against the tester, and the developer as
responsible to the user context that Rachel positions (in conjunction with C4i’s lead
designer on the project, whom Rachel advises) by challenging the singularly-focused
rationality applied to programming in order to “get it working.”

The interactional consequences of dividing labor along these lines of rationality,
such as co-location and simultaneous gendering of the work environment can be likened
to the way that Michelle Rosaldo and Sherry Ortner refer to the asymmetry of work and
home life into the respective categories of male and female. Their arguments describe, as
I have briefly discussed previously with Ortner, a relegation of certain activities, ways of
speaking, and “domains” of existence to women and others to men. More specifically,
Rosaldo describes this asymmetry as a situation where “men are the locus of cultural
value” (Rosaldo, 1974: 20). It is not merely that men have the ability to exercise power
over women in a direct sense of physical power, but that the legitimation of authority, the
activities in which men participate as a consequence of exercising authority over certain
cultural domains, are intrinsically more valued than those relegated to women. This
notion, as Rosaldo argues, allows men to claim legitimacy in the subordination of
women, to claim that there is some objectively identifiable reason why this subordination
must occur (Rosaldo, 1974: 35-41).
In scholarship on this asymmetry, this concept has been most-often applied to an examination of the authority granted over the home for women and to the domain of work for men. Ortner pushes this concept further in discussing the notion of men to “culture” as women are to “nature,” in which the production of value in public life is intrinsically associated with male activities, from which these activities become structurally oriented away from allowing women to participate (Ortner, 1974). However, it is not simply that these activities are structured to disallow the participation of women, but that the ways that women interact in social life is intrinsically altered due to this structuring and differentiation of values associated with gender. From these valuations, women and men are taught to value different activities and to defer to the opposite gender in different domains. One need not look further for a simple example of this than the endless smattering of jokes about the perils of men attempting to exercise authority over the organization of the home or vice-versa in relation to the workplace.

For the purposes of my argument, creating gendered asymmetry in the workplace is not as simple as designating some jobs as female and others as male. Instead, I wish to associate this asymmetry with the way that Carolyn Merchant describes the historical construction of females as metaphorical representations of “nature,” and the subsequent determination of the “male” activity of controlling nature, and thus, women (Merchant, 1980). Merchant’s argument shows that the way that imagery, symbolic, and metaphorical devices were utilized both in legal rationales, artistic frameworks, and in treatises on perceived social ills (such as witchcraft) displayed women was in direct association with a notion of women as “representing” nature (Merchant, 1980: 169). With this metaphorical framework acting as a means to interpret social relation between men
and women, and in the 16th century continuing into the industrial revolution, further metaphorical relations became prominent in which mechanical control of “nature” became a lauded and important goal in Western Europe (and subsequently in North America), through the means offered by science and the scientific method. To have deeper knowledge of natural phenomenon was to have deeper knowledge of how to subject nature to the whim of man (both in the demonym and gendered sense of the word). Because these metaphorical relations of women as representative of “nature” placed women in concert with this project, the dominion over women, by men, became as – ironically, again – natural to desire.

Understanding this relation in the context of what I have already discussed is easiest when conceiving of testing as the “natural” environment, a chaotic force which must be observed, learned from, and then controlled with the products of development. The user, in this case represented by the tester, does not know how to articulate what software should do to a developer – they do not understand, nor are they considered capable of understanding, what is called the “back end” of software (the unadulterated code not interpreted through an interface). The user, and the testers by extension, are kept ignorant of the display of software in code form, as these means are what allow developers to assert control over the problems that users require software to fix. Users do not need to know why something works, only that the software works. Testers, in this equation, become individuals tenuously exposed to the negative consequences of attempting to assert control over a specific user’s problems. Bugs, defects, unintended functionality – these are all mis-fires of developers attempting to assert control over the ‘natural’ environment of the user. In this situation, testers must be kept situated within the
hierarchy as such, and in relation to other labor in this environment in a menial way because to do otherwise would pollute the attempts of developers to assert control over the problems of users by utilizing logic that is specific only to developers. This division of labor is not merely gendered, but gendered in such a way that is a continuation of the metaphorical processes that constituted the project of routinizing the authority of science and the subjection of women to this authority for the purposes of maintaining a notion of a ‘natural’ order (Merchant 1980: 192-252).

It is this same division that Weber describes in relating the means through which rational and legal authority are routinized – not as a measure of the innate responsibility defined by position afforded by bureaucratic division, but as a reflection of the characteristics and rationality that originally defined the ability of this routinized logic to exercise an affect over the course of technological innovation (Weber, 1968: 220-223). This is most clear in relation to Weber’s description of the routinization of charismatic authority (Weber, 1968: 247-249), and to Goffman’s description of the way that certain members of given teams manage and sustain characteristic interactions in order to fulfill an obligation to maintain the expected appearance of the performance of a team’s objective (Goffman, 1959: 100-101).

Weber’s notion of routinization with regards to charismatic authority is that the only way that charismatic leaders can sustain the “value” that has been acquired in attaining authority over or appropriation of resources is by creating a means by which this authority can be recognized after the initial leader dies (Weber, 1968: 246-249). This “succession crisis” dominates the logic of extending charismatic authority into permanence, but it also specifically defines the aesthetic, attributive, perceptual and
emotional characteristics that are increasingly iterated upon, described, categorized and actioned to produce a leader as a reflection of the context in which that leader exists as according to the routinization of the leader’s authority. Instead of only the attributes of the charismatic leader in this case, it is the attributes, characteristics, and performatives of those on the margins that have been routinized in creating a bureaucratic structure that incorporates these positions as reflections of the rationality associated with these positions. For Weber, positions on the margins serve only to communicate, enact, or perform the authority of leadership upon subjects – in effect, to communicate and act out the legitimacy that is perceived to exist in relation to authority (Weber, 1968: 212-213; 243; 249; 251-254). For Goffman, sustaining the everyday performatives of these positions is essential to creating the whole performative context in which a team cooperatively defines and acts upon the objective of the performance. In Goffman’s own terms, the essential characteristic of a teammate is someone “whose dramaturgical co-operation one is dependent on in fostering a given definition of the situation” (Goffman, 1959: 83). However, I wish to go further than both Goffman and Weber to suggest that these routinized performances – in addition to being constituted as specific groupings and understandings of rationality and expected performances of that rationality in a given context – are the means through which the material of production, code, is given purpose and actionable potential in social life. It is not enough to say that these marginal positions sustain the legitimacy of authoritative perspectives in the environment of development, but that they are most-directly linked to both the user as a subject of development and to the social environment in which the user exists. Without these positions, the user cannot exist within the environment of software development, and neither can the community of
defence contracting, the state as a regulating entity, and the corporation as an entity that
must engage with public life for the purposes of advertising, hiring, and as a
representative of economic life in the community.

Reflecting purpose and actionable potential as essential functions of the margins
is an essential function of the rationality afforded to these marginal positions to make the
material conditions of production legible to those who will use this material to leverage
the functions of the software in a given environment. Edward Evans-Pritchard’s
discussion of the concept of witchcraft in Azande society is particularly helpful for
understanding this constitutive relationship. For the Azande, as described by Evans-
Pritchard, witchcraft is not merely a way of describing physical processes that may be
more accurately explained by scientific study; on the contrary, it is the way that the
Azande give meaning to these physical processes for the purpose of acting in relation to
material conditions in social life (Evans-Pritchard, 1937: 73). It is witchcraft, for the
Azande, that “allows intervention and determines social behavior,” and it is that which
rationalizes the “particular conditions in a chain of causation which [relates] an individual
to natural happenings” (Evans-Pritchard, 1937: 67). This understanding of a rationality
that gives social, actionable meaning to physical conditions is exactly what I refer to
when arguing that positions in the margins of C4i are essential to creating the context of
productive capacity. To extend this analogy, I follow Barnes and Bloor (1982) in their
complication of the idea of a strict divide between credibility in a social environment and
the idea of validity – that which provides a definition of truth or falsity in a given context.

[All] beliefs are on a par with one another with respect to the causes of their
credibility. It is not that all beliefs are equally true or equally false, but that
regardless of truth and falsity the fact of their credibility is to be seen as equally
problematic…the incidence of all beliefs…must be accounted for by finding the specific, local causes of this credibility (Barnes and Bloor, 1982: 23).

This credibility is what relates material conditions to social life, that which determines with what power authority enjoins belief to everyday practice, that which determines different agencies of social control and institutionalized logic, and what determines which beliefs are passed down to new generations. In this environment, it is the margins that sustain the conditions of credibility at C4i. Developers maintain the ability to provide validity to claims by C4i’s leadership, the charismatic authority, while the margins sustain the apparatus designed to lend C4i credibility in various domains.

The positions that Jane, Rachel, Vera, and all the testers occupy is one of defining and sustaining this notion of credibility. In the instance of Rachel explaining to Jane the intricacies of communication planning that ITN Planner enables, it is Rachel who provides the credibility to the technical documents that Jane is unable to interpret alone. It is not that the technical documents pertaining to ITN Planner were not valid with respect to technical specifications, but that they lacked a patterned credibility that Jane could interpret and translate into another set of credible specifications for the purposes of crafting user documentation. In other words, these technical documents were just as useless to Jane as they would be to a user of the software. Furthermore, Rachel’s capacity to give these documents a credible, rationalized framework through which to teach Jane about the technology is bound to her own responsibility to take in and manage her own understanding of these documents and then to design visual and material capacities for users to engage around these capacities. Once again, it is not the truth or falsity of the information that comprises the technology that ITN Planner is meant to enable, it is the capacity of Rachel to credibly position that information relative to the context of the use
of the information. The choice of whether to reveal certain specifications, to give superficial descriptions of certain networking capacities of the specific technologies that ITN Planner deals with, and the way this information is positioned relative to the user in Rachel’s descriptions are what produces the credible frame from which Jane is able to produce another credible frame of reference – that of the user documentation.

The relation of Rachel to Jane is also one of indirect hierarchy. Jane is not subject to many other than the lead designers of the projects on which she works, and to the executives of the company in most day-to-day work. Jane is the only technical writer on staff, and as such her work is often disconnected from much of the other work in the office. What is at play in the relationship between Jane and Rachel, however, is the hierarchy determined by the notions of structured knowing and unknowing that I discussed previously. Jane, without a technical education applicable to software development, is subject to the ability of Rachel and the other staff members to provide her with the knowledge that she requires to craft technical documentation fit for user consumption. Jane is subject to Rachel’s schedule, to others when she requires technical validation of certain concepts in the software, and even when she requires further validation in the form of edits to her documentation.

Another reflection of this capacity for creating credibility is Vera’s simultaneous responsibilities as office administrator, accountant, and human resources manager. Vera handles much of the day-to-day paperwork that is required to maintain a corporate bureaucracy, as well as many of the communications that must be prepared and sent out to both employees and external institutions such as the Canadian government or other agencies involved in sustaining C4i’s daily existence. As a further reflection of the
multiplicities of capacity that the margins are meant to fulfill, Vera also completed her accounting certification exam while simultaneously employed full-time in the office. Vera’s marginalization within the office is not only determined by the routinization of her duties in bureaucratic categorization, but it is also physical. Vera’s office is the only one located in C4i’s lobby, the room just inside the entrance and she is often is the first person that many individuals visiting C4i see and interact with upon arrival. Vera does not only sustain, in Goffman’s terms, the “setting” of the “front” C4i’s corporate environment – the spatial environment of the lobby adorned with chairs for waiting, various placards and accolades given to C4i, Vera’s office, a small conference room next to Vera’s office, and three doors which lead to the rest of the offices and cubicles in C4i’s offices, the main boardroom, and the kitchen. Here, again, there is an explicit spatialization of the environment that is segregated on the types of knowing that are valued for different purposes in C4i’s workplace. It is not, as such, an explicit division between any explicit notion of “male” and “female” space as described by Rosaldo (Rosaldo, 1974: 23-29), but it is a sublimated form of this logic structured from the attributes and characteristics of knowledge associated with performing administrative and clerical duties. Vera’s performance in this environment is much more fundamental than merely extending the set of symbols that C4i wishes to relate to visitors and potential customers, it enables the very production that it regulates through the paperwork, communications, and relational activities that Vera is responsible for in her multiple roles. Vera performs credibility for C4i by making C4i’s bureaucratic, regulatory commitments legible to the various agencies that C4i is required to report to and report finances through.
Seeing the State in the Margins

I have argued that corporate bureaucracy – both in relation to the authority of the state (see Chapter 5) and in relation to the way that professional practice is performed individually as a reflection of a division of labor – contributes to a decentralization of power and authority inflected by market liberalization and militarization on a global scale (Duffield, 2001) and routinization of legal authority through the institutions previously constituted by one individual (Weber, 1968: 217-226). However, I also wish to argue that this decentralization is not as monumental as might be implied by following the argument of Foucault in seeing the state as the penultimate rationalizer of information into actionable potentials.

After all, maybe the state is only a composite reality and a mythicized abstraction whose importance is much less than we think. What is important for our modernity, that is to say, for our present, is not then the state’s takeover of society, so much as what I would call the ‘governmentalization’ of the state (Foucault, quoted in Gupta, 2007: 109).

Akhil Gupta, in his discussion of the state, mobilizes an argument against such a totalizing perception of the state as an essentialized entity that exists similarly in all places. Contra Foucault, Gupta argues that rather than understanding the state as a symbolically significant performer of a set of routinized practices, that perhaps it is these routinized practices that “enable such illusions, acts of magic, or fantasies to be created, sustained, and resisted” – those that come to be understood as the collectively imagined entity that is the state (Anderson, 1982; Gupta, 2012: 55). Rather than understanding the
practices of the state as those that reflect the ideology and governmentality of the state, it is more accurate to talk about “procedure as ideology because it is through such procedures that the state comes to be represented and symbolized” (Gupta, 2012: 48). For the purposes of my argument, I wish to situate Vera’s practices in relation to this understanding of the routinized practices that sustain the images of not only the state, but of the possibilities afforded to corporations who organize bureaucracies in this way.

Vera’s performance of this multiplicity of bureaucratic procedures within C4i sustains not only C4i’s legal status and administrative needs, but she also sustains the image of corporate functionality in the minds of other employees and she sustains the credibility of C4i in a rigorously-regulated public sphere by adhering to procedures involved in administrating the day-to-day activities in C4i’s offices. The margins, in this way, are essential to producing the context in which developers, designers, and business developers project the material power of what C4i is as a corporate entity. The margins sustain and develop the required, structured discursive framework from which C4i is able to claim ownership of and circulate utterances, material objects made with this framework in mind, and appropriate other entities that fall under the constraints of the same framework in order to assert power over the way that these frameworks are organized. Use of the term framework implies that the forces that regulate C4i’s practice have a certain amount of stability, but this is only because C4i’s credibility among other entities that subscribe and are contained by this framework is lesser than, say, Northrop Grumman or Raytheon. These corporations, as a function of the diversification of their portfolios – and thus, their presence – to include a wide variety of technologies for the production of war, are able to assert more force over the nature of the framework that
constrains them as a whole. Consequentially, these corporations quite literally come to be representative and emblematic of the network that is meant to constrain them. C4i’s situation in such a network of credibility is marginal at best, sustained by the marginal figures that enable C4i to situate itself within these practices at all.

**Tension, Necessity, and Sustaining the Margins in the Whole**

Thus far, I have discussed performances on the margins as constitutive of an inherent instability of relations that essentially constitutes the whole of C4i’s production. This instability is not something that should be inflected with a negative connotation. To the contrary, I argue that it is this instability that is essential to understand the intersection of development with the other logics involved in production that contribute to positioning, visualizing, and projecting the logic of development into an environment in pursuit of the acquisition of capital. Further, the intersection of these logics is not an inherently balanced affair. Each function afforded to different employees by the bureaucratic organization of the corporation, and therefore its division of labor, is also afforded means to appropriate more forceful articulations of relative position by this organization and by the contingencies that arise during practice. Thus, the margins are not merely the margins because of some standard regulation of bureaucratic practice in software engineering firms and defence contractors. Instead it is the ability of other functional groups within such organizational frameworks to assert the primacy of the contingencies of their experience of these intersections in everyday practice. In the context of the gendered asymmetry that I discussed earlier, the assertion of primacy and therefore authority over the organization of the work environment, is one of a perceived
necessity of subordination of one type of rationality to another for the purpose of regulating a perceived order supposedly inherent to efficient capitalist enterprise. Developers must, inherently, be superior in their assertions, as they are perceived to provide a more thorough contribution to the production of capital through software, as it is by developers’ knowledge that control is exercised over the natural state of the user’s life.

The affordances of additional staff, new tools, reorganizations of office space, and the ability to assert more authority in design, scheduling, and reporting contexts are just some of the varying contingencies that define the priorities of different functional groups in everyday practice. The definition of these functional groups, as I have already argued, is directly associated with the expectations of a specific rationality and subjection to different kinds of authority associated with positions at the core of development and on the margins. This definition of the margins is sustained by bureaucratically legitimized hierarchies that demarcate pay scales, affordances of prestige, and even opportunities for subsequent promotion within the corporation. Structured and routinized by bureaucratically-determined categories, expectations of knowing and unknowing in these environments are further reinforced in the subjection of positions in the unknowing of the margins to the knowing of the core; it would not being going too far to state that the atmosphere of the workplace is one where the margins exist to sustain the development capabilities of the core. Arguing for increased capacity, more resources or employees or for tools for use on the margins, is therefore subject to the authority of the core’s perception of the necessity for this allotment. In effect, the core of development determines the perception and articulation of what the margins experience, because of an
ability to assert the primacy of their own needs in the context of development. I will argue that this is a quality that can be attributed to the way that developers and the executives of C4i actively determine what are ideal conditions for developing software drawn from the perceptions and needs of other marginal positions in the company only in relation to developers. In this environment, to be on the margins is to be only in relation to how development is conceived of through the needs of developers.

Thus far, I have utilized the work of Judith Butler to understand how the subversion of dominant ways of being, through dominant metaphors, and the logics of practice that follow from these metaphors, is capable only in the context of testing – as a demarcated space in which subversive practices within the software can be iterated upon and ironed out once taken back into the dominant framework of development. Judith Butler argues for an understanding of perception, self-identification – and therefore an understanding of being – as the elaboration of other states of being from a core, dominant understanding (Butler, 1990: 59). Butler’s argument pertains to the constitution of being as related to the notion of gender, and the physical, behavioral, and spatial organization of human experience to reflect what it is to be feminine only in response to what it is to be masculine. These definitions are not equally constitutive of one another, Butler argues that it is through “the authorizing signification of the Law that takes sexual difference as a presupposition of its own intelligibility” that the notion of the masculine is constructed (Butler, 1990: 59). Butler goes on to argue that the feminine is not merely constituted by a performed recognition of organizational frameworks designed to subject the feminine to the actions of the masculine, but that it is pursued by the masculine in order to do so; the masculine actively constrains the ability of the feminine to perform outside of the
oppositional identity that is required for masculine ontological self-affirmation (Butler, 1990: 60-64). Similarly, I will argue that it is the ability of functional groups at C4i, such as those of the developers and the business development staff, to define and constrain marginal groups in the workplace that help to define the inherent power that these functional groups hold within the context of bureaucratically organized, capitalist production. The articulation of gender in this context is both coincidental and deeply reflective of the constraining principles that Butler suggests pervade the entire organization of human existence.

The only female employees working full-time at C4i are situated in the margins. Their positionality in this environment is defined both by their associations with a particular functional group, but also by the individual attributes that necessarily position them within these functional groups. If, for example, Nara or Sam had been trained as developers – which would be a statistical irregularity already in the software development industry (Weise, 2014) – they would likely occupy these functional groups at C4i. This is a simple intersection of education as it relates to the ability of gender to inflect an individual’s ability to exercise power and define a conceptualization of being in relation to the organization of production in the workplace – it is, however, a very visible one.

A response to this argument might be that Nora and Sam may simply choose not to pursue such an education and that they may be satisfied with the assertion of power over the organization of their labor. I argue, however, that such a response fails to take into account the ability of these ontological relationships to constrain individual self-identification with performance of economic activities. The very notion of a want to pursue an education in technical training associated with software development is
something that is prefigured towards certain gendered behaviors. In the symbolic world of universal male dominance (Ortner, 1974), it is male to want this technical education – as might be evidenced by studies on the overwhelming dominance of males in developer positions (Stack Overflow, 2015). Similarly, it is female to be relegated to the margins in the context of the metaphorical relations that situate female in relation to the nature that must be controlled by the mechanical means afforded to males in the symbolic order (Ortner, 1974; Merchant, 1980). This is not to say that these relations of organization, production, and identity are static, impermeable or even inherently malicious on the part of individual males in the everyday activities of the workplace.

In fact, Butler’s argument makes it seem more likely that an obliviousness to these organizations of the self and society are more powerful when left unexamined (Butler, 1990: 191-193). If the ability of certain individuals and functional groups in the workplace are left unexamined in their “importance” to the overall productive context, and therefore are afforded more resources and authority in that place, I argue that is far less likely that any self-awareness of the symbolic constitution of this organization would be possible for an individual. As one example of the illegibility of a gendered environment in C4i’s workplace, I turn back to Rachel. I asked her if, in her decades of work, if her work on the ‘human’ side of engineering had garnered skepticism or dismissal from the executives, engineers, and developers she had worked with. She said, simply, “it used to be that way, but I’ve found that they are more open to it now.”
Contingency and Subject Rationalities in Sustaining the Margins

These intersections of professional practice, personal contingency, and performed hierarchy are negotiated both through the use of the shared scheduling and task management space of TFS, but also through the tester’s own passivity and supplication to a shared hierarchy of production responsibility. All testers must wait until the developers have marked features as “ready for testing;” in the space between “ready” and “waiting,” Sam and Ben must maintain their dual roles as graphic designer, network administrator, and tester in order to maintain a more thorough engagement in the construction of professional practice at C4i. This is not to say that the labor of testers who only test is devalued. Instead, the labor of testing, as a measure of professional engagement, is relegated to a periphery role as one might understand the position of an entry-level position in other corporate environments, as a stepping stone or performative environment for the demonstration of more versatile skills. The professional identity of a tester in this environment is unstable, a reflection of the organization of practice that produces the material and relational expressions of “testing as an afterthought.”

Negotiation of professional responsibility in this unstable environment is fraught with the changing expectations of project managers who may need testers to re-align daily routines in order to conform to special requests from clients looking to push features out faster. These expectations are also punctuated by requests from business development personnel in need of graphical design know-how or basic computer literacy skills to prepare for presentations that would later be given halfway around the world. This instability in the tester’s daily routines created a certain decentralization of the labor expected from testers, as everything from helping to coach new users of the software
through demonstrations to finding extra time to develop new, automated regimes of
testing for older versions of software became not only “extra,” but “expected.” These
expectations, in turn, contribute to an understanding of a tester’s role in the company not
as fixed with a clear career trajectory, but as a form of regulated chaos in which a tester’s
development as a professional relied inherently on an ability to exercise skills separate
from the daily work of testing. In Sam’s case, as the only full-time tester for EDMSIM,
she would often complain of being “pulled off” the testing schedule that she had set up in
order to review or make changes to various graphic design projects that she was charged
with – oftentimes directly – by Gordy. These occasions were largely informal, with
Gordy dropping by the test lab to ask Sam if she could adjust or review, for example, the
color scheme of a recently mocked-up advertisement or the work of the other, part-time
(once a week) graphic designer at C4i. Sam’s complaints about these scheduling crunches
were not the norm, however, and she appeared to relish the extra commitment to C4i’s
overall brand and the projects she worked on.

Sam’s role in testing the implemented features for EDMSIM did not only amount
to testing the various interface functions, button clicks, and response times for the various
calculations that were added to process new variables in emergency disaster scenarios.
Sam was also tasked with putting together test exercises for modeling such things as
“cross-contamination for biological weapons,” and the ability of the software to handle
increasingly large amounts of what are called “entities,” objects, people, roadblocks and
other variables that must be calculated during each cycle of the software’s operation.
Tests such as the one for biological weapon cross-contamination required a much more
intuitive approach in asking what exactly a successful test should look like. Questions
such as how to design a small scenario in which to test the different speeds and veracities of infection and contamination, and how to test the spread of destruction in a city after a tornado touches down are questions that also speak to understanding the nature of simulative modeling as a whole, and the assumptions about nature and life that go into attempts to create software to interact with these models. Engaging with these built-in assumptions about the nature of the progression of time – through time compression, in an attempt to watch how diseases spread over long periods of time in a matter of minutes – and breaking apart the different components of diseases through software testing can help to develop a perspective of how human engagement with biological weapons is conceived of and how humans are conditioned to respond to these speculative emergencies.

These examples speak to the ways that the tester’s rationality is subject to shifting understandings of what users C4i wishes to develop for at any one time. Testers are subject to these changing conditions, sometimes on a whim, as testers are pulled off their normal projects to contribute to a “last push” to finish a particular development cycle. The rationalities of military command, emergency disaster response, military communications planning, and military intelligence gathering and plotting are several, but C4i has desires to expand product lines to encompass other groups of users as well. In this environment, as representatives of the users in development, testers must remain open to these reconfigurations of logic that are required to understand and interact with the software for the purposes of testing. The tester’s rationality is purposefully structured as unknowing in this context because the tester must be subjected to the knowing of the users for whom the software is made.
**Automation and the Regulation of Subversion**

Setting the conditions for testing also speaks to another facet of the software development process, and how this process impacts the nature of training individuals through modelling and simulation – that of automation and how the automation of certain actions both simulated and in test construction in order to filter out “unnecessary” tasks and information for users. “Automation” in this context refers not only to how C4i’s simulation software automates certain tasks, such as ambulance routing to and from hospitals, but also the automation of testing in order to institute “regression testing” on a widespread scale. Regression testing is a type of software testing that attempts to verify that all previously implemented features still work correctly as the software continues to develop over time. These tests are time consuming and labor intensive, but without them there is an ambiguous uncertainty as to whether previously functional and foundational features will continue to function in interaction with new features implemented later. These attempts to automate actions and testing confronted me with notions of what labor in the production process and in interactions in a simulated environment “should be” automated, and how these notions of labor reflect assumptions about decision making for users and in decision-making in the context of emergencies and military command. Creating automated testing regimes that are both comprehensive with regards to accounting for all previous functionalities in the software, and also modular, with regards to the ability to discover, diagnose, and change tests on the fly is a process akin to the automation of assembly work in a factory environment. The pitfalls related to the types and costs of software that are available to construct these tests, the available time that
testers have between currently scheduled tests to work on automation, and to perspectives that see automated regression testing as “necessary,” but not something that is possible with tight production scheduling, speak to wider discussions of neoliberalist ideals in the organization of manufacturing and production processes. These ideals, in attempts to centralize control over the standardization, speed, and consistency of manufacturing produce conflicts in the process of automation – between the attention to detail that is required to produce tests that meet the specific and nuanced needs of a piece of software, and the build-up of labor required to maintain this nuanced approach to manufacturing and craft work.

As a reflection of the process of structured and isolated subversion that I referred to earlier, attempts to automate testing provide a final realization of exercising control over the context of the user in the process of development. Sustaining the dominant logic of production removes the user entirely, besides specific consultations with users to garner ideas as to the needs of users, and then to utilize these ideas to construct user stories, from which testers understand the rationality of the user from which to conduct and construct tests. Similarly to how I discussed Weber earlier, Butler makes an argument for the performance of the gendered environment as one of routinization and repetition – for the “mundane way in which bodily gestures, movements, and styles of various kinds constitute the illusion of an abiding gendered self” (Butler, 1990: 191). More importantly, however, Butler situates this idea of repetition as enforcing a gendered environment within a notion of “social temporality” (Butler, 1990: 191). The stylizations of gender must exist in the context of continuous performance in order to become understood as the “ground” from which gender exists, what Butler calls “a gendered
corporealization of time” (Butler, 1990: 192). In this context, gender is a transmitted
genealogy of practices sustained by the historical contingencies that have subjected
individuals to specific stylizations of practice that can be called ‘gender.’

For my argument, this notion of temporality provides the means to understand the
increasing rigor of testing that is perceived to exist when instituting automation. To be
able to run a thousand tests with the push of a button, as opposed to the ten that an
individual might be able to perform in the same time period, is to create the ground from
which to understand the validity of code. Code only becomes more valid if more tests are
performed. Especially in the context of regression testing – testing historically-
implemented features that are taken as “given” functionalities for the purposes of
continued development – automation provides further authority to the work of developers
and to the logic from which those features were developed. If the software remains
unshaken, even within the foundational features that defined the earliest iterations of the
program, it can be demonstrated that not only is the program valid, but valid in the
context of a historical regime of credibility developed through automation. Automation
provides a historical record and exponential multiplication of the labor of testers without
the need to hire additional testers; it is a means of controlling nature without the presence
of nature.

Conflicts between attempts at standardization and the analysis and investigative
skills required to uncover, adequately describe, and make decisions as to the severity of
defects produce divided loyalties between attempts to accurately reflect the user
experience during testing and attempts to streamline and produce testing regimes that can
be easily interpreted by developers and designers for meeting deadlines. The fine line
between this negotiated stance as a “representative” of the user during production, and as one node in tightly scheduled production frameworks, that must interact with multiple companies and production roles, force testers to constantly negotiate for more rigorous approaches to production design that take into account testing as a more fundamental focus of understanding when a feature is “ready” to move off the production floor and into the customer’s hands.

The space between the ideals for software testing and the practiced reality were a particularly salient feature of my exposure to software testing at C4i. Tony’s wishes to implement “test-driven development” – an engineering methodology which prioritizes designing tests based on user desires for interaction with the software, prior to production, and then positions development to implement based on meeting the requirements of these tests – were related to me in hopeful tones. This is in contrast to the everyday expectations of merely “keeping up” with the needs of testing software that is always in production, often with only one tester per project. The ideal of “test-driven development” reflects the desire of both testers and software engineering methodologies to maintain active engagement with users to produce software that is more situated within the stated and daily practices of users, and therefore more likely to be actively sought by users in the industries that C4i wishes to sell software to. These tensions are spatially conditioned and also physically reinforced in the context of monthly review demonstrations. Here, the lead tester is positioned as the “user” who walks through the newly implemented features one at a time, while the development and design staff observe and comment on both the tester’s performance in adhering to the “demonstration script” and the performance of the software.
The burden for success in these performances was most in question during these review periods, where I encountered both testing and development staff confronting a perceived need to be “more aware” of the each production cycle’s particular “needs” for bug-fixing. The achievement of this awareness was thought to rely on closer communication between testers and developers, as well as an increased responsibility for the tester in relaying what testing can be done by developers prior to considering a feature to be “done” and ready for testing. The ideal for making more of the communication between testers and developers was predominantly seen as an achievement of coherence between different mediated forms of communication. These forms, whether the centralized software suite, the Skype and other computer-mediated messaging services, or face-to-face communication, the ideal relationship was one that utilized all these forms appropriately to achieve coherence and awareness of the “needs” of the software. One example of this phenomenon is the continual engagement over the proper syntax and descriptive language used to construct “user stories.”

User stories are a widespread methodological tool of software development that describe a features in terms of a user’s desire to perform a particular function, which is then broken down into “validation steps” that detail how the user should be able to achieve this desire in the interface of the software. Discussions on how better to describe validation steps, how many validation steps were needed to convey a clear understanding of the desired result, and even the background information provided by developers to testers, to contextualize certain steps, were points of constant reflection during review meetings. The arrangement of communication for user stories was largely limited to interaction within TFS, where user stories are viewed, commented on, and labeled
according to completeness, readiness for testing, and according to the amount of hours estimated till completion. The formatting, engagement with, and negotiation of appropriate creation and alteration of user stories, and how these user stories are designed to aid in developer implementation also speak to the ways in which the tools for software development condition the perception of how actions should look within a program or what a user can be expected to understand when interacting with the software.

Testers and developers would often work on separate sections of the program simultaneously, removing testers from active exposure to the most recently implemented code. This disparity in knowledge and separation of labor – usually to ensure that the tester can continue to test while waiting for a developer to submit code on more recently implemented features – led to unique points of tension in how testers would come to associate the responsibility for broken functionality to certain individuals or to areas of the software’s code that were meant to be entirely separate from those that were ready for testing. As an example, both Sam and Nara would occasionally become irritated when Monty and Mular would check-in code for EDMSIM and MILSIM (Sam and Nara’s respective testing responsibilities), as this supposedly “caused” other “separate” functions in the software to break or become unusable. This logic of blame placed upon developers was predominantly caused by an application of the same, associative logic that tester’s use to direct the gaze of developers to “where” a problem might be in the code. This logic of blame results from the tester’s understanding of where problems exist in the software, and what different code in the software exists in relation to, as understood through interaction with the software’s interface. These relative understandings of how the code is actually connected may be completely incorrect, and often developers related to me that
the majority of development work is bug fixing, because one cannot often know how new code will impact other modules in the software until the software is used. There was a common, running joke at C4i that if you were a developer who broke the software (made the software crash or become completely unusable), you had to buy donuts for the office. I witnessed this several times, though Monty was the only one made to buy donuts for the office during my fieldwork. The relation to how developers and testers perceive a notion of “broken” may be similar or even identical, but the reasons for why this broken state exists are entirely dependent on the rationality through which each group interprets the functioning and non-functioning state of the software.

The next chapter will primarily investigate the culmination of roles as a holistic process in the development of C4i’s software, in order to explore the linguistic and material forces that form the epistemological basis for C4i’s technical production. This basis creates the possibility for forms such as expertise, the formation of professional identity in new employees, and the contexts of communication that limit the exposure to knowledge in ways that privilege a “black-boxing” of knowing. This parceling of tasks, organization of knowledge into interfaces that aggregate production statistics and employees’ tasks into legible spaces that are open to inspection; this simultaneously creates a rigorous, communal effort to encourage, steer, and develop each member of a development team in relation to the whole, while simultaneously struggling to integrate professional practices that resist constant iteration and the strictures of tightly-scheduled methodologies that are meant to keep companies “agile.” I have explored the facets of these organizational structures in this chapter primarily through the lens of gender and my argument of a perception for labor outside of development as simultaneously
marginal, but also essential to understanding the development process. Gendered space at C4i is not an explicit segregation of male and female space as such, but it is instead the result of implicit metaphorical processes that have conditioned the spatialization of the work environment and the structured hierarchy of knowing and unknowing for the purposes of creating, containing, and controlling perspectives that are considered to be external to ‘actual’ development.

I have argued that this demarcation of space, of knowing, and of the structured tension between the margin and core of development is a manifestation of the same asymmetry of gendered space between male and female that have been discussed in relation to the production of “nature” and “culture” in feminist scholarship. Further, I have argued that subversion in this environment is designed for in the creation of testing, subject to the logic of development in the iterative practice of “getting it working” by repeated performance of actions and applied fixes to software.

Automation extends this logic in the ultimate act of asserting control over the validity of code and provides an institution of credibility that creates a historical, legible means to understand the ‘correctness’ of the logic of developers. I have also argued that it is the margins that sustain, provide the means for, and create the modalities of credibility that allow the validity of developers’ logic to operate in the public sphere. Clerical, administrative, testing, and graphical design, network administration, and design duties are just a few of the sectors of labor that are relegated to the margins in development, but all are equally essential to sustaining the purpose and meaning of C4i’s software in an environment where even the best software must sell well to be successful.
The essential tension between the core and the margins in development at C4i is maintained by the necessity of differing rationalities for operating in concert with or external to the perceived technical rationality afforded to the knowing of developers. Sequestered away from the chaotic nature of the changing occupations, needs, and experiences of users, the core of development sustains the tradition of separating nature from culture and of subjecting the former to control by the latter.
Promises of the Market:
Liberalization, Militarization, and Mythology in the Development of Simulation

The first desk that I was granted for my stay at C4i was located on the outer edge of a group of four by four cubicles that housed a couple of the developers, Bill and Barry, working on C4i’s communications planning software for the Canadian Military, ITN Planner. This desk situated me in a common thoroughfare that housed both C4i’s test lab and other cubicles housing the lead designer as well as the testers for ITN Planner. Directly across this thoroughfare, behind me, sat C4i’s QA director Tony, who had already been essential to organizing my initial time and responsibilities of access within the office. This situation left me at the intersection of the people and practices that had initially aligned to grant me access. I sat at a crossroads of foot traffic taking developers to and from the test lab and between two sets of cubicles occupied by testers and developers working on C4i’s ITN planner. This space allowed me to stay at the centre of flows of information and people through the hallways of C4i, but it also left me disconnected from more centralized efforts at collaboration that were essential to the “design” process at and in collaboration with C4i’s employees. I was not co-located with any employees from the start, and I had to travel from my cubicle to others or tag along when developers would rush to the test lab to find out if the latest code submitted was working correctly. Separately, I often found myself wandering in the decentralized work environment as I drifted between enclosed sets of cubicles that may have been
demarcated down different projects. Differing commitments from individuals co-located in the same cubicle space left me asking questions about different projects to different employees seated right next to one another. Further, two of the lead developers for two of C4i’s flagship products, EDMSIM and MILSIM, were – when I arrived and for much of my stay – working remotely, one from British Columbia, and the other from home due to a recent injury. The resulting disconnection from active development sometimes kept me out of flows of information that normally traversed digital divides, not physical ones.

I was located in the opposite corner from the offices of Gordy, Bob, and George, and in the half of the office that primarily housed developers and testers, while the other half housed the executive offices, meeting rooms, and offices of business development staff. At first, this location left me confused as to how to conduct myself as an observer. I was not attached to any one project in a space that was designed to be explicitly functional, but reconfigurable; a simple movement of one computer to another cubicle could relocate employees at the drop of a hat. As a result, my research sometimes drifted on these same whims, in which I found testers, summer students, and one director in particular, Tony, particularly amenable to my presence. Through initial encounters with these individuals located primarily on the margins, I was able to slowly drift towards the center of development and the organization of tasks in events such as Stand Up meetings. Without any initial, overarching picture of how projects were proceeding at C4i, I found myself drifting with my informants between points of contact that circulated knowledge as a reflection of professional practice, with little context to understand how these professional practices reflected the desires of designers and those who were responsible for maintaining schedules of production and capacity.
Spending time observing Gordy and Bill became more difficult after I returned from the CANSEC trip. Cordoned off in offices near the front of the building (with my desk respectively located in the back), my opportunities for engaging the day-to-day activities that brought executive decisions into and out of the workplace were minimal at first. However, my first day provided me with a brief glimpse of what I began to see as a separate world at C4i, a world that was purposefully divided from the technical minutiae of developers and the sometimes monotonous repetition of the work of developers – this world is that of design, the constitutive world that feeds practices of implementation. This world of design is fed by executives charged with satisfying customers across the globe and military establishments from South America to the Middle East. Satisfying the needs and whims of customers in various corners of the world, including those of the Canadian Forces in C4i’s backyard, required shifting and reallocation of resources to ensure clients that C4i is actively developing features that garnered interest from these potential clients in the first place.

This chapter explores the ways that promising clients, promising markets, and the promises that C4i makes to different clients shape manifestations of military practice in simulation in addition to conditioning the practice of approaching, sustaining, and integrating with tenuous markets made possible by liberalization and militarization of civilian practices. I will begin with a discussion of design in collaboration at C4i, and the way that these design processes are articulated through simulation and how simulation brings to bear different meanings in perception and practice for both producers of simulation and users of simulation, and in the maintenance of relationships that sustain this development in collaboration.
I will explore one such relationship here through C4i’s interactions with the engineers and students at the University of Calgary’s Agile Surface Engineering Laboratory. Interactions across what was perceived to be a “business-academic” divide are telling of the perceptions that create tensions, difficulties in interaction or understanding, and the simultaneous progression towards a completed project that suffuses such tensions with a unique determination to challenge the norms in one environment through engagement with the other. A more distributed conceptualization of the process of design must inherently address notions of representation and narrativization of both products of design processes and producers; it must address how communicative actions impose frameworks of interpretation and collective understanding that make collaboration and participation possible. Microanalysis of these communicative actions may address everything from the impact of gesture, symbolism, and shared or conflicting indexicality in collaborative discussion, to the influence of textual style and artifacts of methodological regimes of industrial and professional practice, and even the perceptual and epistemological restrictions that tools of practice impose on the process of design (Hymes, 1964).

Analysis of design in broader terms may encompass an examination of the consequences of the neoliberalization and decentralization of the processes of design, planning, and manufacturing, and the implications of orientating oneself and one’s professional practice to coincide with cross-cultural perceptual norms, regulatory ideologies of selfhood, and use of designed things. I will situate my analysis somewhere between these two extremes of accounting for the influence of communication, ideology, and identity. I will construct a picture of design at C4i that explores the confluence of
differently-invested actors and the demands and epistemological allegiances that deference to industrial practices bring to bear upon the increasingly networked practice (both literal and figurative) of software design. Constructing an understanding of external and internal influence – whether wrought through individuals, organizations or ideology – addresses some of the core anxieties of anthropological analysis. Some of these anxieties, for my purposes, include the ambiguous relationship between how the constitution of the anthropological subject is bound to its objective manifestations and vice-versa, and how forces internal to a particular collective sociality shape and can be shaped by external forces of individuals or other collective socialities.

**Presenting the Global and the Local**

On my first day, I met Jacob. It was the first and last time I would encounter him during my stay at C4i. Jacob was also brand new to C4i, taking up a position as a business development representative in the Middle East, living full time in Dubai in the United Arab Emirates (UAE). Jacob’s commitment to C4i was, as far as I understood, full-time. Jacob had previously worked for a large, transnational computer services and hardware corporation as a local business development representative, and had been based out of Dubai for a number of years. Jacob himself described his life as a decentralized affair. His wife managed the pair’s small technology consultancy business based primarily out of Romania. Jacob, an Israeli citizen, had also spent time as a member of the Israeli Defence Forces, and he described his philosophy of business and life to me in terms of “being aware,” both of what “kind of person” that he wants to be and how that perception “impacts what you do every day.” Jacob impressed upon me the importance of
international operations that are rooted in a firmly contextualized understanding of local business relationships, and how one must develop an “open mind” towards different practices in the international sphere in order to be successful. This is an attitude that struck me as particularly suited to bringing products to areas where notions of personhood and family are often described in stark relief to those of the “western” world.

Jacob’s position at C4i confronted me with a model for understanding how to situate C4i within a wider environment of geographies of militarization. Jacob pulled together former officers from the Canadian and Israeli – and with George’s presence, the British – militaries, and his location in Dubai makes him a particularly apt choice to pull together the supposedly disparate worlds of military and civilian industries, between Canadian and Middle Eastern defence industries. Jacob held together the forces of state, civil society, and a transcontinental divide in order to provide a node from which C4i could marshal Canadian productive capacity with Middle Eastern capital. Militarization can be understood as a conceptual framework through which to understand “the contradictory and tense social process in which civil society organizes itself for the production of violence” (Geyer, 1989: 79). For the purposes of my argument, I will argue that Jacob’s situation as a broker between a Canadian defence contractor and Middle Eastern governments represents one clear example of these contradictory and tense social processes that play out in the course of orienting society towards innovation, production, and maintenance of technologies designed for military applications. As Catherine Lutz suggests, in her discussion of the consequences of these processes being actively taken up by increasingly inseparable bureaucratic regimes – tasked with the functions of maintaining “non-military” and military government practices – militarization contributes
to “the less visible deformation of human potentials into the hierarchies of race, class, gender, and sexuality” (Lutz, 2002: 723). C4i’s role in this deformation is not an explicit in a push of a moral agenda for situating military technology in civilian practice. Rather, I argue that C4i’s role in creating the conditions for these deformations is due to the diverse investment in C4i’s products from varying states, militaries and private actors that constitute C4i’s products as reflections of the moral, class, and racial commitments that expound from differing definitions of nation, security, and in the management of disaster. C4i is, in these terms, a medium that ties together the interests of military practice with civilian industry. By exercising the demands of military practice through products such as simulation, C4i also binds itself to the differing casual definitions and hierarchies of security, state, and citizen that follow. The demarcation of such hierarchies of value that determine appropriateness and demarcate bureaucratically-determined categories of identity in professional practice serve in the “shaping of national histories in ways that glorify and legitimate military action” (Lutz, 2002: 723). Affectations of militarization upon the constitution of different modes of knowing and of the presentation of the self within and external to national and international notions of corporate identity situate C4i’s practices within a wider context – of how perceptions of geopolitics and potentials for the creation of capital create articulations with the globalized, neoliberal formations of the defence industry.

What will follow in the rest of this chapter is a contextualization of where the reifications of knowledge and the geographies of military practice come into contact with the geopolitics of market liberalization and the militarization of civilian life through the corporatization of technologies that produce military force. I will show how authority
over the logics that reproduce mythologies of military practice are situated within wider networks of geopolitical relations.

I will start by again addressing Jacob, C4i’s Middle East business development representative, and the notion of authority over military and cultural “fidelity,” as determined not only by personal histories in military practice, but also by associations of geopolitical relations with individuals. Fidelity, in this context, is not just a perspective on the ability of software to reflect the accuracy of practice as understood by the users that C4i develops software for, but fidelity to a specific geographical and cultural environment in which C4i’s products must be marketed, such as fidelity in representing local landmarks and emblems of local organizations in the simulation environment.

Jacob was in Calgary to deliver a presentation to Gordy, Bob, and Rachel (C4i’s human factors engineer) that he would later present to business leaders and members of the government in the United Arab Emirates. The presentation was an overview of C4i’s software and past corporate partnerships, designed to be a “test” presentation; it was a way for Gordy, Bob, and Rachel to see Jacob “in action” for the very first time. This presentation gave me a brief introduction both to C4i’s history and to the perceived purpose and design philosophy underlying two of C4i’s flagship products, MILSIM and EDMSIM. Specifically, this presentation was designed to introduce customers to the newer of C4i’s two simulations, EDMSIM, and the benefit that EDMSIM and emergency disaster simulations in general could bring to efforts at creating emergency response plans.

This presentation was the first opportunity for me to understand how C4i oriented itself externally to customers, and how C4i marketed EDMSIM to its clients. C4i’s
perception of an ideal use for EDMSIM, as presented by Jacob, lay in EDMSIM’s contribution to the “active” process of preparing for “disaster” or “emergencies.” This is in contrast to the “paralysis,” as perceived by C4i, to afflict institutions in times of crisis due to a lack of preparation and understanding of the nature of an emergency or disaster. C4i’s goal – as Jacob described in the presentation – was to move away from perceptions of what an emergency response plan “might” or “could” do in an emergency; or, as Jacob stated in the presentation, “there is no might or would or could – you ‘do’ in simulation.” The idea, quoted from the presentation, is to see a “good plan made into a better plan” through the active process of simulation. From these catchy turns of phrase, Jacob, as well as Gordy and Bill in a video during the presentation, described EDMSIM simultaneously as offering understanding of “different definitions of casualty,” as providing a “mobile framework” for integrating existing technology and resources seamlessly, and as providing a means to characterize “events” and the “unknown unknowns” of emergency situations in intelligible terms. Additionally, EDMSIM (and MILSIM) also offers what C4i calls an “after action report” (AAR) capability, providing replay videos of the software’s interface in-use and logs of “events” that occur during exercises in order to provide feedback for developing new emergency response plans.

Importantly, Jacob relayed the ideas purported by C4i that also stress the “pick up and go,” “low overhead” nature of EDMSIM. C4i not only wishes to position itself as a purveyor of complex simulations, but as a company offering cheaper solutions in a market where “expensive” is the norm. This was an idea that was related to me numerous times over the course of my fieldwork, whether in the form of descriptions of how C4i had pushed out a larger contractor in a negotiation because C4i’s software was much
cheaper, or through descriptions of C4i’s software as “extremely scalable,” meaning that the software could be used to organize simulations that are extremely large and resource intensive or the opposite with relative ease. For so long, state budgets grew larger and larger, especially in the context of defence, and especially in the context of a post-Second World War expansion of state governance in areas such as a social welfare (Harvey, 2005: 39-62). A culmination in collapsing markets for national manufacturing and energy industries in the United Kingdom and in the United States led to rapid privatization of everything from utilities such as water and electricity to defence (Harvey, 2005: 59-63). Particularly in the context of defence, the history between state and private industry is long and can be traced as a force in public politics at least back to Dwight Eisenhower’s comments on the “military industrial complex” in 1961. This interconnection between state militaries and the private industry that produce and accumulate capital in the production of the means for war only became more explicit, and yet, further privatized after the 1985 publication of the US Army’s Logistics Civil Augmentation Program (LOGCAP) and the opening up of private military contracting to on-the-ground logistics operations that could be relegated to private military forces (US Army, 1985; Chatterjee, 2009). The dissemination of authority over military practice and production to private industry was encouraged in the context of neoliberal economic policy as an effective means to encourage innovation, increase the turnover rate for capital invested in military industry and open up the traditionally closed environment of essential state services (such as healthcare, transportation, and now defence) to the competitive forces of the market that promised to revolutionize the way that innovation could reorient these privatized services for the good of the nation (Harvey, 2005: 39-62). C4i is only one company in a
long line of others that have increasingly extended these chains of privatizing different aspects of military practice in order to develop military technologies in a competitive market, freed from the bonds of state-driven production and research, free to seek out clients and applications for military technology with no master but that of the need for an accumulation of capital.

In the previous chapter, I explored the situation of marginalized perspectives in C4i. These perspectives constitute those situated at the bottom of C4i’s corporate hierarchy, but also those considered marginal or low-value. As well, I explored how the performance of certain kinds of work becomes gendered, through articulation of certain responsibilities and forms of work considered menial, repetitive, and oriented towards “visual” capacities to female employees. Negotiation over authority and expertise in certain areas, while not inherently malicious in an explicit capacity on a daily basis at C4i, further complicates the contestation of and capitulation to desires that are articulated by current and desired customers sought out, interpreted, and relayed by business development employees. The maintenance of corporate identity and intelligibility confronts the ability of small teams to implement and maintain support for constantly evolving software; they highlight the advantages and shortcomings of individual implementation, management, and styles of practice in the workplace that may conflict with the schedules and possibilities in innovation sought by those who must sell the product to customers. In what remains in this chapter, I will investigate how these efforts come to impact the process of production and the continual iteration and innovation that is possible when the needs articulated by sales-oriented employees come into contact with the capacities and constraints of individual development teams tasked with
innovation constrained by “market forces.” This context, I will argue, is essential to producing mythologies that represent and order the objects of military practice within everyday life and increasingly militarize civilian life for the purposes of creating marketable products outside of the scope of any one nation’s military practice.

**Situating Design Individually, Collectively, and in Collaboration**

Ethnographic and anthropological accounts of design practices and how design shapes human interaction are extremely varied in scope and application. Understanding “design” as a concept unto itself requires examination of not only interactions that are explicitly described as constituting the act of designing *something*; it also requires an examination of practices that entail the embodiment of ideology and expectations of sociality in everyday life, as well as individual curations or expressions of selfhood.

Linking the active process of design in craft work to distributed and mediated efforts at designing the self, community, and sociality is one of the primary theoretical motivations for this chapter. As described before, C4i’s situation within this field of ideological commitment and corporate identity are complicated by their position as a defence contractor and producer of technologies that enable military practice. This position, in the articulation of C4i’s presentation of a corporate self, forces business development executives and senior design members into conflict with perceptions of collective practice at C4i that are disadvantageous for the purpose of engaging projects that are situated more firmly in direct contact with civil society.

To approach the notion of design at C4i, I will situate my analysis within the context of bridging the gap between, first, those constituting official design sessions
among C4i’s project leads and design consultant. And second, in line with personal efforts at design meant to organize, frame, and conceptualize an approach to individual work, and design for collaboration wherein, for example, the needs of “getting a product to market” and the desire for “interesting projects to work on” must be balanced when creating and implementing a plan for production. I will explore design in collaboration primarily through the interaction between employees at C4i and students, researchers, and an engineering laboratory post-doc at the University of Calgary’s Agile Surface Engineering (ASE) lab. C4i’s project with the ASE lab exclusively surrounds a touchscreen table and integrating EDMSIM’s interface with the table’s hardware in order to produce what Gordy calls an “Emergency Operations Center (EOC) of the future.”

I will also trace categorizations and structures of space, time, and life that exist currently as part of C4i’s simulation software in an effort to understand how designs for simulation come to shape the classification of environments and practices in conjunction with market forces. These classifications of units, of space through mapping out virtual grounds for simulation, and the operation of time in simulation all cohere into a platform for interaction that is conditioned by the assumptions, desires to integrate with other simulation platforms, and goals for future development. Continual development on C4i’s simulation software is not only conditioned by these structural facets that comprise the software’s interface and functionality. Another integral facet of design at the “high level” is negotiating for resources and developer labor, as C4i actively continues to develop not only EDMSIM and MILSIM, but also ITN Planner and other, smaller side projects such as an intelligence gathering and geo-locating tool called SENTIO. The activity on each of these projects waxes and wanes with reference to contractual obligations, the need to
familiarize new developers with C4i’s frameworks, and with the perceived stability of a piece of software as a reflection of received feedback and customer desires for new features.

Actors who contribute to design at the “high level” work closely with one another, even though they most often are heading up or contributing to different projects. All are classified as “directors” or “project leads;” that is, except for Rachel, who operates as a contractor, and has had fifteen years’ experience working for various defence industry companies, in addition to her work in the civilian sector. Rachel had been with C4i for eight months when I began my field work, and her responsibilities as a “human factors engineer” can be summarized broadly with the moniker “design consultant.” Rachel’s expertise as a design consultant lay primarily in designing interfaces that users interact with directly, and much of her time was spent working on ITN Planner, as her contract allotted only ten hours per week for work on C4i’s other projects. However, Rachel also oversaw much of the design consultation and development scheduling for the EOC project. Her efforts at designing everything from the interface under development by the ASE personnel to the collaborative design meetings offered me crucial insight into how concepts of design can also be applied to the organization of development. Such efforts at designing the “process” of development allowed me to grasp another fundamental component of collaborative design both internally and externally at C4i and at the ASE lab – namely, the tensions that arise between groups in the process of commitment and joint work on a singular project. This focus on the group charged with taking in logics of the market, developing scheduled answers to demands for differently-oriented logics of perception in the collected space of a simulation serves to thrust much of the tension
associated with meeting market forces and demands for expanding a market into other
global regions onto this team. In this environment, business development team members
are fully removed from the conversation on how to organize the means of production in
order to meet deadlines. It is here that already-negotiated understandings of commitments
to opportunities for engagement with other companies or chances to showcase recent
implementations are fully detailed to ensure that the software will meet the expectations
for these logics in a detailed way.

Tensions arise internally over efforts in design, and how these tensions can help to
characterize an understood but difficult to qualify division of labor in the design process
– one in which creativity is restrained by rhetorical, conceptual, and technical notions of
feasibility and productive capacity. One, spatial example of this tension is Gordy’s wish
to create a “future lab” in C4i’s newly acquired office space, a space that I was granted a
tour of during my field work in C4i’s current offices. This “future lab,” in what I would
later come to call Gordy’s “visionary” terms, is meant to open up possibilities for
interaction with new hardware for developers and designers to “play with” in the pursuit
of new applications for C4i’s software. Gordy noted that this would remove barriers to
“planning for the future” by removing conflicts with C4i’s existing “lab” space, the
testing lab, and would provide “some kind of bling to blow people away.” In the same
discussion, Gordy himself hedged his discussion by noting “we’re just talking aspirations
here” – it is a statement that can be used to characterize the converse of Gordy’s ideals,
those of what is “feasible” and possible for C4i to produce and sell. The converse to these
ideas was often expressed by both George and Danny, the heads of business development
and engineering, respectively. George and Danny often were present in or heavily
involved in most high-level design discussions, and Danny attended most Stand Up meetings each morning out of concern for how work was progressing or in order to direct individuals towards new tasks. George’s criticisms of Gordy’s unbridled views of where and what C4i needed to succeed were often put to me in terms that spoke of the “attention deficit disorder” that characterized C4i’s tendency to orient towards different markets or different projects on the whims of tenuous commitments from continued clients or new ones. George wished to ground the company’s successes thoroughly before moving on to work towards another. The tension between these two extremes characterized both C4i’s attempts to continue to maintain a flagship product that had been given less attention in recent years (MILSIM), and to continually expand the potential for a new product (EDMSIM) to become representative of the diversity that C4i would be able to showcase as a corporation not entirely committed – and bound by – work on defence projects.

Design at an individual level, as much as it is essential to organizing an individual’s conceptions of their work in relation to the problems that individual is attempting to solve, is just as much an effort produced collectively as individually (Shrum, Genuth, and Chompalov, 2007). Bringing to bear shared definitions in individual work, designing written forms that others will consume and comment on, and designing scenarios and exercises for others to experience are all examples of labour that is embodied by an individual, but constituted and created through modes of perception that are grounded in collective expression and agreed upon understandings. These collective understandings might manifest technically in the form of shared devices through which technical laborers conduct work, such as computers or specific software (Latour, 1979), or through the collective political manifestations that operate to grant one group authority
over technical objects in relation to other groups, such as committees that award grants or contracts (Traweek, 1988). The space between generating collective understanding and collective definitions that may be embodied during individual work is one of reflection, interrogation, and criticism. Review meetings, consultations with employees perceived to have more “expertise,” and the need to individually implement code that “works” among the work of others within a program are all features of this collective practice of individual design that manifest during the production of software. Design at an individual level is conducted by each and every employee at C4i, and not simply the developers who interface with high level designers. Brad, the lead tester on the ITN Planner project was a constant, grounding fixture of my fieldwork. His efforts in designing both testing regimes for automated testing, and in designing appropriate tests for defects, helped to develop my understanding of how communication between developers and testers, and how tools like Team Foundation Server, serve to mediate the experience of design and process of collective understanding. Such mediation experiences smooth out common problems with development scheduling, such as tracking and assigning labor to discovered defects, while simultaneously frustrating attempts by Brad to understand the sometimes ambiguous explanations of features from which tests are designed.

Another, constant fixture of my experiences with the process of individual design at C4i were the observations I conducted of Monty and Mular, the two summer interns from the University of Calgary’s engineering and computer science departments. Monty and Mular, barely three weeks into their time at C4i when I arrived, were initially unfamiliar not only with the code of C4i’s software, but with the coding language (C#), and frameworks (Microsoft .NET) that were used in almost all of C4i’s products. As a
result, much of what I was witnessed while I observed Monty and Mular, was a learning experience, not only for me, but for the summer interns as well. Danny, C4i’s engineering lead, was also in charge of “managing the professional development” of both Monty and Mular while they were at C4i. Danny’s numerous one-on-one and one-on-two sessions with Monty and Mular, normally prompted with a nervous question, allowed me to observe the linguistic, gestural, and mentorship conventions that Danny employed to help Monty and Mular understand how to design solutions to problems. Additionally, among the other developers, I was able to trace out methodological similarities and asymmetries between more senior developers and Monty and Mular in order to show how some approaches to solving problems evolve – such as organizing “pretty” code beforehand, as opposed to after – and how some do not, such as utilizing google as the first line of attack to most problems.

Establishing design in collaboration is a tenuous exercise in balancing a perceived set of political commitments that each group holds as a framing “ideology of practice” that directs and conditions expressions of what each group thinks is possible to achieve with the other (Arnold, 2013: 139; Traweek, 1988: 126-157). These collaborations might take place in the context of administrative officials who direct the resources of laboratories or other contexts of technological innovation (Gusterson, 1998: 131-163), or it might take place across the different capacities and administrative organizations that continue to define cooperation between defence industry participation in technological production and organizations that can be categorized as “civilian,” such as university laboratories (Lowen, 1997; Shrum, Genu, and Chompalov, Ivan: 87-118). C4i’s material commitment to the ASE project, for example, is two-fold. C4i provides some
funds for the lab’s operation, while simultaneously providing a version of their EDMSIM software. The students and post-doc at the ASE lab are, first and foremost, software engineer and computer science students – they work primarily with gestural, spatial, and motion-driven computing technologies such as the Microsoft Kinect, projection technologies that project guiding visuals in a work environment, and a previous iteration of Microsoft’s touch table, now called the PixelSense.

With this project, Gordy hopes to provide more than merely the software means to organize and present information for planning in emergency disaster situations. Instead, Gordy’s plan for this “EOC” project – as it is termed by C4i and members of the ASE lab – is for it to serve as an infrastructural basis that can be sold as an entire package of hardware and software to communities and organizations in need of emergency planning capability. These points of collaboration are fruitful opportunities to draw out the differentiating commitments to ideology, professional ideals of practice, and how C4i attempts to situate a presentation of a corporate self as simultaneously solidified within the “business” or “real” world. Simultaneously, C4i attempts to use the “creative” forces of academic work to supplement a vision of a product that is not bound to one piece of software, but the environment that this software must operate within, and the individuals that the software must operate in conjunction with to achieve functional effect. These moments show how espoused vision of team logics, corporate logics, and the identities that are determined by these logics in relating them to one another come to define the mechanisms by which militarization, markets, and demands of corporate accountability to the bottom line ultimately shape interaction.
From the perspective of business development, sales, and those who deal in the “finished” products at C4i, design begins at the top, and then is implemented by those who will break down, classify, and assign man hours to the particulars of designed functionality. This perspective can be, in part, attributed to the nature of sales and business development work; business developers engage with clients, ensuring that the desires of ongoing clients (such as the Saudi Arabian Armed Forces) and new clients (such as the Armed Forces of the Philippines) are accounted for when deciding on new features to implement or old features to shift up or down in the development schedule. This perspective balances not only the potential or continued revenue stream that C4i uses to keep the lights on, but it also takes into account the changing responsibilities and unique circumstances of different military or governance organizations who may need certain features over others – features that these customers will be willing to pay more for in order to have implemented sooner. The purveyors of this perspective at C4i were primarily individuals who were not regularly, or ever, in the office; Steve, C4i’s business representative for the Philippines, regularly travelled between Calgary and Manila to oversee software demonstrations, and Jacob, the Middle Eastern representative that I met on my first day, I did not encounter again during my fieldwork stay at C4i.

While Jacob’s presentation was essential for me to understand how C4i saw its place in the consumer world, this chapter also addresses how design is practiced internally, from corporate presentations, to the design of upcoming meetings for the purpose of pushing collaborators to be aware of the needs of C4i’s business during development. Design is a means to understand the process of creating a technological framework for problem solving, not an isolated process of creative construction that takes
place before the “real work” of implementation and development begins. On the contrary, design is a constant, ongoing process undertaken by each and every employee at C4i; from the testers designing regimes for automated testing, to the work of project managers and team leaders who are situated within officially-designated roles for ongoing design and “shaping” of projects.

Design can be thought of broadly as any activity through which individuals or collectives interrogate, creatively construct or propose new concepts or ideational frameworks from which to guide perception or interaction. This process, constantly informed by efforts to realize products that integrate with other simulations and other software created by other defence contractors or with databases of mapping and military identification codes, is highly fraught with ambiguity. This ambiguity is not something inherent to the methodologies considered useful for software engineering, but is instead rooted first and foremost in the need to create ‘business opportunities.’ Additionally, in attempting to generate sales for EDMSIM, this ambiguity is generated in C4i’s attempt to create markets for their products in civil society – for example, local or municipal governments. To this end, C4i often partners with academic institutions and positions itself as a “leader” in the field of emergency disaster response simulation. These tensions between generating what is considered a “useful” product and the collective and external performance of a corporate presentation of the self are breeding grounds for uncertainty (Goffman, 1959). These uncertainties lie in understanding the relationship between understanding success as generating capital and generating a product that reflects a customer’s perception of how space, place, and work should be organized for the production of violence, or for responses to disasters. It is through these processes of
design that commitments are formed for standards of visual and interactive aesthetic, for ideas of shared and distributed responsibility during development, and for determining what is possible, impossible, and feasible in the context of technology production.

What I will explore in unpacking the process of design and the influences upon design from internal and external bodies, is the creation of a framework that organizes perception and everyday work practice. I will utilize the concept of a mythology or "realized myth" to do so, to show how the process of designing and implementing functionalities into C4i’s simulation products becomes a reflection of overarching principles that echo representational capacities. These capacities act both for C4i’s desire to accumulate capital in a global market, but also for the various organizations seeking to simulate objects and interactions seen as essential to continued operation and management of people and environments. I will argue that these mythologies increasingly decentralize the production of meaning from the specificities of life in any one nation in particular or the people that the institutions in these nations seek to manage, and centralize the capacity for experience with objects and interactions – deemed essential for adequate management – in the platform of simulation. What I will show is that the platform of simulation, the use of simulation, and the production of simulation serve to reify representational and ordering principles that contribute to the militarization of everyday life in software development, but also to the objectification of principles deemed important and primary to the continued existence of institutions both civilian and military in nations across the globe. These institutions, such as the Saudi Arabian Armed Forces or the Manila Municipal Government, treat the objects of their governance in different ways based upon the stereotypes and assumptions that they hold about their
responsibilities to these entities. In reifying these assumptions and entities through simulation, users experience these assumptions and the responses considered appropriate to their manifestations in simulation and become inculcated to these assumptions.

**Neoliberalization in War and Peace**

C4i is, in the grand scheme of the international arms trade and supply of military technology, a small fish. However, it is a corporation bent on replicating the profits of approaches to military innovation that take seriously the potential for decentralizing productive and marketing practices away from direct association with government-derived directives for the production of military technology. In contrast to nationally-governed programmes for orienting industrial defence production, C4i’s operations are – first and foremost – constituted by the Armed Forces of Saudi Arabia, the Armed Forces of the Philippines (more recently), and increasingly in pursuit of business with the armed forces of countries such as Qatar. C4i is also increasing cooperation and integration with technologies produced by corporations based in the United Kingdom and in the southern United States in furtherance of developing integrated platforms for military and emergency disaster simulation. C4i’s relationships with foreign militaries, city governments, and other internationally-situated defence contractors clearly demonstrate the decentralized defence market and organization of economic practice within neoliberal economic ideals of unrestricted flow of goods and capital – particularly in the context of the defence industry (Harvey, 2005: 83). C4i is a fixed point through which logics, local definitions, and capital are transnationally constituted – through which markets “stretch the bounds of governmentality” and make C4i a fixture of deterritorialization (Ong, 2006:
Further, as C4i expands into the industrial complex of humanitarian aid with products like EDMSIM, they become part of the profitable discourse of “humanitarian reason,” and become part of developing the infrastructure at the heart of the “morality of political action” that is used to justify interventions and governance structures for disaster management (Fassin, 2013: 269).

One of the fundamental drivers of the militarization of public life, particularly in nations situated in what is known as the “Global North” (Western Europe, North America, and Australia, predominantly), is the increasing conceptualization of “international order” as concerned with “control of markets” and with the “commercialization of politics” as constitutive of political power (Duffield, 2001: 183). Market liberalization, as a reflection of increasing deregulation of industrial practice within the defence industry, has contributed to a dilution of the idea of nation-state sovereignty as bound specifically to the governing competencies and bureaucracies of a state. It has forced the previously centralized authority of the sovereign decision into tension with the increasing political competence of corporate firms as capitalist representations of nation-state competence (Duffield, 2001: 164-166). This liberalization has created new centers of authority over the production and sale of military technology, and the penetration of military technologies into civilian life. These new centers of authority have been described as “neo-medieval,” a metaphor that describes an environment where “parcelling out” of authority previously centered on the state creates an environment of intersecting and competing interests (Verdery, 2008: 208; Cerny, 1998). It is an environment that blurs the lines of territoriality understood in terms of the nation state and reconstitutes this territoriality in terms of the regimes of “experts” and
“expertise” – such as that afforded to corporations – that may flow more freely across borders in search of a market in which to exercise authority over newly-privatized institutions and services such as transportation, utilities distribution, and defence (Harvey, 2005: 60-61). Previously, state-run laboratories and civil-military partnerships in the form of directed research at large, public universities defined a more centralized, state-driven relationship to a military-industrial complex (Gusteron, 1998; Lowen, 1997).

A shift away from Cold War structures of nation-state oriented military-industry has also seen a shift away from totalizing narratives of “superweapons” and nuclear calculus as primary drivers of technological innovation and narrativization in planning for war. H. Bruce Franklin discussed this once-dominant framework by showing how nuclear arsenals and plans for creating modern soldiers and tactics were supplemented by fantastic imaginings of future war in science fiction, sometimes penned by the same figures responsible for programs such as the CIA’s “Operation Phoenix” during the Vietnam war (Franklin, 2008: 217-218). Narratives of future war that flowed from these imaginings and consumption of this science fiction conceptualized future war as space that would be totalized in observation and in the destructive capacity of “superweapons” (Franklin, 2008: 162-190; 217-219). Today, such narratives have produced dramatizations of techno-realist conflict infused with the fears and obsessions over superweapons in the form of everything from Tom Clancy to 24. Instead of arguing that C4i is a part of this realization of continually coalescing narratives around the concept of ever-larger, unimaginable superweapons, I argue that it is the diffuse, almost invisible force of simulation that conditions a conception of a military future with more subtle, but equally powerful methods of creating the ultimate fighting force.
Dependence upon corporate client networks, and the contractual interdependence of international firms upon one another have suffused previously state-centric geopolitics with new bases of governance and authoritative knowledge. These new bases of authority are not only derived from corporate client networks and the need to generate capital across international boundaries without concern for ethnonational, gendered, or secular-nationalist narrativizations of political relations and the mediated presentations that sustain these relations in public life. Parallel to these neoliberal relegations of authority over trade and regulation of industry to corporate decision-makers, are the civilian networks and international trade and humanitarian agencies that attempt to regulate relationships between a new “globalized” world, and the everyday lives of individual actors in nations that are impacted by global market liberalizations. These bodies of governance include various United Nations committees and regulatory oversight bodies concerned with the international trade of arms and military technology, humanitarian aid and intervention, and post-conflict restructuring and adjustment regimes – regimes that are advised by and must engage thoroughly with corporate actors to mobilize resources for the production of globalized conceptions of development and “liberal peace” (Duffield, 2001: 71-73).

Specifically in the context of defence production, the increasing decentralization of the bureaucratic authority of the state has allowed for, and even encouraged the growth of, “transborder shadow economies,” those that allow and encourage the unregulated flow of arms, illicit and licit drugs, and commercial goods into areas considered to be “in development” – such as countries in Africa, Southeast Asia, and South America (Nordstrom, 2000; 2004; Duffield, 2001: 136-158). In concert with these deregulated
“grey areas” of liberalized market practice is the concept of “liberal peace;” it is tied to a broad agenda of social transformation intended to reconfigure civil society, governing institutions, and engagement with globalized trade to better reflect the “Global North’s” conceptualization of what values that “developing” nations should understand as leading to “harmonious” interaction with the “rest” of the world. Configuring a picture of what this newly globalized world – replete with the trappings of “liberal peace” – looks like has been taken up in diffuse projects of examining violences both physical and structural in societies trodden under by the unfixed, attention-deficit gaze of neoliberal practice (Malkki, 1995; Theidon, 2012; Pandolfi, 2013). Some of these investigations focus on the ways that governance structures create permanent legal and politically-actionable rationales for “declarations of humanitarian emergencies” in projects for “management of living beings,” in the pursuit of a “morality for political action” that is derived from a totalizing, “globalized form of life” (Pandolfi, 2013: 154; Fassin, 2013: 269). Others have focused on the mutations and shifting morphologies of remembrance and reconciliation that make and “unmake” concepts of common sense, gender relations, and the cohesion of communities in depreciated nations restructured and reconstituted by structural adjustment and neoliberally-aligned authoritarian regimes in nations such as Peru and Liberia (Theidon, 2012; Abramowitz, 2014). In each of these arguments, an “international order” presumes a universal conception of how economy, society, and the everyday lives of individuals should be configured without regard to what current social norms and cultural configurations of value may be, or even whether these notions of civil society may be incompatible with valued lifeways in nations considered to be “in development” or in need of development.
My own investigation of these conceptualizations of international order are informed by the attempts of C4i to create software platforms that internalize these logics in order to train the personnel charged with management of these same disasters, and the militaries that ensure the protection of this same order. Decentralizing and disinvesting the state of the fundamental epistemological and ontological tools – through which the management of life is conceived of and rationalized as actionable – has resulted in corporations, such as C4i, taking up and distributing software as regimes of symbolic governance that are meant to fill this gap and provide a narrative experience that is iterative, instructive, and creates actionable potential. Local understandings of military practice and emergency response – including definitions of enemies, casualties, and vectors for weaponry and floods – are solidified into experiential meta-narratives in simulation that reify and mythologize logics that may only have tenuous connection with the life under management. Since this solidification comes at the price of products that are decoupled from any one, localized manifestation, the transnational nature of the way these products coalesce a multiplicity of concepts pertaining to the management of life is invested with tenuous rationalizations drawn from the continually shifting allegiances of corporate authority.

Literature exploring the economic impact of these decentralized networks of corporate and humanitarian authority has primarily investigated the way that these networks affect life “on the ground” in places that are considered to be actively marginalized by liberalized, networked authority. Carolyn Nordstrom, for example, confines her analysis primarily to African nations such as Angola, where she discusses the everyday practice of the “shadows” (Nordstrom, 2004). The “shadows” describe the
well-established, unregulated marketplaces that allow licit and illicit goods to flow freely and constitute a stop-gap measure in the ambiguous space between the regulated markets of a “liberal” society, and the chaotic configurations of pillage, plunder, and violence that humanitarian and corporate authorities point to as evidence of the need for developmental intervention. Specific to the practice of industrial production, Catherine Lutz and James Der Derian point to a certain techno-fetishism surrounding understandings of the practice of war, and the “certainty” that technology brings to the practice of exorcising “ambiguity” from the potentials for death and destruction in conflict (Lutz, 2002: 725; Der Derian, 2001: 23-47). Taking this argument further, I suggest this techno-fetishism of the practice of war not only helps to contribute to the liberalization of markets in favor of spreading the “miracles” of Western weaponry to the wider world, but it also bureaucratizes and institutionalizes the values, imagined realities, and conceptual imageries of what C. Wright Mills called “a military definition of reality” (Mills, 1956: 191).

**Defining, Marketing, and Simulating the Objects of Expertise**

Understanding the ways that definitions of reality in neoliberally-constituted products of simulation does not merely address the ways that imperialist and class structures divest marginal nation states and communities of local governance and conceptions of self, society, and substantiation. I argue that what these simulation products contribute to a notion of governance that is sanitized of the specific needs of specific populations, a notion oriented outwards to the ambiguous void of a transnational market replete with the “expertise” to solve any problem.
Technological developments can run amok as sectors dedicated solely to technological innovation create new products and new ways of doing things that as yet have no market. Talented interlopers can, furthermore, mobilize technological innovations to undermine dominant social relations and institutions; they can, through their activities, even reshape common sense to their own pecuniary advantage (Harvey, 2005: 69).

It is not, therefore, only the tangible material of divestment and destruction that result from legalistic frameworks, the notion of “free trade,” and other trappings of neoliberal governance that promote unrestricted intervention and reconfiguration of society to serve a “liberal peace.” I argue that is the epistemological foundations of understanding the self in relation to others that undergoes mutation through these products of simulation. The relation of the self to an “other,” in the context of exercising authority in governance and in the identification of enemies and beings of equal or lesser value to oneself, is one that has been taken up in deconstructive investigations of colonial practice and explorations of political myths such as “orientalism” that reify the values, practices, and purpose of entire swathes of the globe (Spivak, 1988; Said, 1978). Here, I wish to explore the process of bureaucratization, institutionalization, and dissemination of a mechanism by which these political myths come into contact with the individuals that will propagate the “truths” taken from simulation in the “real” world.

This process of bureaucratization and institutionalization of a militarized reality produces a convergence upon a unique example of what Michel Foucault called “governmentality.” That is, governmentality can be described as the technologies involved in the rationalization, demarcation and encirclement of classifications that inscribe conceptualizations of the management of populations, of functions that institutions are expected to perform, and of the objects that can be said to “exist,” and therefore be pronounced upon, in the context of institutions rationalized to confine such
objects to a particular existence (Foucault, 2007: 117-119). It is not enough to confine a discussion of the militarization of society through defence industry production to the way that this industry articulates with civilian and military populations in an effort to sell products. Instead, I argue that it is essential to situate this discussion in conversation with the way that the objects – those that are meant to be affected by these technologies – come to be defined and come to be considered “manageable” in concert with these articulations in the globalized market. The ability to constitute conceptual objects through technological platforms, such as the notion of particular kinds of conflict, or problems of communication between institutions that manage individuals who perform functions upon deviant socialities (such as the police) or upon states of nature considered antithetical to the continued existence of society (such as firefighters) is an exercise of power over the configuration of value and life in society. Exercising this power over configurations of how different institutions of societal governance through technologies that have a transnational orientation – for diverse marketability and in search of monopolizing market penetration – alters the fabric of these relations that are understood as constitutive elements of nation-state governance.

Taking the place of these relations is the reconfigurable platform of simulation, whereby the “objective qualities” of time and space are given meaning by those who “define the material practices” associated with achieving “hegemony” through “control [of] the material context of personal and social experience” (Harvey, 1990: 227). Simulation allows for a mobile means of conceiving of a solidified structure of time and space as a service, as a means of increasing the turnover of capital investment while maintaining the rigidity of social relations that it uses to manifest these concepts of space
and time in concert with the experience of the user (Harvey, 1990: 229). Whether Saudi Arabia or the Philippines, the basic concepts of understanding the organization of space and the contingencies of time in military command or emergency disaster remain the same – simulation universalizes space and collapses time around the experience of individuals in simulation. Through simulation, individuals are able to gain experience with any space on earth and are able to sustain these experiences iteratively through repeated exercise, but only as a measure of the ability to map out space and time in new configurations in the context of the simulation’s computational structure. Mapping concepts of space and time is not just limited to locations, either. Allowing individuals to experience the consequences of disease or biological weapons in space, and across time, requires integration of models to account for these experiences.

The selection of the phenomena for mapping within the context of simulation are tied to the ability of C4i to negotiate the sale of software with clients in mind; C4i does not merely sell a simulation platform, it sells the configuration of that platform in ways that represent the primary indexes of meaning inherent to clients. For the Philippines, this meant working to introduce flood modeling as one configuration of disaster. C4i often does “demonstrations” of their simulation’s capacity to introduce new concepts before signing contracts as a show of good faith to customers, quite literally prefiguring the relations of governance in simulation in order to reinforce the status of expertise that leads to the ability to increase turn-over of capital.

I will further this argument with a conceptualization of how these logics of reason and bureaucratizations of ways of knowing, space, and time come to be taken up by corporate actors in the pursuit of authority over the production of technologies that reify
these logics in material forms that are given monetary value and then marketed as “solutions” to problems that are constituted through the creation of these same technologies. I will argue that solidifying these conceptualizations of governance in simulation, and the unique nature of simulation as an iterative, individual experience of the objects of governance that is divorced from material consequences results in a stable mythology of governance that C4i utilizes as part of creating desire for products.

The problems that C4i’s software is meant to address through simulation are configurations of the imagined potentialities of objects that are “made real” through programmed interfaces that create symbolic, “representative” displays through which individuals garner an understanding of the interactional potential of those same objects in “reality.” However, at C4i, not all objects of simulation are created equally. The ability of C4i to market the authoritative value of their simulations depends upon their ability to generate authority over the constitution of objects that are considered valuable to the institutions that C4i wishes to sell to. Whether or not an object of simulation receives attention, and whether that object comes into simulatable “reality” with other objects, is contingent upon the values and demands that these institutions relate to C4i or those that C4i can relate in terms that these institutions see as valuable for the purposes of creating institutional, regulated authority over a specific phenomenon. C4i’s products, in concert with the external consumers who constitute their existence, come to reify the dangerous world of conflict and disaster that C4i seeks to address through software development.

For example, in the context of military simulation, much of the identification of units and the attributes associated with these identifications – and any changes to these attributes that take place in the course of simulation – is coded through use of the
Distributed Interactive Simulation (DIS) standard. This standard provides numerical values that represent everything from a unit’s national identity, a unit’s movement through space and time, a unit’s interaction, “collision,” and ability to fire weapons and be fired upon, to the simulation of communication between units for the purpose of giving orders or requesting repair of vehicles or resupply. The encoded identities of these specific units and the functions between units are sent as Protocol Data Units (PDUs) – encapsulated packets of data containing different DIS values – over a network, and the simulation responds to these values accordingly. From these values, C4i may also create values of their own, or may integrate new units and abilities based upon the interactions available through DIS, a process that is called “DIS mapping.” When C4i wishes to impress upon potential customers the ability of the simulation to address the specific priorities of specific customers, such as the Canadian, Saudi or Philippine Armed Forces, they prepare demonstrations and configured scenarios that map DIS values in different ways to appeal to the priorities of these potential and current clients. Canadian Armed Forces members, for example, might not pay for software that only represents Saudi military units, weaponry, and physical geography. For the purposes of an interactive demonstration with a Calgary reserve unit C4i prepared an exercise representing an insurgency in the foothills of southern Alberta. When C4i executives learned, while at CANSEC, of a possible visit by Canadian Navy personnel they prepared a small visual “flyover” of a fleet of Canadian ships to demonstrate the ability to relate to the Navy’s presumed needs.

Therefore, C4i’s platform does not necessarily provide the base understandings of attributive identity and interaction in simulation, but it garners the perception of expertise
surrounding C4i’s ability to represent these values in configurations that are meant to position C4i and C4i’s software as valuable. Further, by mapping new interactions for DIS units to engage within the context of simulation, such as specific geographic locations and the features of elevation, weather patterns, or even flight patterns and standards of aerial combat engagement, C4i extends authority over the constitution of objects in simulation to other perceived facets of objective existence for varying institutions. By achieving authority over different interactions and identities in the configuration and expansion of the DIS system brought about by new mappings, new visualizations, and most of all, by new customers adopting C4i’s simulations instead of others, C4i achieves a sort of vertical integration of the way that perceptions of objects are constituted and interacted with. This vertical integration is one of meaning and perception, and the ability to state with authority whether or not an object or specific interaction exists or not. If C4i’s success at garnering customers increases, so too does the demand for development of objects and interactions considered primary and to exist by other institutions, and therefore the value of C4i’s expertise increases, the price of the software increases, and so too the ability of C4i to set the terms of revisions to the standards of encoded entities in simulation. The distributed, diffuse process of achieving authority over the objects of simulation is one that creates narratives of value and appropriate and inappropriate experience for individuals interacting with these objects. Interactive simulation, after all, is used to train individuals in specific tasks. By training individuals more and more individuals in specific tasks that are configurations of objects set by specific institutions that are customers of C4i, C4i stabilizes these narratives as the
most objective and proper, and inculcates this authoritative narrative into the daily experience of individual.

I argue that this process creates what Pierre Bourdieu calls a “realized myth,” a reflection of a “dialectical relationship between the body and a structured organization of space and time” through which “common practices and representations are determined” (Bourdieu, 1977: 163). I argue that the experiences with objects in simulation is mythical because of its relation to structuring the practices of a collective group of individuals to perform according to prescribed responses when presented with a given configuration of objects or interactions in simulation. These objects “structure not only the group’s representation of the world but the group itself, which orders itself in accordance with this representation” (Bourdieu, 1977: 163). Bourdieu originally utilized this term to discuss the integration of the Kabyle’s social production of meaning with the economic practices that sustain everyday life. These practices sustained the link between social and economic life, such as through cycles of harvest and identification of male and female qualities with times of the year based upon environmental qualities (such as hot and cold) and the association with “inside” and “outside” with different times of the year (Bourdieu, 1977: 163-167). Harvey contends that capitalist practices that require “fragmentation and ephemerality in the midst of the universals of monetization” preclude an ability to construct a stable myths through which to both represent and order everyday practice (Harvey, 1990: 217).

However, I contend that it is the platform of simulation that allows the stability of myth to become representative and act as an ordering force in the constitution of everyday life. Simulation acts upon the ordering and representative practices of everyday
life by providing a space in which to repeatedly experience the contingencies of these representative and ordering principles, a practice that lends authority to these principles. By creating a stable, centralized platform through which to intake and manifest diverse perceptions of objects and interactions pertaining to different institutions, and by making experience with this platform the central mode of sustaining these perceptions, C4i collapses the time that might be needed to qualify these objects and interactions as objective and appropriate into the space of simulation. The phenomenon of simulation, then, acts as a response to what Martin Heidegger criticised as the elimination of “time as history” – as a force that provides meaning and identity to individuals and collectives – through the “bland universalisms of technology” in creating simultaneity of communication and experience in space and resulting in the “collapse of spatial distinctiveness and identity” (Heidegger, 1959: 202; Harvey, 1990: 209). Simulation both particularizes and universalizes in the ability to take in, and accelerate the process of historical experience that Heidegger saw as essential to “being.” By accelerating the experience with these meanings, but by also providing a stable platform through which to repeatedly train the supposed “proper practices” meant to be understood as reflection on the meanings taken from simulation, simulation acts as a means to realize myth in everyday life. While stable when taken in and projected, such as when C4i is able to create scenarios with floods in mind for the Philippines, the realization of myth while in production is an extremely unstable affair that is beholden to the potential of relations between C4i and clients to shift based upon the contingencies of C4i’s need to generate capital at an increasingly high rate of turn over.
The unstable system of relations that C4i engages with in seeking out customers, attempting to deliver simulation that address those customers’ institutional objects and rationalities of management creates a dynamic picture of a reality that is not immutable – and therefore calculable. For C4i, the platform of simulation provides a self-sustaining myth of flexible capital accumulation; it is an epistemological project in sustaining the institutional perceptions of others in a stable way to create a platform for the myths of others; but for C4i the products and production of simulation provide a representative and ordering set principles that C4i uses to structure the work of software development. I use the term myth in the context of C4i’s everyday production to refer to the structured, networked symbolisms of market logic, varying notions of authority and legitimacy in regions in which C4i intends to market products, and the nationalisms and institutionalized objects of practice that contribute to individual and corporate presentations of the self, and to the material constructions that embody these symbolisms in simulation. As a small notion of how this myth has become increasingly representative of C4i’s every practice, the company’s name recently (after my fieldwork ended) changed from “C4i Consultants” to “C4i Training and Technology.”

There is an inherent contradiction in the logic that prefigures the idea of simulation; that there is an immutable reality that can be programmatically represented and interacted with in empirical, practicable terms that are not grounded in the ambiguities of subjective experience. For, in the creation of C4i’s simulations, C4i and its corporate representatives put themselves at the mercy of market forces that determine the categories of mutable reality that comprise the supposedly objective platform of programmed simulation. Differing customers concerns and conceptions of dangers – and
the symbolisms that comprise these conceptualizations of danger – demand differing configurations of reality in simulation in order to make simulation “real” to the customers that C4i wishes to sell software to. This inherent contradiction strikes of the timeliness and simultaneous timelessness that Claude Lévi-Strauss ascribes to the operational value of myth; “[myth] explains the present and the past as well as the future” (Lévi-Strauss, 1963: 209). Simulation, properly configured in consultation with subjectively-defined, programmatic objects, constitutes the historical reality understood by simulation consumers and creators, the present configurations of those realities that can be acted upon in simulation, and the future ascriptions of meaning that will be after experience with those realities in simulation. It is, as discussed before, a realization of Heidegger’s appeal to the concept of being as meaning derived from history and the distinctiveness and meaningfulness in particular spaces for particular peoples through the same technological processes that Heidegger criticised as creating universalizing, and therefore impermanent notions of space and experience devoid of the meaning generated by history. This conception of simulation begets discussion of the semantic potential drawn from simulation in both diachronic and synchronic terms; the way that the interpretants programmed into simulation as entities and the relations between entities may be pulled out of the holistic conception of a simulation exercise and may be performed upon to constitute new structural forms.

The integration of C4i’s simulation software with another, three-dimensional, visual simulation – in which C4i’s software provided the organizational, logistical, and command interactions between units – provides an example of how the negotiation of experience with the objects in simulation and the representation of objects in simulation
comes to represent the difference between synchronic and diachronic relations. Monty and Mular, when they first arrived at C4i, were charged with fixing bugs in MILSIM for the upcoming demonstration at CANSEC. While MILSIM’s functionality in terms of handling the interactions and identities of units was not in question, the translation of this functionality into the functionality of the 3-D simulation’s own ability to handle these interactions was in question. Units characterized as “running” in MILSIM would simply slide across the ground in the 3-D simulation. And further, entities that existed in MILSIM could not fire at or engage with entities in the 3-D simulation. This was billed as a DIS problem, a mismatch between the data sent in MILSIMs PDUs and the interpretation of that data in the 3-D simulation’s own environment. Thus, the synchrony of the objects of MILSIM’s simulation were not in question in this environment. MILSIM functioned in its own terms, but not when interacting diachronically with other functions over the course of simulation. Performing upon these notions of diachronic versus synchronic functions in simulation was a matter of isolating the mechanism that was preventing the individually, correctly performing functions of synchronic functionality from functioning diachronically in the experience of the simulation. Testing this phenomenon required sending data between simulations repeatedly to see if the functions could be interconnected in such a way as to provide a seamless, diachronic experience of both simulations’ functionality in a single space. Thus, creating the proper semantic potential for simulation often requires isolation of, and performance upon not only the simulation of objects in software in terms specific to those objects, but upon the ways that these objects interact in the course of simulation to provide an experience with simulation that is not only sustainable and stable in space, but also through time.
The process of performing upon software in a synchronic manner is much easier than a diachronic one, at least from the perspective of developers. The natural tendency in software development is to compartmentalize, to black-box, to parcel out the functionality of software into as many pieces as possible that operate as a whole while running. As an example of this, I look to Monty. Monty, about two-thirds of the way through my fieldwork, was charged with integrating other mapping databases into C4i’s software, in order to make “routing” work in MILSIM. Routing is the function in software, such as in Google Maps, that allows you to type in a location and to receive directions to and from that location. Routing is what analyzes a geographical environment, determines whether or not there are roads or other obstacles to navigation, and provides an assessment of the direction and time it will take to arrive at a particular destination. Routing functions in EDMSIM, as it is considered more important to the overall functionality of the software – in that being able to route police cars, ambulances, and fire trucks to a destination is considered an important part of the multi-agency command and control procedure inherent to emergency disaster response. Monty was charged by Danny to integrate routing capabilities into MILSIM, with one of the rationales being that the addition of routing might make a good case for MILSIM being able to simulate urban warfare more effectively. As well, this gave Monty an opportunity to work by himself on a project for the first time. Up until this point, Monty and Mular had worked together on almost everything. Initial successes with Monty’s development of routing later morphed into problems as Monty found himself unable to integrate his code with the up-to-date build of MILSIM. MILSIM was still under active development by the main developers on the project, after all, and Monty’s contributions were not
considered important enough to run the risk of Monty’s changes wreaking havoc with the
c changes that the main developers were making to MILSIM at the time. Monty was, quite
literally, compartmentalized out of active development on the software. He was able to
continue to a certain extent, but being unable to integrate his code into the most recent
builds made it more difficult to test his contributions – as Nara, the tester on MILSIM,
almost always used the most recent build of MILSIM to test changes. As a reflection of
the synchrony in development, Monty’s situation reflects both an organizational and a
programming example of the phenomenon of synchrony. Monty was forced to develop
his module for routing in isolation from the others, both as a reflection of his junior status
and the low priority of the functionality that he was developing. This also allowed the
software to remain free of the potential impact of a piece of functionality that was not in
high demand by any of C4i’s clients. Effectively, Monty’s module existed outside of
MILSIM, only as an “add-on” that might be integrated later, depending on Monty’s
performance in this restricted environment and the impact of his module upon the rest of
the software. Monty’s isolation as a subjective experience of labor practice reflected the
“realized myth” of C4i’s practice in that his labor was isolated from the whole in much
the same way that features not considered “priorities” were. In this way, the realized
myth of C4i’s practice becomes materially constituted not only in the platform of
simulation, but in the organizational principles that are used to produce the platform of
simulation. The materialization of other institutional myths and ordering principles of
C4i’s clients in the platform of simulation is dependent on C4i’s adherence to C4i’s own
set of realizable myths. C4i’s realized myth represents and orders practice in ways that
are considered essential to producing a product that is cohesive and able to be sold
without accounting for contingencies produced by the addition of functionalities that are considered secondary to producing authoritative simulation for one client or another.

It is therefore helpful to extend the conception of simulation-as-myth to the ways that these market-driven narrativizations of objects and categorically-organized visualizations of experience are performed upon as a materialization of subjective experience. Lévi-Strauss understood myth as innately structured, and yet mutable into differently-configured formulations that allow for an examination of the relations between humans in interaction and the world around them (Lévi-Strauss, 1963: 217-219).

This conception is in contrast to those who would argue for a singular interpretation of narrative based on a diachronic analysis of particular expressions of myth. Myth, comprised of the narrativized relations between objects and persons in interaction, is thus permutable through functional descriptions that Lévi-Strauss conceived of (and visualized as) as relations described by formulas. These formulas do not describe, in detail, the components of a myth’s relations in specific terms. Rather, these formulas are meant to grant understanding of the transformative properties of myth. The relations described in myth allow for conception of one object via an opposite, an inversion, and, therefore, a conception of a dynamic system that allows for positioning of meanings in relation to one another (Lévi-Strauss, 1963: 228). While I argue that this formulaic interpretation of myth lacks nuance when directed to the specificities of everyday experience, Lévi-Strauss does provide us with a unique conception that I argue has been taken seriously in the production of simulation. This unique conception displays itself most clearly in Lévi-Strauss’ argument for the use of “perforated cards, which in turn require IBM equipment,” that is computing equipment, in the search for “constituent
units” and the relations that comprise these constituent units in myth (Lévi-Strauss, 1963: 228-229). Lévi-Strauss argued for a search for the components of myth that relies heavily on structured, iterative permutation of the different expressions, and aesthetic organizations of myth across time in order to develop a thorough understanding of the relations inherent to each myth. I argue that simulation represents just this search for permutable forms of relations considered as given by those charged with structuring simulations through programming. Simulation, and most software, is constituted by the ways in which algorithms are applied in relation to one another, and how the outcomes of these applications are visually displayed and acted upon in order to solve problems in a context defined by the mathematically-interpreted relations that comprise algorithms. The algorithm, in this context, perfectly embodies an extension of Lévi-Strauss’ conception of the constituent relations of myth as “logical [models] capable of overcoming a contradiction,” in which “a theoretically infinite number of [models] will be generated, each one slightly different from the others” (Lévi-Strauss, 1963: 229). In the case of computing, contradictions are resolved as problems – as mathematically interpretable relations – through which outcomes are produced and that then configure responses from other bundles of mathematical relations that can be applied to “solve” a problem.

I argue for this specific understanding of the permutable nature of myth because algorithmic interpretation of the relations between given objects (also constituted by differently-ordered algorithms) is the means by which the nature of objects given by C4i’s customers is given material and actionable form. Taking in the narrativizations of relations between, for example, the way that soldiers take orders from superior officers and relay those orders to subordinates or the way that norms associated with navigation
of aircraft when patrolling an area or landing, and then subsequently creating
mathematical applications to visualize and act upon these narratives serve to create a
space for permutation on the logical relations that comprise these narratives. It is not just
that the logical relations that define objects for C4i’s customers are taken seriously in the
construction of simulation by C4i’s employees, but that these logical relations are made
real in creating a material platform from which to perform actions on these relations.
This interpretation of the nature of simulation is not a new one. Jean Baudrillard, in his
discussion of the increasing deference to simulacra – an ordering of relations and objects
drawn from what are, already, interpretations of reality – as interpretants of “reality,”
notes that simulation is “the generation by models of a real without origin or reality”
(Baudrillard, 1983: 2). In contrast to Baudrillard’s disparagement of the conceptualization
of reality through these “simulations of simulations,” I argue that it is the narrativized,
institutionalized constitutions of what is considered “real” and “factual” that must be
interrogated and not the mechanism by which these constitutions are brought into
programmed permutation with one another.

To reassert the analogy of the myth here, I argue for an investigation of the
articulations of the objects of myth as drawn from the attempts of C4i to create, sustain,
and expand a “market” for software. These objects are those that are drawn from C4i’s
customers, in attempts to purchase an interactive space in which to permute different
configurations of the different myths that orient action during, for example, the material
conditions created by an explosion in a particular location or the possible responses to
floods in a city with a given set of bureaucratically-defined resources.
Militarizing Everyday Life in Commentary and Development of Simulation

For the purposes of my argument, this process of narrativization, programming, and experience with different clients’ objects and narrativized “military values” also contributes thoroughly to the process of the militarization of civilian life and to the notion of civil society sustained by the accumulation of capital in concert with military practice. This is not simply because of the decentralization of control over the production of military technology that is increasingly the norm in a liberalized market, where corporate firms are bound not to host-government directives to solve the current conflicts, but instead to the demands of varying governments as merely one client among many. The consequences of militarization come more clearly into focus when considering that C4i’s latest project is a civilian-oriented, “emergency disaster response” simulation, drawn from the military simulation. The same logic that informs a notion of “high-tech weaponry’s superior efficacy as a modality of war” also orients perception in civil society. This logic informs “campaigns for better living through those sciences that brought advances in transportation, food technology, home appliances and computers” and buttresses arguments for expanded production – and therefore an expanded market for – technologies that were originally produced to enable military practice (Lutz, 2002: 725). A particularly telling representation of these logics operating in concert with one another is, as mentioned in chapter two, the practical demonstration of C4i’s EDMSIM alongside MILSIM in a single operational environment, where the operational contexts of emergency disaster response and military operations are considered to be functionally bound to one another. This is made further evident by the perceived necessity to make functional the ability to fire at and damage entities in one simulation from another; the
programmed, interactive symbolisms of danger in one context were considered so
interlinked as to require representation of one within another.

As an example of this process of militarization of civilian society, I will explore
C4i’s relationship with the Agile Surface Engineering Laboratory at the University of
Calgary. C4i, in attempting to create and sustain a market for their EDMSIM product, is
attempting – through work with the ASE lab – to create an “environment” in which their
software is the organizing force. What C4i’s software will do in such an environment is
network pieces of hardware together and provide a visual manifestation of what will be
an “Emergency Operations Center” of the future. Not only is C4i directing the logic of
command and control in concert with the production of EDMSIM from the basis of
MILSIM – as a reflection of the similar principles of command, logistical organization,
and directed dispatch that MILSIM provides in simulating military operations – but it is
also attempting to utilize EDMSIM to manifest a physical space in which these principles
will direct the practice of emergency responders hierarchically, compartmentally, and in
ways that echo the style of command common to military practice. One of the pieces of
hardware meant to make this possible is a centralized display on a television that is meant
to draw in data from multiple instances of EMDSIM’s display interface to allow a
centralized official to see and direct resources accordingly. Further, the interface that is
meant to buttress this centralized display is a centralized control interface in the form of a
“touch table,” which might be likened to a tablet computer writ large. In constructing an
environment with these tools, and by centralizing the response to and planning for
emergencies, C4i transforms the command structure and response of civilian agencies
into that of military command. Creating the market conditions in which this
transformation takes place involves C4i attending various conferences, such as the Ready at a Moment’s Notice Conference, and by creating opportunities at various events for civilian agencies to see actionable benefit of centralizing authority and control over resources during an emergency by displaying the actionable capacity of simulation to provide certainty in times of uncertainty. This capacity, as developed when I watched Gordy take the stage at a panel at the Ready at a Moment’s Notice Conference, is developed as “training” through iterative “practice” in a simulation environment. Alongside other “industry experts,” such as the Directory of Safety at the Calgary Airport Authority, and the director of Business Continuity and Loss Prevention at Walmart Canada, Gordy narrativized a recent experience with conducting a training exercise with the Jamaican government, during which the government discovered the flaws and organizational inefficiencies inherent in a plan to respond to natural disasters in the country. Through this narrativization of disaster in the terms of the follies of a lack of training, Gordy creates demand for C4i’s software by creating the demand for an organizational structure that is best to train with. C4i’s EDMSIM enables a certain kind of training, a kind of training developed with hierarchies of command and control in mind. While configurable, EDMSIM ultimately provides models for organizational structure that take into account “executive decision makers,” and a series of subordinates who will operate as dispatchers, relays for commands, and logistics organizers who take direction from these executive decision makers. This was clearly evident in the fact that the conference, it turns out, was attended primarily by these “executive decision makers,” evidenced by the explanations offered by panel members of the benefits of organizing one’s bureaucratic structure in the ways that enable these executive decision makers to
take into account the principles of command and control related by different panel members. Questions for Gordy on the panel, and later during an exercise meant to showcase the capabilities of C4i’s software, were directed to the ways that the software could be used by many of the attendees subordinates to enable more hands-on experience with the “motions” of emergency disaster response.

In providing advice to the ASE laboratory personnel (who were, for the most part, students in summer positions from computer science and engineering departments), Rachel, George, and Danny often organized advice in terms of C4i’s desire to provide the “real-world” perspective on what the lab was accomplishing. George, Danny, and Rachel often discussed the need to provide narrativizations of the “real-world” environment in which the integration of C4i’s software with ASE’s software would take place, as to provide the grounds for development informed by marketable potentials. After all, C4i still needed to sell this idea, its software, and the technology required to enable this integration to the various organizations and agencies (such as municipal governments) that it saw as potential markets for expansion. ASE personnel would relate to me the, for the most part, productive relationship that had been developed, but they occasionally complained that C4i’s personnel often “did not know” what was going on in the lab, how the development was tied to one specific schedule or another, and therefore it left some of the lab’s personnel feeling somewhat jaded as to C4i’s ability to actually provide advice on specific developments or not. In this case, C4i’s authority was primarily generated through their provision of software to integrate with hardware, and financial support for the lab’s continued operation. In the day-to-day production, interaction with C4i’s staff
was a mismatch between the authority generated at an administrative level and at a level conducive to collaboration through information sharing.

Another example of the ways in which this militarization takes place in the process of production, I explore George’s role in the production of MILSIM. George, as a former officer in the British Army, had experience running live-action simulation exercises with British Army personnel in conjunction with Canadian personnel at a base north of Calgary. His previous experience both with command, and with time spent as a director at both at C4i, provides him with authority over the interpretation of C4i’s software as “realistic” for the context of military simulation. This is not just to say that George provides the authority over whether or not C4i’s software provides a good approximation of “real” processes in simulation, but it is also authority over whether military organizations would find C4i’s software “useful” in conducting simulation, and therefore whether these organizations would be inclined to purchase C4i’s software. One event in particular during my stay stood out in this regard. C4i was in the process of developing more complex functionality for determining holding patterns, landing patterns, and other functionalities to simulate aspects of aerial command. C4i wanted to produce this functionality in time for an exercise on the same base from which George had previously organized simulation exercises. The interface for aerial command in MILSIM as it stood before much of the work was to be done to develop this functionality was a complex relay of menus in which an individual creates aerial “missions” with a specific location, specifying aircraft type, flying height, pattern of flying once reaching the destination, and whether or not armaments should be deployed upon arrival. The interface, while attending to much of the important information required by an individual
planning aerial missions from a command perspective, did not sustain a continuous relay of all these variables, how the variables might change given local aerial or geographical conditions, and this information was relegated to the menu used to plan missions. Further, if the functionality was to be expanded, and made more complex, this menu was determined to be arduous to navigate and continuously refer back to. George’s comments on this interface were critical of the capacity for the interface to deliver the information that aerial planners would require in a way that could allow for timely response, adjustment, and continuous updates. George wanted this data to be readily visible and for the interface to provide notifications when certain values would change, such as when an aircraft arrived at a specific point and transitioned to a holding pattern. George articulated these comments as changes that would have to be made before C4i’s product was ready to integrate with the other software and hardware that would be operating in conjunction with MILSIM in the simulation environment. Other simulations would have to take in the data that MILSIM put out (in the form of DIS information), and if this data was not even being displayed adequately and realistically to users of the simulation, George did not think that the necessary fidelity for C4i’s software would be achieved in conjunction with other elements of the simulation.

George, in this case was acting as a gatekeeper and authority on the fidelity not only of approximations of military practice, but the representative practices necessary to create approximations of these military practices as-developed by a civilian software engineering firm. This capacity was not only present in George’s commentary during demonstrations; George was also responsible for using the latest versions of the software, acting almost as a software tester would, and providing commentary on the fidelity and
accuracy of the functionalities under active development. While not the project manager or designer for MILSIM, George still became the ultimate check upon the representative practices of military simulation. Reflection on George’s commentary necessarily entailed creating an interface and functionalities that represent his comments on accuracy and fidelity, and ultimately, direct the development of software by civilians with understandings determined by military practice.

Further, as a reflection of the permeation of everyday practice becoming suffused manifestations of militarization, there is the subject of talking about simulation. Everyday talk about the development of MILSIM required developers, the technical writer, and the directors and designers to refer to units, to killing, and to the capacity for different interactions to enable entities to be “fired upon,” to be “killed by” other entities, and other minutiae of functionality which were filtered by the terminologies utilized by users who would ultimately be military personnel. In one of the final design meetings that I attended for MILSIM, the concept of “fratricide” was still described as a fundamental problem in MILSIM’s functionality. This function was not described in specific programmatic terms, but in terms that described what military units were doing to one another in the simulation environment. Another functionality, such as problems with altering flight plans for aerial missions mid-flight was another problem that was described in terms of narrative example, such as “what happens if the aircraft is on approach and suddenly someone wants to make it leave again?” The penetration of daily civilian development by narrativizations of military practice became essential for employees to relate commentary on, and problems with functionality in MILSIM to one another. During this same meeting, Tony – the project manager on MILSIM – expressed
frustrations with the inability of developers to explain developed functionality in terms that could be related to users or to clients interested in purchasing the software. He described how, often, developers would simply say “Oh, don’t worry, that isn’t key functionality,” and that he is beginning to respond to this line of questioning by stating “If it isn’t key functionality, then why is it a selling point?” This description ultimately culminated with Tony stating that they “Should make sure that all of their ‘key discriminators’ (functionalities) have documentation” and that “All the things that set us apart have to be clearly documented not only for use, but for appearances sake.” The appearance that C4i understands the functionalities it is trying to replicate, therefore, is not only important for accurately simulating these functionalities, but also for achieving authority over these functionalities in the marketplace. This connection between representation, fidelity, and authority is made even clearer in a later discussion about how to plan for future development. George wanted to be able to say, with certainty, that MILSIM would be able to package certain functionalities under specific headings in each release, such as to be able to say that – with a future release – that “MILSIM Six does better logistics!” Development, he argued, should be organized in such a way to better connect the development process and the marketing that would be necessary to sell the future releases of MILSIM.

In this way, MILSIM militarizes the development process by situating discussion of the marketability of the software in terms that specifically relate to the same understanding that military personnel must have when engaging with the software. Problems in fidelity are not merely problems from a developmental, scheduling, or monetary perspective, but from a military operations perspective. A lack of fidelity is,
therefore, a lack of value as perceived by C4i’s military customers, and therefore functionality must be documented and described in ways to better orient the perspectives of development personnel with the perspectives of military personnel.

This language is inculcated among developers through the use of technical documents that provide technical overviews of the processes, mechanisms, and entities that MILSIM must enable through simulation. Developers, through these documents, come to understand how, for example, certain types of communication are facilitated during military operations, so as to reflect these communication processes (such as in the case of ITN Planner) in an interface that is meant to enable planning for these communication practices. Technical documents describe the types of hardware that must be planned for, the way this hardware interconnects and is communicated with through a network, and the different types of operations that this communication hardware and networking enables.

This chapter has addressed the ways that global forces of market liberalization, identities codified through geopolitical narratives, and the objectification of customer logics come to reinforce and condition the development of professional and corporate identity in presentation and in subsequent design of software. Decisions and decision-makers do not simply receive requests, “do” design, and then fit everything together accordingly. The influence of previous products on new ones – such as EDMSIM’s echoes of militaristic schemes for unit organization – and the need to “quickly” implement a fix or new feature for a long-time client having particular trouble with a piece of C4i’s software – as is often the case during the continued development of
MILSIM – all determine not only the shape of software to come, but also the markets and users that will later interact with these products.

Today’s users of EDMSIM are hierarchically organized collectives of those who use the software to do specific work, such as acting as a dispatch for police or paramedics, in contrast with “decision makers,” those to whom C4i wishes to market the product to in the first place. These organizations of space and time, solidifying logics of corporate responsibility and charismatic authority within institutions dedicated to the preservation of civil society, are coached to increasingly think of responses to emergencies in ways that echo military operations. Military operations, in this context, are seen as models for civilian life, as a means to more effectively and efficiently control operations that are considered chaotic and uncertain, operations that can be likened to conducting war. These attempts at control produce lasting affectations upon how society organizes for the production and response to violence, and an exploration of C4i’s design process shows us just how fraught with competing interests that stretch out on a global scale. These decisions and the decision-makers orient the production process towards or away from different features in an attempt to satisfy the technical needs and “ease” of implementation for developers or to satisfy continuing or desired customers by implementing features such as flood plain analysis or more complex flight data into aerial combat simulation. Making these decisions appears as a chaotic, constantly-shifting endeavor, as a constant attempt to seek out the next opportunity for a sale or to produce within the means of a small development team with limited time and technical know-how. Design at C4i is iterative and ongoing, and takes into account the competing interests of creating a marketable product and of ensuring that developers and testers are
capable of processing background knowledge required for the implementation of simulation entities, actions or the necessary knowledge required to run tests as a user would or with the perception of a user in mind. I have shown that these practices of decision-making, and the iterations on design conducted in conjunction with the objectification of entities and interactions with agencies and institutions across the globe reify mythological structures of representation and ordering into the fabric of experience with simulation. Realizing myth in everyday life centralizes and mitigates phenomena (such as floods, diverse militaries acting in cooperation) that can generate chaos through uncertainty. The experience with simulation for these organizations reifies the principles that these organizations seek to control and the process of producing this certainty through simulation produces a realizable myth of C4i’s very own in compartmentalizing, prioritizing, and scheduling implementation of features through the compartmentalization and prioritizing of different individuals’ work.

Internally at C4i, there is a practiced, negotiated tension in designing everything from the flow of communication between employees, user interfaces that reflect not only the functional needs of the user but also what is best for workflow, tests that meet the “realistic” needs of constantly shifting simulatable properties and entities, to architectural frameworks that govern code and technical possibility of feature implementation. Decisions that are made relative to these designs are made with the input of most employees involved in the implementation of software designs, though some – mainly developers – tend to hold more sway in these conversations than others.

In this chapter, I have shown that professional practice cannot be taken for granted as devoid of the representative concerns that operate on a globalized scale.
Corporate representations of the self, ideologies that suffuse everyday practice with an awareness of the fidelity of interactions with regard to one interpretation of military or “emergent” phenomena, and the deeply technical configurations of mathematical formulas that configure and mythologize these interpretations on screen all comprise an exercise in corporate capitalism that is at once highly specialized and differentiated. Yet, these practices contribute to wider narratives of market liberalization and militarized civil society. These practices also show how individual identity, corporate selves and technical professionalism are crucial to winning new contracts.
Conclusion

In this thesis, I have explored the ways that the structures and principles of capitalist bureaucracy, engineering methodologies, military needs and desires, and the everyday practice of civilians come to condition and produce technology for military practice. I have argued throughout that the increasingly blurred lines between civilian and military practice are enabled by relationships between not only the state and private business, but by the increasing tendency to situate the decision-making processes over military needs within the private sector. The civilians who make these decisions come to be conditioned by developing technologies for these needs, and through marketing these needs as an increasing reflection of their own need to accumulate capital within an economic system that privileges the tendency of corporations to seek authority over areas of governance that were previously in the realm of the state.

In this environment, it is the structuring of business to meet these needs that allows corporations to develop and exercise this authority in the marketplace. Within C4i, as I have shown, the tools of the trade – such as C4i’s use of Team Foundation Server – serve to centralize the production not only of this technology but the authority that this technology introduces into C4i’s ability to situate products as the solution to a problem. The practice of secrecy surrounding military projects in this space is one of structural conditions, where the demarcated space between civilian and military is as simple as a badge, a sign-in, and a bureaucratic regime meant to indicate which products should be controlled, and which should not be.

By developing an understanding of the communicative contexts in which the production of this technology is enabled, I have shown that employees at C4i are
dependent on the ways in which knowledge is circulated in the workplace. These dependencies help employees to understand the authority that is afforded to executives such as Gordy, they help them to understand their roles in daily production through the summaries and scheduling of tasks at Stand Ups, and they help them to conceive of C4i’s own role in the global, transnational market of military technology production. These contexts of communication also help to develop the ways that C4i becomes situated within the larger context of defence industry business practices, which I have primarily developed through my ethnographic exploration of the show floor at CANSEC. This environment, both in material and interactional terms, serves to manifest understandings of military technology that can be best described as only representing the needs of the businesses that sell these technologies. Removed from the contexts of use, and situated as integrated with other technologies, these settings serve to situate products from individual companies within the wider context of global military production; a product is for military purposes if it is found here, and if it is shown to integrate with other products that meet this definition.

On the show floor, informality and the conditioning of a community of business developers, former military personnel, and other individuals who have circulated from corporation to corporation within the defence industry serves to create a semantic legibility and kinship between individuals at such shows. These events solidify the disparate, far-flung realities of multiple locations for production, globally-situated, transnational corporations that operate in numerous countries at once. Such events solidify the communicative act of indexing certain relationships, they create an icon of
the indexes of production and serve to territorialize the map from which military technology was developed.

In the context of the everyday, the maintenance of the structures that enable these logics to exist on the show floor is more subtle. Developed in ritualized events such as Friday lunches, espousals of the needs of the business and the vision of the corporation are afforded to employees both in raising spirits and creating allegiances to the everyday and the potential for future capital. This environment infuses the corporate environment with the trappings of the state, the rituals that create allegiance to authority, and the potentials for succession in the uncertain world of capitalist enterprise.

In daily life, outside of the core of development through developers, the space for constituting these products and the structures that sustain the context of production are left to those who exist in the margins. These individuals, whose roles I have explored through the experiences of testers and the ways that the contingencies of gender come to spatialize the workplace, serve to challenge, but also buttress, the dominant logics of developers and business executives whose needs are exercised over the margins in structuring of regime such as testing meant to give official sanction to the iterative process of subversion. These processes help the core of development to understand, respond to, and condition the user’s experience through software, placing the position of testing as close as possible to external to the process of development through hiring practices and relations within the workplace that situate testers as close to unskilled labor as is allowed to exist in the context of software development. The divide between skilled and unskilled labor is also conditioned by the contingencies of gender, which create a familiar asymmetry between the ‘nature’ of the world outside, the world of the user, and
that of ‘culture,’ that which is utilized in an attempt to subject and control the chaotic problems perceived to exist for users – from which the authority and expertise of C4i’s business practices are developed.

These realities of gendered production are constituted within an environment that hearkens to the relationships of artisan guilds of past centuries, in association with a technically-realized masculinity that produces like-for-like relationships between those who are presumed to be knowledgeable, technically competent, and therefore, competently masculine. Outside of these relationships, the femininity that sustains the whole through different forms of unskilled labor is relegated into constant tension with the core of development. Whether through design, and bringing the user back in at a high level of the hierarchy of production, or in the everyday lives of testers, whose multiplicity of skills leaves the role of testing in a constant state of vulnerability between the inability to move upwards through the chain of command due to a lack of perceived technical competence, and an ability to exercise skills that would normally require an entire other individual to fulfil, such as the roles of graphic designer and network administrator. It is here that the division of labor creates an irony in the necessity of tension for constituting the whole of production; without the unskilled and unknowing roles of the user, fulfilled by those who are gendered and unskilled in the development environment, the core of development has nothing to engage in the pursuit of capital.

Finally, in search of the market, C4i’s relations on the global stage help to produce and centralize the objects and interactions of global institutions through the centralized platform of simulation. The history of neoliberal economic thought is one that is fraught with stories of privatization and an increasing decentralization of the powers of
the state into the hands of private corporations whose interests in accumulating capital have centered authority over these decentralized measures of governance within a larger global sphere. This practice has not been limited to industries such as utilities, management of healthcare, and other services considered necessary to everyday life. It has been rapidly expanded to include the production of military practice, whether in the development of private armies or in the increasing tendency of capitalist enterprise to provide the means to wage war and earn a profit at the same time. These realities have led C4i to orient their simulation platform towards a global market, wherein they may take in the anxieties and objects of governance unique to institutions across the globe and centralize and manifest these principles within the experiential mode of simulation.

This practice, as I have argued, makes a myth of the political tensions inherent to government. No longer can the objects of governance be contested as existent or not – when on screen, the objects of governance are given not only representational character, but also the character inherent to ordering everyday practices meant to manage these objects. In providing a centralized platform for a multiplicity of states to realize myths of existence in an experiential place, C4i professionalizes the practices of mythmaking and the authorities that are afforded to corporate enterprise in providing a platform through which to plan for the contingencies of disasters that these myths predict. In constructing simulations for emergency disasters from a platform originally conceived of and exercised in military practice, C4i increasingly militarizes the practices of civilian governance in search of new markets and new forms of violence through which C4i hopes to generate more spheres for the development of corporate authority. It is here, in the search for new terrain from which to generate new opportunities for capital that C4i’s
own myth, in representing and ordering the daily lives of employees, truly lies. It is the search for new streams that coalesce and empty into the great ocean of war, and for the hope that enterprise may shine a light on the violent exigencies of civilian life with the lessons of authority, hierarchy, and structures of knowing meant to push back the uncertainties of the unknown.
References


