ENERGIZED WORK: WHEN CHOICE IS REALLY NO CHOICE AT ALL

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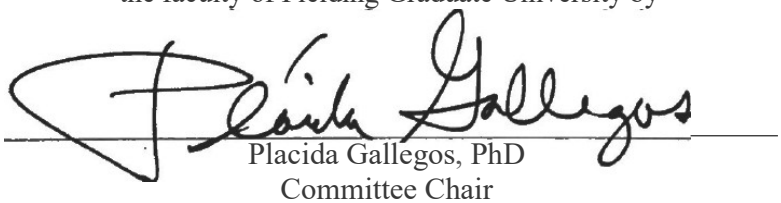

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Energized Work: When Choice is Really No Choice at All

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Abstract

Working live is responsible for over 50% of all deaths and injuries for those in the electrical trade, and electrocution is the third leading cause of death at work in the USA, yet little in the way of academic research has shed light on the why of live electrical work in industrial, commercial, and institutional electrical (ICI) workplaces. Live work has been a standard of practice in the high-voltage powerline installation and repair business: a workplace with strong safety records. This is not the case in ICI electrical work, where live electrical work has been the norm for over 130 years where this cultural artifact has deep roots in the ancient society of electricians. However, live work is illegal in many jurisdictions, yet electricians continue to work live and to die because of its continued practice. In earlier work, the researcher explored the risk-taking side of occupational electrocution. This study explored the dynamically complex and tightly interlinked factors behind continued live work. It sought to unpack these harms in order to develop more effective organizational risk mitigation strategies designed to prevent death and injury from live electrical work .

key words*:* *apprentices, apprentice ratios, COVID-19 risk in construction, electrocution, electricians, high angle rope access in construction, injury underreporting, live electrical work, male gender, organizational power, occupational risk of harm, occupational risk bearing, risk, risk taking,*

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Dedication

I dedicate this work to first and foremost my beautiful and brilliant wife, Jacqueline, and our three lovely children, Vanessa, Jake, and Alanna, all who supported, encouraged, cajoled, and challenged me over these many years when I would retreat to my "bat cave" to study, write, and learn what it takes to become a PhD. I dedicate this work to my brother Sean who lit the way for this academic journey. Finally, I dedicate this research to all the "sparkies" out there; the men and women of the International Brotherhood of Electrical Workers and all electrical workers who place themselves in *harm's way* each and every day in order to keep the power on, the house warm, the water running, and to build out this bright, new, technological future, and indeed our entire lives that more and more have come to depend on electricity. I also dedicate this to the keen mind of my editor, Karen Graham. Finally, I dedicate this to the clear-eyed, wise, and seasoned men and women who train and educate our most precious asset, our electrical apprentices: those who commit to learning new ways to keep safe around electricity while learning how to keep the "lights on" for the rest of us.

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CHAPTER ONE: INTRODUCTION

Live electrical work has been a trade practice for over 130 years, and today, this practice is responsible for over 50% of all death and injury in the electrical trade (Howe, 2011, p. 31). Throughout this chapter, and indeed all of this dissertation, phrases in italics are verbatim quotations from electrical workers interviewed.

Sadly, a true and very recent story testifies to just how risky the electrical trade continues to be. The suddenness and severity of occupational electrocution was vividly captured in a recent report (Delitala, 2019) confirming the electrocution of an 18-year-old electrical worker named Vadim Buczel, who thought he was working as a registered electrical apprentice. However, he was actually hired on as an unregistered laborer by a fully licenced electrical contractor in Ontario, Canada. Unregistered laborers are not allowed by law to work on electrical equipment, panels, or machinery; yet at the time of this incident, Vadim was working alone on an exit sign in a downtown condominium, when he came in contact with live electrical current. Somehow, some way, he was *working live*. Vadim was taken off life support after 2 days in the hospital; sadly, his electrical burns and injuries were so severe that none of his internal organs could be donated to needy patients because these organs were so badly damaged.

I ask a central question about this incident as it is germane to this study and the methods utilized to inquire about live electrical work: How is it that a young man, who only had a 3-month electrical safety training course and who was not allowed to work on electrical equipment, was on a ladder, alone, and came in contact with live electrical current?

There appear to be three possible reasons why Vadim is dead today. Perhaps he (a) came in contact with a live electrical circuit and did not know the equipment/circuit he

was working on was energized; (b) was knowingly working live on an energized electrical circuit; or (c) the last possibility is that his supervisor possibly went to energize or de-energize the equipment Vadim was working on. Somehow, Vadim came in contact with an energized circuit and is now dead due to live work, whether knowingly or not, and so to me, Vadim appeared not to be a risk taker, but was rather a risk bearer.

The risks of unintentional electrical contact are similar in some ways to the risk of contacting the Covid-19 virus, and a high risk trade practice called high and medium angle rope access (RA) work, in that the risk is *always on*. RA work is where a trained RA worker or construction worker sits suspended in a harness connected by one or two ropes that connect to the top of the structure they are working on. For medical staff in long-term care homes or meat rendering plants, the risk of contracting Covid-19 is ever present, as it is invisible, has no smell, makes no sound, and is always on. Electricity is pervasive in electrical work, making this a risky trade as electricity has the potential to be *always on*. In RA construction work, a trade worker as well as an expertly trained RA worker faces significant risk (Land, 2010, p. 77) when hanging suspended from ropes at sometimes significant heights of up to 300 ft or more, with the reality that something could go wrong at any time, again a condition where the risk of falling from heights or getting entangled in one rope/harness is *always on*. The risk of entanglement is very serious because in this situation, a worker has 11 minutes to be rescued or will face death due to constriction and decreased/obstructed blood flow should a rope become tangled around a leg, resulting what is called “suspension trauma” (Rogers et al., 2013). RA trained experts cannot simply get off the ropes if something goes wrong; they must bear the risks (Searer et al., 2018, pp. 5–6), which placed them in this predicament of occupational risk of harm in the first place, just as

the risks of active Covid-19 on today's construction sites is pervasive, as these risks are also always on. The Covid-19 virus is also invisible, makes no sound, has no smell, is airborne and hard to detect, and as such, even with the protection of face coverings, social distancing, and frequent hand washing, it is often impossible to detect on today's construction sites.

Several bodies of literature were reviewed to help inform this study: occupational health and safety, risk, male gender, risk perception, human factors and risk, precarious employment, men and dangerous work, law, and organizational culture and theory. These literature sources discuss the confluence of male gender, dangerous work, predominance of male workers, precarious employment, deeply rooted organizational cultures and beliefs, and lack of communications combined with a highly competitive construction industry that allows live work to continue today. The literature showed that live work exists today in a state of dynamic complexity, not linear or simple complexity, and teasing out the prime drivers of live work is not an easy task. Therefore, the research methodology of combining an extensive literature review with the power of a thematic analysis research study on the lived experience of live work offered the best means of teasing out the underlying risk structures that allow live work to thrive today. Chapter 4 illuminates some of these underlying structures as being strongly related to the pace of electrical work today, the pressure to get the job done faster, male gender, dangerous or risky, male-dominated workplaces, and the need of these workers to *suck it up, someone's got to do it, can't say no,* or *don't be a pussy you will get a reputation*. The inability to communicate about risky situations or to refuse live work due to fear of job loss, combined with the pressure to speed up are prominent themes and appear to be strongly related to worker insecurity.

This thematic analysis study examined the other half of occupational risk: not the risk-taking action, but the risk-bearing behavior I call occupational risk bearing. This is a term I have coined to describe situations where electricians and electrical apprentices are asked, coerced, shamed, or otherwise encouraged, against their wishes, to work on energized electrical panels, equipment, or machinery. One notable differentiator between risk taking and risk bearing may be voluntariness. Voluntariness likely exists on a continuum ranging from true risk taking to risk bearing, insofar as live work is concerned, because this particular electrical risk becomes normalized over time: *I've done this a thousand times,* and *It won't happen to me.* The first few times an electrical worker is asked to work live, they might resist, but after seeing guys *laid off for refusing live work via a text message 15 minutes after leaving the site,* electrical workers may act out of habit or coercion, both of which are related to action and interpretation. Weick et al. (2005) discussed making sense of a situation such as a live work request as being "when action becomes the central focus, interpretation, not choice, is the core phenomenon" (p. 418).

In relation to risky behavior, Sandman (1993) noted,

> If the behavior is voluntary, it shows up in the literature as three orders of magnitude more acceptable than if it is coerced . . . [or] that's up to a thousand times more acceptable if it is voluntary than if it is coerced. (p. 14)

The point Sandman was making here is that if a person is coerced into risky behavior, the degree of unacceptability is high indeed and ought to be factored into any meaningful definition of occupational risk of harm.

Who's Working Live: An Overview of the Dynamic Complexity of Live Electrical Work

"A man is a man when he can think like a woman" (Ely & Meyerson, 2006, p. 26) was the rather profound statement from an oil rig worker who commented on working on an

offshore oil rig where men were allowed to talk about risks and fears, let down their guard, and accept and give advice. This environment allowed the workers to stop their hyper masculine behavior, and these men on two oil rigs off the coast of Florida worked toward organizational goals, such as safety, reduced down time, and such; they did not invest time and energy maintaining a manly presence, with improved safety resulting on these two inherently dangerous oil rigs (Ely & Meyerson, 2006). Ely and Meyerson (2006) found that through increased communications around safety, fears, one's own mistakes and short comings to peers, supervisors, and apprentices along with open communications about one's fallibility, all had a direct correlation to improved job site safety. These findings on open or closed communications amongst men who work in dangerous environments provide important considerations of one intractable system holding back change in the electrical trade: namely, the inability *to just say no* to live electrical work.

Research Question

The research question explored in this dissertation research project was, Why do men still work live?

Live electrical work in the industrial, commercial, and institutional (ICI) sector has become a normal work practice, with one deadly outcome being the increase in occupational electrocution in the USA. This has led to an increase from the fifth leading cause of death in 2012 to now being the third leading cause of occupational death (United States Department of Labor, Occupational Safety and Health Administration [OSHA], n.d.). Live electrical work is, as noted, illegal in Ontario where I reside, except for powerline work, and it appears that a "wicked problem" (Coyne, 2011, para. 1) persists today within the electrical industry. This wicked problem involves the definition and interpretation of just what live electrical

work is and when it is executed. This difference in the definition of what live work is lies between those who toil at the "sharp end" (Hollnagel, 2004, p. 63) of electrical risk versus the managers, supervisors, owners, and leaders who inhabit the upper echelons of construction companies, clients, and contractors. The transient nature of electrical work, where the majority of electricians are self-employed, means workers do not form the same strong and lasting bonds with peers, supervisors, and apprentices as compared to oil rig workers who have regular scheduled shifts and get to know and work closely with fellow workers. It is worth noting the difference between oil rig workers and electrical workers, whose worldview is best expressed by one participant's quotation: *You keep your mouth shut* about errors, fears, mistakes, or electrical contact and other injuries.

Goals appear to play a significant role in how men show up, behave, and interact with others working in hazardous conditions (Ely & Meyerson, 2006, p. 20). The internal goal orientation of oil platform workers was best displayed in how these workers reacted to each other in three domains: (a) the physical domain, (b) the technical domain, and (c) the emotional domain. Ely and Meyerson (2006) found that platform workers sought to enhance "safety and effectiveness, readily conceded their physical limitations, publicly revealed their mistakes and shortcomings and openly shared their fears and anxieties" (p. 20). These workers were much more communicative and openly talked about mistakes and accidents, and they analyzed these rather than laying blame. In short, when men replaced self-validation goals with goals outside of their own, they communicated more openly, safety improved, and the work environment as a whole was more conducive to safe productive work on oil rigs (Ely & Meyerson, 2006). Ely and Myerson's finding differed from the results of this study, in that both journeymen and apprentices demonstrated an unwillingness to push back, speak

out, or disagree when asked or told to work live. Open, honest communications about risk, specifically risk of live work, are not shared with electrical co-workers or supervisors. Yet, there is hope for change. As one apprentice noted, *One year ago, I would never have spoken up. Today I would speak up* when asked how they respond to requests for live work.

The Immutable Nature and Deadly Risk of Live Work

Despite the fact that occupational death and injury have been reduced in recent decades, the construction industry, in general, and the electrical trade, specifically, continue to represent hazardous employment. Twenty years ago, occupational electrocution was the fifth leading cause of death amongst U.S. workers (U.S. Department of Labor, n.d.), while today, occupational electrocution has risen to become the third leading cause of death amongst these workers (Construction's "Fatal Four" section). Live work is responsible for half of all death and injury in the electrical trade (Ontario Ministry of Labour [MOL], 2010), and today, it is still unclear as to why this ancient work practice prevails today.

As noted, the purpose of this research is to help understand why electricians continue the deadly practice called "live work" or "working live," whereby an electrical apprentice or a certified electrician proceeds to work on or around electrical machinery, panels, or equipment that are still energized. In their 2017 *Ontario Electrical Safety Report*, the Electrical Safety Authority of Ontario reported, "The rate of occupational electrical-related fatalities has increased by 114% when comparing 2008-2012 and 2013-2017" (p. 19). In an earlier report, the Electrical Safety Authority of Ontario (2006) had reported that

> For all injuries in Ontario, the ratio of injuries to fatalities is 158.5 to 1 for the two-year period. For electrical related injuries, the ratio is 13 to 1. Thus, the probability of sustaining a fatality when the injuries occur in the electrical industry is ten times higher than if it were another type of injury. (p. 17)

Theoretical Insights into the Ancient Society of Electricians

Upon completion of my master's thesis (Howe, 2008), I realized I had only studied one part of occupational electrocution: the risk-taking part, which is where apprentices and electricians knowingly and willingly work live on energized systems, machinery, or circuits. What was then required was a thorough analysis of the other half of electrical risk: risk bearing, where electricians are coerced, encouraged, shamed, or somehow otherwise pressured into working live. To date, there is little in the way of research in the organizational, risk, or occupational health and safety literature on a construct I have called occupational risk bearing by highly trained expert males in construction trades or, for that matter, in other similar high-risk occupations: for example, in professional sports such as football and hockey, where the risk of injury is ever present and is a fact of occupational life. Given the prevalence and spread of the COVID-19 virus, early frontline workers who dealt with infected patients in hospitals and long-term care facilities without proper training and personal protective equipment (PPE) could also be called risk bearers if their employers were not taking adequate steps to keep their employees safe from risk of harm. Other risky occupations would be fire services, police, first responders, oil and mineral extraction, military personnel facing combat, offshore fishermen, and forestry workers, to name a few.

This new notion of occupational risk bearing in socio technical environments has not been well studied nor researched, and in fact, the literature on occupational risk bearing deals primarily with drug and alcohol addiction, gambling, cigarette smoking, and pathological behavior, with very little research on risk bearing by well-educated, highly trained trade experts. Ely and Meyerson (2006, p. 26) found clear examples of occupational risk bearing due to pressure, either externally or internally generated, when one worker commented on the

fact that he changed his safety protocol out of self-doubt because of his respect for his much larger and more experienced co-worker, ultimately causing an oil rig shut down.

Electricians have been working live for over 130 years, and my research results will help to better understand the drivers of risky decisions taken by experts and apprentices. This is a male gender study, given the ratio of male to female electrocutions is 17:1, with no female electrocutions occurring since 2001 (Electrical Safety Authority of Ontario, 2006, p. 6). This study does not involve power line electricians, who often must undertake repair work on energized equipment, under careful attention and close supervision.

Socio, Cultural, Organizational, and Gender Enablers of Electrical Risk

The objective of my research study is to explore enablers of risk that may be holding back improvement or resulting in resistance to change and help explicate the related bio, socio, organizational, cultural, and gender and power factors. Van Maanen and Schein (1997) described nicely the essence of my research study:

> Social research has yet to discover a work setting which leaves people unmarked by their participants' and this leads to my question "how is it that only certain patterns of thought and actions are passed from one generation of organizational members to the next" a topic which has been neglected. (p. 1)

Live electrical work is one such practice that has not only been handed down from one century, where it was required, but also to the next. Live work has become an indispensable work around to the constant job pressure of getting the work done as quickly as possible.

Study Significance

I argue this research is vitally needed today because

1. The sheer morbidity of occupational electrical incidents is vastly different as compared to other construction injuries due to the latent nature of and hard-to-

diagnose injuries: If a worker requires time off work, referred to as a lost time injury (LTI) resulting from electrical contact, he or she is almost 100 times more likely to die from that injury as compared *to all other types of occupational LTIs combined* (MOL, 2010).

2. Contrary to Heinrich's model suggesting a 300:1 ratio of accidents to fatalities (Hollnagel, 2004, p. 23), Anderson and Denkl (2010) noted that when it comes to fires and explosions (electrical arc flash injuries are both fire and explosion), the injury-to-fatality ratio is 12:1 (p. 1), making the electrical trade an extremely hazardous one.
3. The prime cause of injury and death for those in the electrical trade is making errors of omission (Williamson & Feyer, 1998), not errors of commission, which is the norm in all other occupational fatalities.
4. An increase ratio of journeymen to apprentice by just 10% in one hazardous trade (residential roofing) caused a 27% increase in falls (Kaskutas et al., 2010, p. 262).
5. The nature of electrical current is undetectable by normal sensory input; electricity is invisible, odorless, makes no sound, and is impossible to detect without the appropriate equipment.
6. There is a prevalence of organizational pressure to under report accidents due to the fact that if there are no burn marks from electrical contact, it suggests no harm was done:

   "Near misses, on the other hand, are much less obvious both in how they appear and in the consequences" (Hollnagel, 2004, p. 23), and this is especially important

to note in electrical accidents where, if not fatal, there is often no visible sign of contact.

7. Death by electrocution at work has moved up from being the fifth leading cause to the third leading cause over the past decade (U.S. Department of Labor, n.d., Construction's "Fatal Four" section).

Important research work has been undertaken to help address a few of these points. Williamson and Feyer (1998) noted,

> Behavior was most likely to be involved in electricity-related (trades) deaths and be a prime cause, but unlike all (occupational electrical) fatalities, behavioural involvement occurred earlier in the accident sequence . . . [and that for these electrical trade workers,] omission errors were much more common than commission errors [as compared to all occupational electrical fatalities]. (p. 187)

This tells us these experts know what they are doing, but decide to omit a step in the safe work practice by making an error of "omission, things not done" (p. 189), such as not wearing personal protective equipment, not tagging out and locking out the circuit, and so forth.

From a systems perspective, this workplace practice called live work is frozen in place in the ancient culture of electricians and it is important to share with readers why I say this. As a scholar I have been researching occupational electrical risk for over 15 years, and for many of those years I was also an occupational electrical risk practitioner. As leader of a full-service brand communications agency my role was to create consumer and occupational electrical safety communications campaigns for the Electrical Safety Authority of Ontario (ESA). The ESA was also my sponsor as I undertook my masters' research, where I examined risk taking and occupational electrical injury and fatality. This dual role of scholar practitioner; my research and my job, has resulted in a dissertation slightly different from

traditional dissertations in that I move from inquiry to advocacy in the final chapters of this dissertation. Qualitative research cannot inform on causality yet the powerful, lived experiences of risk, as shared with me by electrical apprentices and journeymen suggest hope for changes and these stories form some of the recommendations for change. That being said, future action research is required to help develop organizational interventions strong enough to break this system open in order to create a safer work environment for electricians and apprentices.

Summary

Live electrical work being performed by qualified, highly trained, expert electricians and their apprentices has not been studied extensively, and the goal of this study has been to dive deep into the pernicious and deadly effects of this gap in the literature on so-called live work. The study is important because (a) occupational electrocution is the third leading cause of death amongst those employed in the construction industry (U.S. Department of Labor, n.d.); and (b) the significant morbidity of electrical contact: for example, a worker who suffers a lost time injury due to electrical contact is 100 times more likely to die from that injury as compared to *all* other lost time injuries combined (MOL, 2010). A detailed review of several bodies of literature is presented in the next chapter, which serves to frame up the many and varied drivers of live electrical work and how these drivers enable live work to continue to this day.

CHAPTER TWO: LITERATURE REVIEW

The continued unnecessary death and disfigurement of apprentices and certified electricians requires urgent attention by all stakeholders involved in the industrial, commercial, and institutional (ICI) construction trade in order to better understand the factors that contribute to risk of harm due to a deadly practice called *live electrical work*. This is a situation where the electrician works on energized electrical machinery, equipment, or panels, often knowing the systems are energized. Live work is responsible for over 50% of deaths and injuries in the electrical trade (MOL, 2010), and electrical contact was the third leading cause of death in the construction industry in 2016 in the United States (U.S. Department of Labor, n.d.), with electricians and apprentices suffering the highest proportion of electrocution death (Electrical Safety Authority of Ontario, 2013, para. 1).

In order to begin to explore and understand this workplace phenomena called live work, it is necessary to examine the concepts of risk, risk perception, and sense making of risk, and how electricians and electrical apprentices navigate the world of work and risk. The notion of occupational risk taking and occupational risk bearing by electricians and construction workers is examined in this lit review. As well, numerous other contributors to occupational risk of harm were identified and will be discussed in this chapter.

Risk, Risk Perception, and Sense Making of Risk

Risk, the perception of risks, and sense making of perceived risks are tightly linked to how subject matter experts, electricians, and their apprentices behave around the occupational risks of energized electrical panels, systems, and machinery and how they live and work with a risk, perceive this as a risk, or not, and how they make sense of such risks. Each stage of the risk evaluation process is discussed in detail in this section.

Risk

A sound and simple risk definition was developed by Sjoberg et al. (2004): "Risk has been defined in a number of ways but is often seen as the likelihood that an individual will experience the effect of danger" (p. 7). The elegant framing lies in the experiencing of the effects of risk. There seemed to be a consensus about an adverse event and the magnitude of its consequences as being important, and yet according to Rayner and Cantor (1987, p. 7), this definition may be adequate to define risk of engineering-type calculations, but could be misleading at a broader, more intractable level of large-scale societal risk management.

Aven and Renn (2009) argued that in the social science view,

> Two prevailing definitions of risk are 1) risk is a situation or event where some of human value including humans themselves) is at stake and where the outcome is uncertain; 2) risk is an uncertain consequence of an event or activity with respect to something humans value. (para. 1)

These scholars argued that a new, merged definition of these two constructs makes more sense: "According to these definitions risk expresses an ontology (a theory of being) independent of our knowledge and perceptions" (para. 1). Insofar as electricians are concerned, the dangers involved in live work are real and ever present if the machinery or circuit is energized and lies independent of their knowledge and perceptions. As far as apprentices and electricians are concerned, live work is extremely dangerous, especially when undertaken in a hurry.

With respect to risk in general and the risk of live work for electricians, inductive reasoning suggests that there is no uncertainty in the minds of a trained electrician as to the severity of the outcome—contact with energized equipment or machinery. However, given occupational electrocutions in the electrical trade are somewhat rare, there is a distinct

possibility that as Aven and Renn (2009) stated, there is "uncertainty about . . . the consequences, or outcomes" (para. 1), and I argue it is the lack of frequency of these events that is one enabler of the risk of live work. Why else would it be that highly trained, expert, licensed journeymen and apprentice electricians, who are fully aware of the danger of electrical contact and understand the risks of live work, would work live on electrical equipment?

I argue those employed in the electrical trade understand that risk is comprised of "magnitude (how bad it gets) times probability (how likely it is to happen)" (Sandman, 1993, p. 6), and this class of skilled trade workers knows full well that the severity of electrical contact can be disfiguring, lethal, and awful to witness, as many electricians have.

Risk Perception

A request to undertake live work can look different from one person's viewpoint versus another's; risks are learned, and they have different meaning for different people. Further, any understanding about risk and subsequent actions is both socially and organizationally learned (Sjoberg et al., 2004, p. 7). Licensed electricians and electrical apprentices know full well the potential for the power to always be "on," and are trained to ascertain if this is the case prior to starting work. It is clear from the findings presented in Chapter 4, there is no ambiguity amongst those in the electrical trade as to how concerned they are about the consequences of live work. These workers are very concerned about live work, yet they have little control over the decision to undertake live work. Once factor limiting the efficacy of OH+S interventions is systemic. As noted by Sjoberg et al. (2004), "Risk perception is related to conceptions of knowledge which stress the limits of science and different, ways of knowing" (p. 5). Simply put, based on the current literature we don't

know what we don't know about all the factors involved in men working live on energized systems, machinery, or panels.

Electricity is invisible, odourless, makes no sound, and does not have a tell-tale smell, like natural gas does, and so this risk is a great deal harder to perceive; it is only the consequences or outcomes that are sometimes visible. Undiagnosed electrical injury is a significant risk, while perhaps the perception of risk around this type of injury is poorly recognized in some of the system actors (Howe, 2015), yet this does not appear to be the case with electrical workers. This research study was designed to tease out these subtle drivers of risk perception, or rather lack thereof, which allow, encourage, or coerce men to work live on energized electrical equipment.

Sense Making of Risk by Electricians and Apprentices

When an electrician or apprentice attempts to make sense of a situation where live electrical is considered as an option, Weick et al. (2005) claimed, "Sensemaking is about the interplay of action and interpretation rather than the influence of an evaluation, or choice. When action is the central focus, interpretation, not choice is the core phenomenon" (p. 409). They went on to stress that people frame an "individual-level puzzle as a question of meaning rather than deciding" (p. 409). This framing is best embodied by the question and subsequent attempt at sense making: What's going on here, and what do I do next? If Weick et al. are correct in their findings, the sense-making process an electrician, or an apprentice goes through when dealing with a live work request is underpinned by interpretation and action and does not involve choice. Examined in Chapter 4 are two different reasons why live work continues: (a) occupational risk taking and (b) occupational risk bearing, with the goal

being to better understand why subject matter experts fall victim to the impacts of such deadly risks.

Occupational Risk Taking. For the purpose of this research study, occupational "risk taking is a type of unsafe behavior that involves making a decision with uncertainty in both the probability of success/failure and its associated severity" (Low et al., 2019, p. 2). In their recent and extensive review of the literature on occupational risk taking, Low et al. (2019) identified the individual factors of attitude, cognitive bias, and risk perception as being linked to risk perception. However, their research empirically showed "work conditions, attitude towards risk, cognitive bias, and risk perception have a significant influence on construction worker risk taking behavior, whereas safety climate does not have a significant influence" (p. 8). Risk taking certainly exists on the construction site: *Every site has a Golden Boy, a macho guy who will do whatever the boss asks, and guess what, he stays steady,* meaning the golden boy, the risk taker, will be the last person to be laid off a job site. Any workers not seen to conform to the norms of live work will be laid off earlier as a project nears completion.

Occupational Risk Bearing. Electricity has the potential to cause harm, and even the slightest contact with live electrical current can be fatal or cause severe injury to the worker. Studies have shown that human factors are the predominant cause of industrial accidents: "Around 90 per cent of all industrial accidents reported indicate a failure on the part of the injured person or a co-worker" (Davies & Adams, 2015, para. 2). However, they went on to note "human beings are prone to making mistakes, yet all too frequently organizational issues make such errors inevitable or at least more likely" (para. 3). It is these organizational issues

that allow, encourage, or sometimes conspire to coerce electrical apprentices and certified journeymen into bearing the risk of live electrical work.

Another, more potent signal of occupational risk bearing is the suicide rate of those employed in the construction industry: “Working on a building site has become the deadliest of profession in the UK” (Rice-Oxley, 2019, para. 1). Further, Rice-Oxley (2019) noted, “More than 1,400 construction workers took their own lives between 2011 and 2015 according to national statistics. In 2016 the figure was put at 450. The rate was three times the national average for men” (para. 2). However, in the United Sates, a 2018 report by the Centers for Disease Control showed male American construction workers were four times more likely to commit suicide as compared to the average American. The high rates of suicide in the construction industry could be linked to the precarious and seasonal nature of construction employment, the power a foreman or supervisor has over the worker’s schedule, along with a worker’s inability to speak out when asked to undertake risky work.

To date, there is little in the academic literature on the notion of occupational risk bearing in the construction industry. Risk bearing in the construction trade is viewed as risky work performed unwillingly when under duress, production pressure, stress, or coercion by peers, supervisors, or clients. This condition is perhaps partially explained by a conflation of two different safety concepts: (a) safety-related behaviors and (b) safety outcomes, which are both interchangeably used to describe safety performance (Christian et al., 2009, p. 1104).

In Howe’s (2016) study on occupational risk of harm in the construction trades and, specifically, risk bearing by those in the electrical and pipe trades, the researcher noted the importance of regulators and lawmakers and just how difficult it is for these organizations to focus on a specific group of harms. As Sparrow (2008) noted, “Harm reduction work remains

widely unrecognized and poorly understood" (p. 124). Sparrow advised regulatory practitioners to organize around "specific knots of harm" (p. 63), and my study confirmed and built on his views as my participants identified 200 specific knots of harm these experts face daily while at work. (p. 5). Further, Howe (2016) noted,

> In speaking to risk law, Finkelstein (2003) asked the following question: "Is the imposition of risk a harm to the person on whom it is inflicted?" (p. 965). In this same paper, she went on to successfully argue it is (p. 965). Beck (2009) also noted that "acceptable risks are those that are accepted" (p. 13), but what about those risks not accepted. Would these be outside a risk contract? Risk is a perception-based exercise, and perception is inextricably linked to risk: what looks like a risk to one worker, may not be viewed as risky by another worker. (p. 5)

A vivid example of what this researcher calls occupational risk bearing is the recently reported case of a helicopter pilot working alone on the oil sands in Western Canada when a sour gas leak occurred (McSheffrey, 2019). This gas (H2S) is deadly on contact, and when this pilot looked for gas masks, none were there. When he went to report this incident, which could have killed him, his supervisor made it clear he would no longer work as a subcontractor for Canadian Natural Resources Limited (CNRL) if he filed an accurate incident report. McSheffrey (2019) reported,

> According to Mathew Linnitt, the pilot, lying on official paperwork to the benefit of industry employers is a transgression rarely caught, but part of a "systemic problem" of oil patch rule-breaking, in which "good people are incentivised to lie" to keep their jobs. (para. 12)

If this systemic problem exists in the oil patch, why would it not exist in the electrical industry, which is a much older and equally risky industry?

In closing, for now, on the notion of sensemaking, the advice of Weick et al. (2005) is quite diagnostic in so for as live work is concerned: "To work with the idea of sense making is to appreciate that smallness does not equate with insignificance. Small structures and short moments can have large consequences" (p. 410). Two such aspects of these small structures

or short moments are risk taking and risk bearing while working on or near energized electrical equipment, with the distinction being voluntariness, or not, when undertaking risky work. The distinction between occupational risk taking and risk bearing by electricians and apprentices, though it may be small, can, in part, be explained by Weick et al.'s finding that:

> Sense making should occur when people are socialized to make do, be resilient, treat constraints as self-imposed, strive for plausibility, keep showing up, use retrospect to get a sense of directions and articulate descriptions that energize these micro level actions. They are small actions, but they are small actions with large consequences. (p. 419)

Utilizing Weick's model, one can see how electrical workers have been desensitized to the risks of live work over the decades through small, and large, actions on the job site, all of which conspire to make saying no to a request for live work seem normal.

Contributors to Occupational Risk of Harm

An extensive analysis of several pertinent literature sources on risk, and specifically construction risk, in addition to past research suggested 12 key factors that contribute to occupational risk of harm amongst those who work in the hazardous electrical construction trade. These contributors are systemically linked in dynamic, not simple or linear, complexity, and many have received little attention in the organizational or risk literatures. Nor, conversely, have these been studied in the occupational health and safety literature. Through this review of the literature on occupational health and safety and hazardous construction trades, and based on prior research (Howe, 2008, 2011), further occupational health and safety gaps for those employed in the electrical trade will be identified.

In presenting these 12 major contributors to risk of harm in construction, specific attention is paid to the electrical trade. These 12 major contributors were identified in my past research on electrical risk (Howe, 2008, 2011, 2016) as well as theory contained in the

literature (Ely & Meyerson, 2010; Francis & Barling, 2005; Kaskutas et al., 2010; Sjoberg et al., 2004; Weick et al., 2005). As such, they are "deductive a priori themes . . . [forming] the philosophical framework" (Fereday & Muir-Cochrane, 2006, para. 2) on the notion of risk of harm. Kleiner and Won Park (2011) identified electrical trade as an extremely hazardous construction trade.

The 12 major contributors of risk of harm for electricians (Howe, 2016) are listed, not in any particular order or ranking, in Table 1. These 12 contributors to construction risk were derived from the various literatures. Perhaps point number 5 could be challenged based on the findings contained in Chapter 4, given that the adoption and use of technology has apparently not increased risk for electricians and apprentices. Rather, the findings noted in Chapter 4 suggest human agency, organizational imperatives, lax injury reporting regulations, and a highly competitive construction market conspire to make socio-technical risk less of an issue insofar as live electrical work is concerned.

Table 1

Twelve Major Contributors to Risk of Harm in Electrical Construction

Contributor	Description
1	Safety is generally a discussion after the fact of an incident or death
2	Accident data from construction sites and other workplaces are not reliable due to underreporting of injuries
3	Two prominent accident theories conflate with each other to make risk assessment and safety decisions more difficult
4	Picking important harms, or risks, and finding ways of dealing with them are extremely difficult for organizations and regulators to undertake
5	Today, all modern risk is socio-technical in nature
6	Apprentice ratios and their relationship to worker safety
7	Protection of vulnerable workers
8	Occupational electrical injuries are different from all other occupational injuries
9	Ancient work cultures, risk, and sensemaking
10	Masculinity and risk
11	Power in the power industry
12	Human factors

Contributor 1: Safety is Generally a Discussion after the Fact of an Incident or Death

In his important safety report to the Ontario Provincial Government, Dean (2015) dealt with the reality that the worker safety discussion, for the most part, is conducted post hoc: in other words, after a construction accident or death has occurred. This post hoc reality combined with the technical training and background of those who conduct construction death and injury investigations has led to the extensive use of an incident investigation tool

called root cause analysis, which is a widely accepted incident investigation tool; however, it does not "see" nor recognize the human factors involved in accidents. Human factors related to organizational factors are strongly linked to human error (Hollnagel, 2004, p. 30). If, in fact, modern construction incident investigation techniques rely on models that do not recognize the role of human nature and human decisions, such as making errors of omission or commission, working under flawed heuristics, peer or supervisory pressure, or economic stress in serious injury and accidents, how can effective safety policy be developed based on a limited worldview in accident investigation?

Dean (2010), who also advised the Ontario Ministry of Labour on worker safety and led several occupational health and safety advisory panels, noted that

> Stakeholders have questioned the reliability and validity of certain measures as predictive indicators of occupational health and safety performance. Lagging indicators (for example injury/illness frequency and costs) predominate and the identification of valid leading indicators has been a challenge. (p. 23)

Sparrow (2008) elaborated on the elusive nature of risk reduction and harm control in occupational settings:

> - The task of controlling bad things is usefully differentiated from the task of constructing good things
> - There are distinctive patterns of thought and action peculiar to controlling harms, which provide special opportunities for effective intervention
> - The fast-growing risk literature so far provide least guidance where the majority of practitioners are required to operate- within the multi-dimensional dimensional and textured layers the lie between high level policy decisions (based on macro- or national-level risk assessments), and low-level incident response. Almost all the important operational decision making about harm-reduction lies somewhere in these two extremes. (p. 16)

In this observation, Sparrow explained best why in the electrical trade, with such stringent safety rules and extensive training, expert electricians and apprentices are still being killed and injured. Hollnagel (2004, p. 59) posited this could be because these workers operate in

the fuzzy middle ground between high-level policy and the low-level, non-serious electrical shock incidents that take place at the "sharp end" (p. 63) of hazardous work.

Contributor 2: Accident Data from Construction Sites and Other Workplaces Are Not Reliable Due to Underreporting of Injuries

Underreporting of injuries seems most prevalent in the construction industry (Wall, 2016). Lipscomb et al. (2015) observed that "declining work injury rates may reflect safer work conditions as well as underreporting" (p. 411). Lipscomb et al. further noted that workers "felt pressures to use their private insurance for work injury care" (p. 411), as reporting the injury to workers' compensation insurance would, if used, become part of the public system safety record as well as being recorded as an injury for a specific company.

The gap in the goal of keeping workers in hazardous trades safe from death and injury results from the fact that it is extremely difficult to accurately measure the rate of injury on construction sites due to nonreporting or underreporting of occupational injuries (Azaroff et al., 2002; U.S. Department of Labor, n.d.; Tucker, 2012; Tucker et al., 2014; Tucker & Turner, 2013). This significant gap in the occupational health and safety literature represents a dearth of reliable injury data upon which regulators could accurately plan and execute worker safety programs and then proceed to demonstrate improvement and program success via injury reduction statistics. However, if regulators and safety authorities start out with flawed injury data sets, where as many as 20% to 70% of all occupational injuries are not reported (Fagan & Hodgson, 2017, p. 79), how can they effectively establish programs aimed at decreasing the occupational risk of harm to construction workers in hazardous trades?

These regulators and authorities would be operating under a condition that Beck (2009, p. 5) has noted as "Nicht Wissen Konnen" or an inability to know exactly what the

real injury data show; that is, how often do those unreported construction injuries occur and how severe are they? There is a broad range of factors why underreporting of occupational construction injuries still exists today, which include regulatory incentives, profit motive, and the need for a clean safety record in order to be able to bid on that next big job. In a study of over 1,000 carpenters, one of the most dangerous trades, Lipscomb et al. (2013) noted a comment by one carpenter:

> You're pretty much screwed if you get hurt at work [which they elucidated upon based on their research]. .....However, considerable evidence of fear of reprisal for reporting injuries was revealed. Less than one half (46.4%) reported that work-related injuries were reported in the current workplace all or most the time, and 30% said they were almost never or rarely reported. (para. 3)

Underreporting is longstanding, pervasive, and detrimental to worker health in the construction business, and Azaroff et al. (2002) noted how this is the normal condition of the United States Bureau of Labor Statistics' injury reporting system: "Data produced by these systems has been described as fragmentary, unreliable, and inconsistent. Moreover, they have been shown to underestimate the incidence of work-related injuries, illnesses, and even fatalities by as much as several hundred percent" (p. 1421).

Fissuring, a new concept by Weill (2011, p. 33), where employers farm out the risks by using contractors and subcontractors, can also explain the prevalence of a pervasive risk of harm to construction workers and the underreporting of construction site injuries. Research has shown that "90 percent of employers do not comply with OSHA record keeping regulations, resulting in underreporting by 38 percent of surveyed employers" (Robinson, 2014, para. 1). Probst et al. (2008, p. 1147) suggested that 81% of eligible claims went unreported in organizations with poor safety climates. Over 15 years ago, Shannon and Lowe

(2002, p. 467) confirmed this trend in the making, with data showing only 21% of injured workers filed a workers' compensation claim.

Yet, it is noteworthy that in a report by Prism Research (2013) commissioned by the Ontario Workplace and Safety Insurance Bureau on injury claim suppression, Prism categorically stated,

> There is no strong evidence to support credible inferences on the motivation for claim suppression. It is unlikely that conventional research methods could ever generate valid estimates of the incidence of claim suppression or incontestable accounts of the motivation for claim suppression. (p. 2)

Prism Research attempted to make a distinction between claim suppression and under reporting due to their view that it takes both an employer and an employee to suppress a claim, yet only a worker is needed to under report an injury. This distinction appears dis-ingenious, given one common situation reported by scholars and researchers is worker fear of reprisal (Howe, 2008, 2011, 2013, 2015; Stergiou-Kita et al., 2015; Weil, 2011) for reporting an injury was a key driver in not reporting an incident. Workers would not simply go to their boss and state they are afraid of being laid off if they report they are injured. Rather, they would simply press on with the work at hand, and as noted previously, might seek personal, not workers' compensation, medical and insurance attention. Lastly, it should also be noted that underreporting of an electrical injury is quite easy if there are no visible marks or wounds from electrical contact, which is often the case.

Contributor 3: Two Prominent Accident Theories Conflate with Each Other to Make Risk Assessment and Safety Decisions More Difficult

This contributor deals with false belief systems in accident investigation and prevention arising from two prominent, confounding occupational health and safety (OHS)

theories and the extent of their mainstream acceptance (Wright & Van der Schaff, 2004). These two confounding theories comprise the common cause ratios theory of safety, where a claimed reduction of less serious incidents, also called near misses, leads to a reduction in more serious injuries and death. This theory is commonly referred to as the "Heinrich Triangle" or the "Iceberg Theory" (Hollnagel, 2004, p. 24). The issue here is that this worker safety theory has been confounded with a theory suggesting there is a ratio relationship between incident severity and incident frequency.

According to Anderson and Denkl (2010), Heinrich's triangle theory makes a great deal of common sense from a risk-of-harm-reduction point of view, as it encourages workers to pay careful attention to the causes of near misses by focusing on the "small stuff," in the hope that this vigilance might help workers avoid the more serious errors that cause death and serious injury. However, in an analysis of 21 causal factors involved in UK train accidents, Wright and Van der Schaff (2004) found that only three factors had a greater proportion of these factors assigned to fatality and injury than to "near miss" incidents: (a) knowledge-based errors, (b) training, and (c) procedures. In other words, only 3 of 21 incident factors are common to both fatalities and injuries and to near misses, demonstrating there are very different causal factors involved in injuries and fatalities as compared to near misses. The conflating data appeared to link incident severity or consequences to incident frequency, as opposed to the causes of incidents and their frequency, which thus leads to flawed regulations, laws, standards, and safety programs.

Most harm control theories are well established, with a few being rather dated: "The invention of new theories of operation is rare. Most harm reduction work is conducted under theories established years ago" (Sparrow, 2008, p. 54). Further, Sparrow (2008) noted a gap

in conventional organizational approaches to modern accident prevention: “When institutions organize around specific concentrations of harm, rather than around functions or processes, they engage in a very different form of organizational behavior” (p. 54). He went on to note that research into several core literatures about organizational theory and risk control theory has not done a very good job of attending to the unique nature of an organizational harm reduction program. The older conventional approach to occupational health and safety and accident investigation then leads to a situation where:

> The fast-growing risk literature so far provides least guidance where the majority of practitioners are required to operate-within the complex, multi-dimensional and textured layers that lie *between* high level policy decisions (based on macro or national level risk assessments), and low-level incident response (which is driven by established processes and protocols). Almost all the important operational decision-making about harm-reduction lies in between these two extremes. (Sparrow, 2008, p. 17)

Sparrow pinpointed the gap between high-level policy and the reality of what construction workers face in what could be called a low-level incident. Hollnagel (2004) framed this gap another way: “The tendency to look for causes rather than explanations is often reinforced by the methods that are used for accident analysis. The most obvious example of that is the principle of Root Cause Analysis (RCA)” (p. 27). This approach “tells us how the accident happened, yet this does not mean this is the cause and it does not tell us why the accident happened” (p. 29). As such, many OHS practitioners operate under the assumption that all fatal construction industry incidents have the same causal patterns and sequence. However, Williamson and Feyer (1998) have shown this is not the case with occupational electrical fatalities.

Contributor 4: Picking Important Harms, or Risks, and Finding Ways of Dealing with Them Are Extremely Difficult for Organizations and Regulators to Undertake

Sparrow (2008) argued for precision in selecting the harms to address. Sparrow further suggested that many terms do not focus on the correct risks, or harms, and noted,

> Pick Important Problems, and Fix Them .....However simple that sounds, it turns out that organizing around carefully selected and important pieces of a risk—rather than around traditional programmatic or functional tasks, or around core-high volume operational processes—is extraordinarily difficult for agencies and or institutions to do. Even if they manage to do it once for something special, many organizations have no place for such conduct within their routine operation. (p. 5)

So rather than taking a shotgun or scattered approach to reduction harm, he advocated that regulators pick specific risks of harm, measure them both quantitatively and qualitatively, then go about attempting to fix them. The reader begins to see the dynamic complexity of occupational health and safety through the tightly held linkages between these 12 contributing factors. For example, how can the regulators and lawmakers plan a specific safety training or safety awareness program when they have no true idea of what the real-world injury statistics are and why it is so extremely difficult for them to pick the important harms in the construction trade? Kaskutas et al. (2016) analyzed the deadly types of harm of construction injury and falls from heights and noted that “over half of the fatal falls occur from structures that are less than 20 feet in height” (p. 824). However, in more recent work, Dong et al. (2014) found that in the residential roofing industry, 80% of fatalities were from falls (para. 3). This study will attempt to shed light on a deadly harm in another hazardous trade: live electrical work.

Contributor 5: Today, All Modern Risk Is Socio-Technical in Nature

There are complex links of sociality to technology and risk, and there has been inordinate difficulty in demarcating the difference between the two and their impact on modern construction risk: "Risk perception is related to conceptions of knowledge which stress the limits of science and different, ways of knowing" (Sjoberg et al., 2004, p. 5). Tulonen (2010) also found "electrical accident risk is ubiquitous in electrical work" (p. 33), and "being in a hurry, customer demand, and human failure" (p. 54) are the top three reasons for live work. Perhaps the notion of all modern risk being socio technical in nature could be challenged by those who would examine risky worksites, male gender, organizational power, precarious work, and economic pressure and ought to make stronger reference to the human and organizational factors involved in allowing live electrical work to continue.

If one examines the causal links of death and injury noted in these 12 contributors, the strongest thread linking these discussions is human nature and human behavior and its many, and increasingly complex, interactions with technology, technological change, technological measurement, and organizational theory. All major accidents today have their roots in the dynamic complexity of socio-technical systems (Hollnagel, 2004, p. 67), and as such, the social elements involved in modern construction accidents and fatalities are as relevant today as the technical element. Therefore, I argue an operational definition of occupational risk of harm in construction ought to include social elements. The inclusion of the social elements in an analysis of electrical injury and death was summed up nicely by Sparrow (2008):

> Preventive work involved sliding up and down the chronology of any particular harm, examining the full range of pre-cursors, and the pre-cursors to the pre-cursors, searching for opportunities to remove, restrain, or divert some essential ingredient or ingredients of harm. (p. 139)

Electricians learn technical work practices and safe work practices on the job in a highly socialized work environment as part of an apprentice, master (i.e., journeymen) work culture that is at least 150 years old in North America.

Contributor 6: Apprentice Ratios and Their Relationship to Worker Safety

Apprentice-to-journeyman ratios have been a mainstay of the labor market for hundreds of years in one form or another, with one definition of an apprentice being: "A person who is learning a trade from a skilled employer, having agreed to work for a fixed period at low wages" ("Apprentice," n.d., para. 1). The ratio of apprentices to journeymen in trades was also modified in later years in order to keep the most vulnerable workers (i.e., new, young, inexperienced workers) safe while they learned the hands-on intricacy and risks of doing craft work expertly. Over the past decade here in Canada, and specifically in Ontario, what I consider to be a wrong-minded and concerted attack has ensued on the entire notion of ratios of apprentice to journeymen in some compulsory trades, by suggesting that ratios should be assigned only through an economic benefit lens (Bryden & Dachis, 2013; Dawson Strategic, 2015; Human Resource Professionals Association of Ontario, 2014; Lerman, 2014; Lorimer, 2012). By government regulation in Ontario, a compulsory trade is one where a trade is regulated "in which registration as an apprentice, journeyman candidate . . . is mandatory" (Ontario College of Trades, n.d., para. 5). All 33 compulsory trades in Ontario have apprentice-to-journeymen ratios.

Risk of harm to young workers employed in dangerous construction trades increases significantly when the ratio of apprentices to journeymen on job sites increases (Kaskutas et al., 2010). Much of the academic discourse around apprentice ratios has attempted to make an argument that apprentice ratios have nothing to do with apprentice safety (Bryden &

Dachis, 2013; Dawson Strategic, 2015; Human Resource Professionals Association of Ontario, 2014; Lerman, 2014; Lorimer, 2012). Whereas Kaskutas et al. (2010), whose peer-reviewed work predates the works noted above, clearly demonstrated the risky gap of this one-sided argument, insofar as it pertains to lawmakers trying to keep young workers safe in risky trades.

In his review of the Ontario College of Trades, as requested by MOL, Tony Dean (2015) addressed how apprentice-to-journeymen ratios ought to be assessed through the lens of risk of harm to workers and apprentices. MOL accepted the recommendations of Tony Dean in his review of Ontario College of Trades, which stressed, "Place worker safety first, then the good of the public" (p. 13). Yet the Ontario College of Trades proceeded to create a definition of risk of harm opposite to what Dean recommended. Why was that: to appease the profit motive of organizations or due to the difficulties in adopting a more robust definition?

When Dean (2015) discussed the notion of risk of harm to those in the construction trades, he noted, "The key factor for classification or reclassification (of a trade) as voluntary or compulsory is risk of harm to one or more of a) individuals working in the trade, b) other workers on the job, and/or c) the public" (p. 13). Dean also made reference to changes in the apprentice-to-journeymen ratios being made and noted that "quality of on-the-job training" was the Number 1 criterion for evaluating submissions to modify apprentice ratios, with the second criteria being "the potential for risk of harm for an apprentice and others" (p. 16). Based on Kaskutas et al.'s (2010) studies of one hazardous trade, residential carpentry, one critical factor featured prominently in the ongoing health and safety of workers on dangerous construction sites, which was the role of a mentor-and-boss, a hands-on teacher supervisor,

and more importantly, an experienced professional showing the new worker how the work gets done—well and safely.

If one were to deconstruct Dean's (2015) counsel, the aim of occupational risk of harm in construction is first, to protect from risk of harm those trade workers undertaking the work; second, other trades on the job site; and third, the public at large. The organizational and occupational literatures were largely silent on what risk or harm means to workers who are healthy, highly trained expert adults working in hazardous trades. Conversely, the risk literature also had no definition for this new construct. Based on Dean (2010, 2015), Howe (2013, 2015, 2016), and Kaskutas et al. (2010), the adjudication of ratios for apprentices employed in hazardous trades should first and foremost be evaluated through a worker safety lens and not simply an economic perspective.

Contributor 7: Protection of Vulnerable Workers

Protecting vulnerable workers is perhaps a simple notion, yet this idea truly lies at the heart of the new concept called occupational risk of harm. However, the literature has remained largely silent on this notion, and it may be that there is a worldview that macho or manly men do not need protecting (Ely & Meyerson, 2010). However, recent work by Mitchell and Murray (2017) and Weil (2011) painted the reality that a swiftly changing economic landscape and workplace culture is leading to more off-loading of occupational health and safety responsibilities through the use of subcontractors.

Weil (2011) confirmed Dean's (2010, 2015) concern for vulnerable wage workers and the process, which Weil called fissuring. Fissuring is where the lead firms shift employment responsibility, determine market condition and wages, and violate working and safety standards while distancing themselves from their out-sourced subcontractors. In doing

so, the firms offload their organizational liabilities such as workers' compensation payments (Weil, 2011, p. 35). Weil also found the construction industry has 33.8% of its members in non-standard, or precarious, employment working from project to project which he identified as a hallmark of a vulnerable worker. The construction industry has the third highest share of non-standard workers at 8.9%, with only professional, scientific, and technical workers (10.4%) and retail (11.1%) having more non-standard workers (p. 49).

Mitchell and Murray's (2017) *Changing Workplaces Review* is an exhaustive study that looked at many other aspects of a swiftly evolving workplace, including workers in Ontario "whose employment puts them at risk" (p. 14). Mitchell and Murray also reflected on the Internal Responsibility System (IRS) established by Canada's Occupational Health and Safety Act (1990) "that some argue has been effective at making Ontario's workplaces safer and more healthy" (p. 89). This is a system where both the employers and employees share responsibility for safety in the workplace, yet Tucker (2012) disagreed, stating, "One study comparing the IRS system in 1990 and 2001 found that worker influence seemed to be in decline" (p. 37). This decline in worker empowerment and safety voice makes a great deal of sense when taking into consideration that live electrical work has been the "go to" for over a hundred years, and so continues today.

Classical technical risk formulae do not factor in the socio-economic, cultural, societal, environmental, and organizational power changes affecting modern construction sites. Weil (2011, p. 33) named this new, modern type of risk "job fissuring," which is an organizational and economic construct. This notion embodies a modern contractor's drive to be economically competitive in the construction business, to be allowed to bid on new construction projects, to be removed from liability, and to be profitable. In doing so,

contractors cut corners in an effort to cut costs: “More intense competition creates pressure to lower costs, particularly the sizable cost, and the one most easily controlled: labour” (p. 37). Fissuring and its outcomes increase risk of harm to skilled trades when these workers are further removed organizationally from the ultimate project owner.

Weil (2011, p. 35) went on to explain this shift to creating distance from principal to workers and noted a high incidence of violations of labor standards “regarding off-the-clock work, overtime pay and minimum wage requirements” in the construction industry and many others. Weil researched the practice of fissuring, where larger organizations, through organizational design, remove themselves from lower levels of organizational staff and support that they once used to maintain (p. 36). The rationale for this change in labor laws and what defines risk of harm in construction and many other industries was well thought out by Weil:

> In some cases, it reflects a desire to shift labor costs and liabilities to smaller business entities or to third party labor intermediaries, such as temporary employment agencies or labor brokers. Employers have incentives to do so for obvious reasons. As has been documented in numerous studies, shifting employment to other parties allows an employer to avoid mandatory social payments (such as unemployment and workers’ compensation insurance or payroll taxes) or shed liability for workplace injuries by deliberately misclassifying workers as independent contractors. Misclassification of this sort is a major problem, particularity in industries like construction, janitorial services. (p. 37)

Weil (2011) accurately described and explained the reason behind the Number 1 occupational health and safety concern raised by electricians and plumbers on today’s modern construction sites, which was “the risk of harm caused by workers who are unskilled, untrained, uneducated, non-expert and uncertified” (Howe, 2016, p. 2). Also, in Howe’s (2016) thematic analysis study of 47 apprentices and journeymen who had a combined 1,159 years of experience in their respective skilled trades; participants stated that their greatest

safety worry for themselves, their apprentices, and other trades workers was the unknowns of prior work. They wondered whether or not this prior work had been executed to provincial and federal construction and building codes and had it been executed by a fully licensed and certified trade expert? The risk of harm condition is one over which workers have little control and very limited ability to ascertain the work quality thereof, and I argue this is another example of where the electrical trades that work on short-term contracts, for the most part, are vulnerable. Not only are they susceptible to the economic pressures of their piece work, they also face many unknown risks on the job site.

Contributor 8: Occupational Electrical Injuries Are Different from All Other Occupational Injuries

Occupational electrical death and injury are different from all other occupational incidents, which best highlights why a robust definition of risk of harm for those in hazardous trades is required. Based on their research of the 2009 census of fatal occupational injuries, Kleiner and Won Park (2011) found that "death and injuries of electricians rank amongst the highest in the construction industry" (p. 3). Taylor et al. (2002) noted, "Occupational electrical deaths occurred almost entirely among males, with 'the highest rate by age group among those aged 20-34'" (p. 306). White males represented 90.9% of all those electrocuted at work, with Hispanic workers at 11.6% and Black workers at 7.8%.

Some alarming statistics have emerged around electrical injury and death. As confirmed by Williamson and Feyer (1998), "Knowledge-based errors of omission, not commission, were a key factor in accidents and fatalities for those in electrical trade" (p. 187). They further noted, "Unsafe work procedures endorsed by management were the single largest work practice contributor for both general causation patterns and electrical and

related trades" (p. 195). In an attempt to better understand the notion of live electrical work, Howe (2008) conducted a master's thesis research on live work and contributing factors, such as personality and the role this plays in risk taking and risk bearing. His report on these findings was contained in a key-note presentation and paper he presented to the Institute for Electrical and Electronics Engineers in spring 2010, with key findings about live work:

> Electricians continue the century old cultural tradition of working live: other than power line workers who must often work live. In a survey of hundreds of electricians in Ontario the Electrical Safety Authority found that 69% of electricians rated working live as being above average to high risk. Yet 90% said they have worked live, with 64% saying they do so to "test" the equipment, and of a group 17% stated, "I manage the risk". Therefore, working live for today's electrical trade worker is the norm, not the exception. Of note, 88% of all electricians have been educated to minimize the risk of live work, with 49% stating they have been asked to work out of established safe work practices. These trained experts said they worked live for a number of reasons: a) supervisor needs (72%) b) scheduling (80%) c) customer needs (91%). (Howe, 2011, p. 2)

Overwhelmingly, 94% of electricians believed that work situations in small businesses pay the least attention to worker safety, and these data points matter because 87% of all electrical contractors in Ontario have less than five employees (Howe, 2011, p. 2). In an effort to explicate why the difference in electrical injuries underpins the call for a more expansive definition of risk of harm, consider these facts as uncovered by MOL, showing that "a lost time injury due to electrical contact at work is almost 100 times more likely to kill a worker as compared to all types of construction injuries combined" (p. 2).

Based on Howe's (2011, pp. 2–4) report, several points are summarized:

- Over 50% of all electricians and apprentice deaths and injuries by electrical contact are caused by working live;
- Electricians know and have been trained on the hazards of live work;
- 90% of electricians have worked live;
- The majority of Ontario electrical contractors have less than five employees;

- The majority of electricians face organizational pressure to work live;
- Electrical injuries are 100 times more deadly than all other lost time injuries combined;
- In 2015, 60% of all fatal US electrical injuries occurred in the construction industry;
- Workers aged 25–34 experienced 50% to 100% more electrical fatalities when compared to all other age groups;
- Nonfatal electrical injuries (Ontario would classify these as the serious electrical injuries) resulting in days away from work (lost time injuries) rose by 33% from 2014 to 2015, the highest level since 2009, a year which saw an inordinate increase in electrocution and electrical injuries in both Canada and the US.

Thomée and Jakobsson (2018) reported significant and invisible harm to electricians and apprentices who have suffered contact with live electrical current, namely:

> The physical consequences of electrical accidents can be instantly evident but may also appear insidiously after an initially uncomplicated event and can have long term effect on health and work ability.....[Long-term complications resulting from electrical contact can include] reduced mental well-being and psychiatric problems such as depression, anxiety, phobias, and post-traumatic stress disorders (PTSD). (p. 574)

Thomée and Jakobsson also noted that emergency medical staff and doctors are not trained to recognize the symptoms of undiagnosed electrical injury, likely because these are long tail events and do not show up with any frequency in hospitals (p. 574).

Given these facts, it is clear that as Sparrow (2008, p. 5) advocated, "pick important harms and fix them," and given the significant and on-going harm caused by live work, a new more robust definition of risk of harm must be introduced, and quickly. This notion of feeling vulnerable at work is an important contributor to any discussion of risk of harm for electricians because of the dichotomy that exists between the high-level, serious electrical injury and its significantly higher morbidity rate, as compared to all other occupational

injuries, and the low level, non-serious electrical shock which leaves no mark and is almost never reported.

Contributor 9: Ancient Work Cultures, Risk, and Sensemaking

The ancient society of electricians, as I refer to them, has a longstanding tradition of live electrcial work going back 130 years when the first telephone and electrical power lines were being installed. At that time, the mortality rate for electrical linemen was 50%, because in those early days of electricity, powerlines had to be worked on live. Cultural norms in the budding electrical sector were being formed by strong, young, fearless men who were fit enough to climb up poles and towers, working at heights, with rudimentary climbing equipment and little to none in the way of safety protection. Modern electricians and apprentices must make sense of the daily risks they face just as their predecessors did 130 years ago: knowing the electrical system is on and proceeding to work live in the face of danger.

Organizational experts Van Maanen and Schein (1997) discussed the notion of socially constructed heruistics in a work setting as possibly being one reason why live work is still so prevelant today:

> Any organizational culture consists broadly of long standing rules of thumb, a somewhat special langauge and ideology that help edit a member's everyday experience, shared standards of relevance as to the critcial aspects of the work that is being accomplished, matter-of-fact prejudices, models for social etiquette and demeanor, certain customs and rituals suggestive of how members are to relate to colleagues, subordinates, superiors, and outsiders and a sort of residual category of same rather plain "horse sense" regarding what is appropriate and "smart" within the organization and what is not. (p. 1)

Van Maanen and Schein explained the training and the strong bonds of culture that are created in work places. They noted that where risk exists, "Organizational cultures arise and

are maintained as a way of coping and making sense of a given problematic environment" (p. 2). They went on to suggest these are self-preserving acts of a "sociocultural form" (p. 2). These deeply ingrained values, beliefs, and attitudes—or culture—are acted out in organizational socialization as follows: "Put bluntly, new members must be taught to see the organizational world as do their more experienced colleagues if the traditions of the organization are to survive" (p. 3). Socio-cultural factors that could affect risk taking or risk bearing by electricians and apprentices were noted by Thomée and Jakobsson (2018): "Most electricians are males, working in male-dominated occupational settings. Thus also at play are norms about masculinity, favouring toughness, and stoicism, acceptance, and normalization of risk" (p. 574).

ICI electricians are not taught in apprentice school to work live, and they are admonished not to do so because of the deadly risks of contact with an energized circuit panel or wire. Working live is taught to apprentices on the job site by journeymen mentors. There are no manuals showing how to work live in the ICI trade; rather, journeyemen show apprentices how these workarounds are performed, and once these apprentices become journeymen, they go on to teach their apprentices how to work live. This fact has been confirmed by Acumen Research (2008) in their research for the Electrical Safety Authority of Ontario as well as by the International Brotherhood of Electrical Workers (IBEW, 2010), who reported that the vast majority of electrcial workers still work live.

Berger and Luckmann (1966) helped expose the mutlifaceted nature of the organizational construction of reality for electricians and apprentices, and how this learning relates to live work:

> My knowledge of my own occupation and its world is very rich and specific, while I only have sketchy knowledge of the occupational worlds of others. The social stock of knowledge further supplies me with the typifactory schemes required for major routines of everyday life. (p. 43)

These scholars shed further light on how live work persists today: “The typifications of habitualized actions that constitute institutions are always shared ones.They are *available* to all members of the particular social group” (p. 54). Berger and Luckmann described the socialization process electricians undergo as apprentices where they see and learn about live work as secondary not primary socialization (p. 130).

Holzner (1968) decribed heuristics, worldviews, and work-arounds such as live work another way: “The meaning structures of everyday life define the world in which we are confident and in which we are at home” (p. 13). Further, Holzner went on to state, “Knowledge is always the knowledge of an observer and is therefore inescapably relational in nature” (p. 23). Sjoberg et al. (2004) reinforced the orgnizationally contructed nature of risk perception: “Perception of risk goes beyond the individual, and it is a social and cultural construct reflecting the values, symbols, history and idelology” (p. 8). A most telling look at risk theory and live work was offered by Sjoberg et al. who noted that risk theory must first start with the idea of wllingness to take a risk and that humans are more likely to tolerate risk if it is undertaken on a voluntary basis (p. 9).

Sensemaking of risk is importantly located in context of social interactions, observations, interpretation, and action: “When action is the central focus, interpretation not choice is at the core phenomenon” (Weick et al., 2005, p. 409). Weick et al. (2005) noted, “Sensemaking is social and systemic” (p. 412). Weick et al. provided insights into the subtle and small phenomena of organizational life and how these little things can impact those

around us: “To work with the idea of sensemaking is to appreciate that smallness does not equate with insignificance. Small structures and short moments can have large consequences” (p. 410). One small structure could be the so-called normalcy of live electrical work: An apprentice sees a journeyman working live, and this then becomes a lived experience of *how we do it*. Weick et al. expressed this notion as “The concept of action suggests this is more important to keep going than to pause, because the flow of experience in which action is embedded does not pause” (p. 419).

Scholars cited here supported the notion that (a) risk perception is an individualized experience; (b) different people perceive the same risk differently; (c) sensemaking in risky situations involves an interplay between interpretation and action, rather than the “evaluation or choice” (Weick et al., 2005, p. 409); (d) sensemaking relies on the central role of organizing through communications; and (e) the perception of what is risky and what is not is formed and influenced by social, cultural, institutional, human, and organizational factors. The definition of risk being used to elicit responses is important. Therefore, if a limited and narrow definition of risk is being utilized for understanding risk of harm in the construction trades, workers may not evaluate and understand the true nature of the construction risk accurately because “people are more easily sensitized to risk than to safety” (Sjoberg et al., 2004, p. 30).

Contributor 10: Masculinity and Risk

Few studies, save and except Ely and Meyerson (2010), have focused on the impact of an organization’s ability to influence the social identity of men at work: “‘Shortly after a fatal crash, a naval pilot dismissed the physical threat of his job, ‘We’re aviators. We laugh

in the face of death'" (p. 10). Is this behavior a response to risk taking or risk bearing as a military pilot?

To be clear, risk taking still exists in the electrical trade and, likely, in all other construction trades, other high-risk occupations, as well as in some professional sports such as professional football, hockey, and rugby, based on a worldview where hyper-masculinity or manly behavior is honored. Ely and Meyerson (2006) found that such behavior can limit a worker's ability to "perform their jobs more safely and efficiently . . . [and further, to improve safety outcomes], workers engage in mutual expressions of vulnerability" (p. 2). The oil rig drilling and rig business where Ely and Meyerson's study was performed is a relatively new phenomenon not common until the 1960s. However, what if the culture under examination has been active for over 130 years and there is no meaningful system or mechanism for workers to express vulnerability without looking less than manly or perhaps even fearful?

Occupational risk of harm to healthy, highly trained, male, subject experts in the construction industry has not been studied before. It should be noted this is a gendered study, as no female electricians have been killed while working in Ontario. It must be noted this practice is outlawed in the Province of Ontario, except for power line work that must be undertaken live with at least one worker and one spotter. Live work appears to be endemic and is heuristic in the electrical trade. It is almost a required process when dealing with the following conditions: street light repair, traffic signal lights repair, some power outages, emergency infrastructure situations, and troubleshooting, which is a very common work condition where the electrician works backward to ascertain where the problem is and requires an energized electrical current to do so. Other common reasons based on pilot

research results are the desire to look good in the boss's eyes; to be valued, appreciated, and praised; and to not be looked upon in a negative light.

Based on preliminary data only, socio, cultural, and organizational drivers appear to encourage this type of risk taking and risk bearing by experts. Risk bearing is different from risk taking, in that the apprentice or electrician is asked, coerced, or pressured to knowingly work live. Risk taking and risk bearing around electricity appear to continue to hold currency as a valid work around, as opposed to going and shutting off the power. This approach is reflective of the ancient society of electricians.

Is this the culture of masculine fearlessness in action, or is it that electrical workers "are motivated to control their fear, . . . [and] because they believe that it is futile to control the danger" (Witte & Allen, 2000, p. 595)? MacKeracher (2004) agreed that one cannot be removed from the context in which one works and learns: "Invisible context surrounds us. These contexts derive from the cultural and social expectations that control and direct how people relate, and work gets done" (p. 192). MacKeracher defined culture as being a system of learned beliefs, values, assumptions, customs, language, meanings, and behaviors shared with groups of individuals, which then acts as a guide for organizing the lives of group members (p. 192).

Westaby and Lowe (2005, p. 1028) confirmed that the role and behavior of a supervisor has an impact on his/her employees' safety. When supervisors stressed safety over speed—an obstacle faced in electrical work, for example, "Do I walk across the plant to turn off the power or do I work live—worker injuries were reduced" (p. 1028). Peer behavior and risk-taking should not go unnoticed. "Risk-taking orientation increased when youth workers believed that co-workers also took risks on the job" (p. 1033). Further, Westaby and Lowe

stated, “Youths global attitudes towards risk are also influenced by individuals in their immediate work environment” (p. 1033). Most important from an organizational development perspective was the indication that “co-workers risk-taking was a relatively stronger predictor of risk-taking orientation than supervisory influence” (p. 1032).

The notion of male gender at work in dangerous workplaces carries responsibilities for how workers show up: “Once men are accepted as insiders, they are expected not only to defend their own image of infallibility, but also that of higher-ranking colleagues” (Ely & Meyerson, 2010, p. 10). Under a cultural norm such as the one described here, if the boss or supervisor works live or asks a lesser-ranking worker to work live, the cultural imperative would not encourage the worker to challenge the supervisor, but rather accept the request and proceed to work live because, as Ely and Meyerson (2010, p. 34) noted, dangerous workplaces tend to intersect with masculinities, traits, behaviors, and competencies, and this results in men being men.

Analysis of gender and risk-taking is pertinent, as the incidence of accident or death by a female electrician or electrical worker over the past decade in Ontario is zero (Electrical Safety Authority, Engineering and Regulatory Division, 2005). This is, in part, due to the very low numbers of females in some trades; however, the fatality statistics remain, and risk taking as well as risk bearing by men at work needs to be continually reviewed.

In the view of Ginsburg et al. (2007), men take risks more often than women: “The meta-analysis strongly indicates that males were typically more likely to take risks than females” (p. 408). However, they cautioned that age and context, along with worldview, also play a role in differences in risk-taking. Scholars have also referred to this as a “self-system” (MacKeracher, 2004, p. 7). On the self-concept of men’s gender: MacKeracher (2004,

p. 154) suggested that relatively autonomous elements of the "self-system" manage risk, while for women the relational elements tend to dominate when faced with risk decisions. This concept strongly agreed with Byrne, Miller, and Schafer's (as cited in Ginsburg et al., 2007) meta-analyses of gender difference in risk-taking. The self-system is constructed of the following elements: "self-concept, self-esteem, self-ideal and body image" (p. 154).

An autonomous self-sense gives one the frame of "seeing the self as separate from others" (MacKeracher, 2004, p. 154) versus the relational sense, which allows one to see self in context of others. In so far as safety is concerned, moving the risk taker from the frame of autonomous to relational learner (Bolman & Deal, 2003, p. 12) could help mitigate risk-taking behaviour, in that the risk-taker may now see his risk-taking and its consequences through the eyes of others who matter.

Ginsburg et al. (2007) succeeded in leaving us with an assessment of risk taking by gender. To summarize the current learnings on risk-taking differences amongst the sexes, Ginsburg et al. proposed, "The underlying causes of sex differences in risk-taking behaviour remain unanswered and complex, having genetic and environmental concomitants" (p. 411), save and except to state, "Men engage in more risky behaviors than do women" (Harris & Jenkins-Guarnieri, 2006, p. 48).

Hyper-Masculinity, or Manly Behavior on the Job Site, and Risk Taking. Does men's identity construct of masculinity inhibit sound safety practices (Ely & Meyerson, 2010, p. 2)? A review of the organizational norms and systemic drivers that may encourage, promote, or reward subject matter experts in their occasional risky behavior was undertaken. The cost of masculinity displays at work have been reviewed as well as the construct of what steps organizations can take to change or modify the conventional masculine identity

construction process. Ely and Meyerson (2010) found that organizational features, such as norms and work practices designed to enhance safety and effectiveness, had the "unintended effect of changing how men enacted their masculine identities at work" (p. 2). Ely and Meyerson have examined the construct of how, within the organization, masculinity negatively impacts safety learning and practice: "A prime site for the conferral and expression of masculinity is dangerous workplaces" (p. 9). They further opined, "No other setting evokes more vividly the dominant cultural image of the ideal man: autonomous, brave and strong" (p. 9).

Acting Masculine and Fearless. Acting masculine and fearless can inhibit learning, and "the costs of men's masculine striving are high" (Ely & Meyerson, 2010, p. 4). "When people are fearful or anxious, they focus mainly on what they are afraid of, or on safety from this thing, and they disregard almost everything else" (Oatley et al., 2006, p. 270). Further, Ely and Meyerson (2010) argued, "Defensive behaviour has long been recognized as an impediment to learning" (p. 37), adding that "efforts to appear invulnerable block precisely the kinds of actions that encourage safety and effectiveness . . . [as well as], covering up mistakes, for example curtails learning and allows for the repetition of errors" (p. 12).

"In sum, men in dangerous, male-dominated settings gain respect by demonstrating and defending their masculinity" (Ely & Meyerson, 2010, p. 12). The problem, therefore, may lie with "men's efforts to prove themselves" (p. 7), given that "men went to great effort to appear physically tough, technically infallible, and emotionally detached, in order to prove their merit as workers and as men" (p. 9). Dynamic, not simple or linear, complexity is readily apparent when assessing the roles of masculinity, and risk, on dangerous job sites. In their study of oil rig workers, Ely and Meyerson (2010) found that if workers share their

fears and concerns about risk, if they communicate these to fellow workers, safety on the oil rigs improves.

In their recent work, Austin et al. (2020) examined electricians' safety decisions and suggested an integrated theory of why electricians work energized and found several mental models that have influence on injury risk:

> Electricians are aware of the danger, old equipment and low quality materials pose a risk, low quality past work is a risk, physical and environmental jobsite hazards take a toll, others on the site can present a hazard, electrical work safer than it was a decade ago, live work is common, working energized sometime happens unexpectedly, and they go on to note: "usually the choice to work energized reflects perceptions doing so is necessary, although convenience is sometimes a factor." (p. 8)

Their work did not uncover the emotional burden of constant pressure to hurry up, along with fear of reprisal for refusing live work, nor did they note male gender, dangerous jobsites, and the ancient culture of electricians as factors impacting live work.

Austin et al.'s (2020) research found only 25% of electricians felt pressure to work live versus the majority of my research participants, who rated this and *hurry* as the top risk electricians and apprentices face today. The findings of Austin et al. also confirmed that providing electrical workers with training and safety tools such as the Just Don't Ask Authorization form (see Appendix A) could be effective while attempting to "negotiate to working de-energized" with employers (p. 11).

Stergiou-Kita et al. (2015) examined male gender in male-dominated trades and high-risk situations and found men valorize their role and identify strongly with their chosen trade, they are reluctant to report accidents, and strong culture beliefs exist in the electrical trade. Their work did not uncover fear of reprisal, the economic factors that influence the

prevalence of live work, nor did they uncover the prevalence of being pressured into rushing to get the job done faster.

However, in Stergiou-Kita et al.'s (2015, pp. 214–217) literature review, they noted several factors that may be involved in live electrical work:

- Dominant masculine norms can affect perceptions, acceptance, and normalization of risks in the workplace context;
- Gender and gender identity can influence health and health-seeking behaviour;
- Men celebrate "heroism, physical strength, toughness, and stoicism;"
- Young workers may face greater institutional pressure to accept risk;
- The breadwinner role is conflated with demonstrating masculinity;
- Production pressures and incentives can impact safety and risk;
- There are gaps between official safe work practices and what really goes on; and
- The social and organizational construction of male gender can impact risk and safety.

In closing, self-selection into dangerous occupations may be a powerful motivator related to risk taking. However, it may be that the lure of self-management, autonomy, working with tools, and working outdoors and not in an office environment are very appealing to some types of workers.

Contributor 11: "Power" in the Power Industry

The role of organizational "power" in the power industry has so far not been explored in detail by the industry or occupational health and safety professionals; nor has it been studied in the risk literature insofar as live electrical work is concerned. Organizational power in the power industry refers to the influence, whether implicit or explicit, that

supervisors, foremen, journeymen, project managers, owners, and clients exert on the electricians and apprentices they employ, in order to get these skilled workers to undertake live electrical work. The rationale employed by leadership, heard by this researcher time and time again over the past 15 years, goes something like this:

> Johnny, its 4:30 on a Friday afternoon, and if you walk to the other end of the factory to shut off the power to replace that switch, and then walk all the way back to test we will not get out of here until 6 PM; end of the shift is 5 PM, and we are on strict budget control, the contractor will be pissed off at us, so can you just work live? (Howe, personal observation, November 18, 2018)

In the discussion of links between organizational power and OHS outcomes, it is helpful for electricians to consider for a moment the global meta-data on six decades of occupational electrical death and injury assembled by Batra and Ioannides in 2001, where they noted, "Worldwide, reliable comparable data exist and indicate a downward trend in fatal electrical accidents" (p. 285). In 2013, the U.S. Department of Labor (n.d.) noted occupational electrocution was the fifth leading cause of death at work and now, 18 years later, this risk represents the third leading cause of occupational fatalities according to OSHA data. These data represent a disturbing trend because in 2006, "contact with electrical current was responsible for approximately 4% of all fatal injuries in the US" (Janciak, 2008, p. 617), with injuries significantly higher for workers aged 16 to 19 (p. 620).

Given the significant improvements to safety training, personal protective equipment, technological advances, and so forth over the past decades, why are we seeing an increase in occupational electrocutions? I would also argue there has been an increase in electrical injuries as well, given the prevalence of injury underreporting when data reflecting most other types of construction fatalities are falling.

Batra and Ioannides (2001) provided an important insight into one important expression of the power in power: namely, control of access to incident data. It is pertinent to note this study was written in 2001, reviewing six decades of occupational electrical death and injury data across the globe. Batra and Ioannides presented the following thesis:

> Statistical data reveal that electricity is a great killer among workers, especially those performing electrical work. It would be expected that electric companies, knowing this first hand, would publish much more and more detailed data. But only 12 records gave electric company data and none of them were recent. Important questions thus arise. Why electric companies do not publish accident statistics? Why those electric companies that used to publish accident statistics (e.g., EDF) no longer do so? Why is electricity no longer statistically attractive as an occupational risk although electric accidents continue to represent a great portion of fatal occupational accidents. (p. 304)

A thought-provoking definition of power as it relates to occupational health and safety of electricians and sensemaking while on the job was put forward by Weick et al. (2005):

> Enhancements of sensemaking that pay more attention to power will tend to tackle questions such as how does power get expressed, increase, decrease, and influence others? Preliminary answers are that power is expressed in acts that shape what people accept, take for granted and reject, Pfeffer (1981). How does such shaping occur? Through things like control over cues, who talks to whom, proffered identities, criteria for plausible stories, actions permitted and disallowed, and histories and retrospect that are singled out. (p. 418)

Sensemaking in terms of risky actions is an important lens into construction accidents and fatalities due to the belief that

> Sensemaking is central because it is the primary site where meanings materialize that inform and constrain identity and action . . . [and] is about the interplay of action interpretation rather than the influence of evaluation or choice .....[More importantly though, they noted], When action is the central focus, interpretation, not choice, is the core phenomenon. (p. 409)

Sensemaking shares a worldview with phenomenological inquiry, in that Weick at al. (2005) noted, “If the first question of sensemaking is ‘what’s going on here’, the second,

equally important question is ‘what do I do next?’” (p. 412). If an electrician is faced with the quandary of undertaking live work or not, Weick et al. argued the decision to do so is not based on choice per se, but rather on interpretation of the situation and all that it contains. Given today’s fissured workplace (Weill, 2011), electricians and apprentices know that if they refuse to undertake risky work, such as live electrical work, they will be the first electrician to be let go as the project winds down. As self-employed subcontractors, their business plan is to stay employed on their *projects* as long as they can in order to earn an income for their families.

A third vector of power linked to OHS is represented by analysis of the size of a construction company and its injury rates:

> Small construction companies have high rates of work-related injuries. Safety research often focuses on large construction companies and sites, while less attention is paid to construction employees in small companies, working individually or in pairs at different job sites. (Ozmec et al., 2015, p. 275)

Thus, there is a need for great attention where most construction workers toil: namely, smaller firms. In closing, Ozmec et al. (2015) concluded, “Overall safety practice was a negotiated practice established in both internal and external struggles for legitimacy, identity, positions and craftsmanship” (p. 281).

The underreporting of injuries is a fourth and important element of power in small construction companies. This was confirmed by Holte et al. (2015), who noted, “Injury rates are high despite wide-spread agreement that underreporting of injuries exists” (p. 207). Issues of underreporting work injuries may be particularly relevant in small business, and “reports suggest that injury risk is great among workers in small businesses” (Sorenson et al., as cited in Holte et al., 2015, p. 205). Holte et al. importantly noted, “The highest injury prevalence

was found within electrical trade" (p. 207), with an interesting pattern showing that "electrical trade had the highest prevalence of injured apprentices within companies having 10-19 employees (44% injured)" (p. 207), which most often occurred after 19 to 24 months of experience.

A fifth power factor related to power and worker safety was best described by Weil (2011, p. 33) in a process he called fissuring and which deals with vulnerable workers, where he noted the labor violation of working "off the clock" (i.e., coming in early or staying late with no pay). Weil found that 72.2% of construction workers had experienced this condition, and he found that this notion is based on increased subcontracting as a means of defraying vicarious liability or "the liability imposed on one party because of the actions of another" (p. 47).

Sixth in line as a power factor in electrical trade is supervisory and organizational pressures. In his Institute for Electrical and Electronics Engineers conference presentation, Howe (2011) highlighted a survey by the Electrical Safety Authority of Ontario that had found:

> . . . 69% of electricians rated working live as being an above average, to high risk. Yet 90% of electricians said they have worked live, with 64% stating they do so to "test" the equipment and of this group, 17% [stating], "I manage the risk." (p. 2)

Further, respondents went on to describe why they continue to work live: "These trained experts worked live for a number of reasons: (a) supervisory needs (72%), (b) scheduling (80%), and (c) customer needs (91%)" (p. 2). These data again point out the dynamic complexity of the phenomenon called live work.

A seventh and final power factor is workers' perceptions of safety climate and their perceptions of "management attitudes and behaviors in relations to safety as well as to

production, or other issues (selection, discipline, and planning)" (Flynn et al., 2000, p. 185). In their meta study of safety climate research, Flynn et al. (2000) found that "the most commonly measured dimensions relate to management, safety systems, risk, followed by work pressure and competence" (p. 188).

In closing, this section on occupational health and safety and the impact of power in the power industry and those who regulate, monitor, insure, inspect, and legislate this complex multilayered industry, which is at the heart of the modern industrial complex, I note the words of Shaw and Barrett (2006), who stated,

> However, not only is the concept of risk historically and socially located (i.e., it is perceived in different ways by different people and across societies) there is also little evidence that the extensive arrangements in place for assessing and managing risk are effective. (p. 14)

However, one piece of evidence on how, from an organizational point of view, to partially mitigate the role of power and risk of harm to electricians and electrical apprentices came from Amick et al. (2015). In their analysis of workers' injury compensation rates for over 44,000 construction firms in Ontario, Canada, they compared union versus non-union rates. In their study, which examined the compensation rates for the period of 2006 to 2012, they found the following compelling data:

- unionized firms have 13% higher rates of total claims (allowed and not allowed)
- lost-time claims allowed (LTA) are significantly lower in unionized firms by 23%
- unionized construction firms report 28% higher rates of no lost time claims (NLTA) allowed, and 14% lower rates of lost time claims allowed. (Union Safety Effect section, para. 1)

Their findings were clear:

> Overall, the results of the data linkage and analysis suggest that unionized firms in the ICI [industrial, commercial, institutional] construction sector in Ontario encourage reporting, as reflected in the higher rates of NLTA claims, and reduce occupational

> hazards and improve safety programs to reduce the rates of more significant LTA claims compared to non-union firms. (Discussion section, para. 9)

These data have confirmed the significant role underreporting of occupational injury plays in occupational health and safety and shed light on the pernicious links between "power" in the power industry and workers' ability or willingness to report an injury.

Contributor 12: Human Factors and Risk

A brief overview of the concept of human factors and risk of harm is provided in this section. Human factors in complex socio-techncial systems and their links to risk taking and risk bearing were seen and felt in many of the contributors noted thus far in this report (Batra & Ioannides, 2001; Sparrow, 2008), which again illustrates the dynamic complexity of attempting to limit risk of harm to healhty, well-adjusted, highly trained, expert males. Human factors in accidents have been examined extensively and have been found to be a major cause of accidents (Hollnagel, 2004; Weigmann & Shappell, 2001), with Weigmann and Shappell (2001) noting that "human error has been invloved in 70% to 80% of all civil and military aviation accidents" (p. 32). One of the most telling insights into the human factors and risk came from Bargh and Chartrand (1999, p. 462), who noted that most of a person's everyday life is determined not by their conscious intentions and deliberate choices, but by their mental processes. They went on to note "perceiving an action increases the person's likelihood of perfoming the same act" and confirmed that perceptual activity is "largely an automatic act" (p. 465). More tellingly, Bargh and Chartrand explained why live electrical work is so pervasive, with their thesis on automaticity and behavior:

> To consciously and willfuly regulate one's own behaviour, evaluations, decisions, and emotional states requires considerable effort and is relatively slow. Moreover, it appears to require a limited self resource that is quickly used up, so conscious self-regulatory acts can only occur sparingly and for a short time. (p. 476)

Bargh and Chartrand further noted that “automatic self-regulation requires one third less effort than regular thinking” (p. 476), thus providing support for the notion of human beings relying on automaticity or heuristics when undertaking live work.

Williamson and Feyer (1998) presented their observations on occupational electrical fatalities, where they found behavioral events, not environmental events, were the prime cause of electrical fatalities. Although these behavioral events occurred less frequently in the trades, when they did occur, they were “much more likely to be the prime cause of fatality” (p. 193). Specifically, the prime contributing factor in occupational electrical fatality was unsafe work practice (52.6%), or an error of some kind. Williamson and Feyer also found the error to be an omission for those in the trades as compared to the commission of an error in general electrical fatalities. Futhermore, these errors of omission occurred in the second event preceding the incident; whereas in all other types of occupational fatalities, it was the event immediately preceding the incident that was the prime cause.

Electricians made errors of ommision (i.e., things not done) in the second event prior to the incident, and these errors were most often unsafe work practices; specifically, unsafe procedure by management appeared to be the most prevalent type of unsafe work practice (40%) followed by individuals conducting unsafe procedures. “Human factors, in the form of errors of omission and unsafe work practices, were most commonly the prime cause of fatality” (Williamson & Feyer, 1998, p. 194).

In closing, the impact of human factors is tightly linked in dynamic complexity to the other 11 contributors. Williamson and Feyer (1998) summed up their findings with respect to the tightly linked systemic complexity of electrical death and injury in this manner:

> The analysis showed that more than half of all fatalities involve unsafe work practices and/or a task error at an earlier time, and the majority of these factors were a prime cause of fatality. ..... [with one important additional finding]. Unlike the general patterns, however the behavioural events invloving electricity mostly did not occur immediately before the fatality, meaning it was the second to last event which was the prime cause of the fatality. (p. 196)

Electricians continue to make errors of omission somewhat automatically and continue to take risks when coerced, pressured, cajoled, asked to, or otherwise encouraged to do so by peers, supervisors, management, and clients.

Summary

Gaps in the current understandings surrounding the deadly practice of live electrical work stem largely from a condition Beck (2009, p. 5) described as "Nicht-Wissen-Konnen" or an inability to know. Today, we do not know what we do not know, insofar as where risk taking ends and risk bearing begins in relation to occupational death and injury amongst electricians and electrical apprentices.

If occupational risk bearing and the drivers of such behavior were better understood, electricians and apprentices would be better able to push back against those who would ask or coerce men to take life-altering risks. Years ago, I created the Just Don't Ask form (see Appendix A), where those requesting live work were asked by the electrician to sign this form, assuming responsibility should anything go wrong. This intervention was successful, as one senior member of the electrical union in northern Ontario noted, "After some time of me giving them these don't ask forms, they just stopped*"* (G. Howe, personal observation, October 7, 2020).

Provided in this was an overview of several bodies of literature related to the dynamically complex issue of how it is that live electrical work continues today. This

question was expressed in 12 contributing factors involved in the practice of live electrical work. Explored in Chapter 3 will be the methodology and methods utilized in this thematic analysis research study aimed at better understanding the lived experience of how electrical trade workers deal with the deadly request to work live.

CHAPTER THREE:

QUALITATIVE METHODOLOGY AND THEMATIC ANALYSIS

> Learning from accident investigation is an emerging topic of safety research. (Nadhim et al., 2016, Section 4, para. 4)

In this chapter, the research methods and methodology utilized to examine the perceptions of risk in the electrical trade will be reviewed, and specifically their views and lived experiences with a common electrical practice called live electrical work.

The primary research question of this study was, How is it that highly trained male experts in electrical work continue to undertake a deadly work practice called live electrical work? This question was explored in Chapter 1, while in Chapter 2, a host of literature bodies were examined related to how it is that live electrical work still takes place today, considering electricians are well trained in electrical risk and danger.

Provided in this chapter is a detailed understanding of why the research methodology of thematic analysis was selected for use in the study, which was based on the literature review, results of the pilot study, and how or where the pilot study informed the design of the main study. Additionally, how the study was conducted utilizing an inductive thematic analysis approach, research instruments utilized, and steps taken to understand the resultant data are discussed in detail.

Two studies were conducted: (a) a pilot study and (b) the main research study. The pilot study consisted of one apprentice and one fully licensed journeyman and was conducted in order to test the ability of the research instruments (i.e., pen-and-paper survey followed by an in-depth interview with six unstructured questions) to elicit clear data for this study, which utilized the research methodology of thematic analysis to elicit honest, insightful, and

diagnostic answers to the research question. The main dissertation study was conducted with 13 apprentice electricians and 10 qualified journeymen electricians with the exact same research instruments as utilized in the pilot, though with a different execution process for the apprentice group. This was due to the fact that journeymen research took place in early December 2019, while apprentice research took place in March 2020 after COVID-19 became a serious health issue. Given the COVID-19 outbreak and lockdown of colleges and training institutions, no in-person research was conducted with apprentices. Rather, one-hour phone interviews were conducted with apprentices, who had emailed answers to the pen-and-paper surveys, with the six in-depth, unstructured questions being asked at the end of each interview. One additional question was asked of apprentices during the unstructured questions; namely, "Has COVID-19 had any impact on your job sites?"

Researcher Reflexivity

I have been studying the notion of live electrical work in one fashion or another for almost 20 years, and clearly this exposure to the topic material could bias me, my approach to the study, my line of inquiry, the wording of my questions, or my interpretation of the resultant data and findings. Deductive thematic analysis (Braun & Clarke, 2006, p .77) was selected for the research study in part because it helps that as researcher, I minimize bias by utilizing an a priori or pre-planned set of thematic codes while searching through the resultant data. Pearse (2019) also discussed the importance of greater understanding of the behavioral and social processes affecting phenomena under research:

> Deductive qualitative research procedures have the potential to address some of the shortcomings of inductive approaches, including a more systematic development of a body of knowledge of behavioural and social processes that take place in business. (para. 1)

Given my 20-year focus on studying this wicked and apparently intractable practice called live work, I have over the years conducted a more systematic development of body of knowledge of the behavioral and social processes that take place, while studying the occupational risk-taking part of live work.

Given that data are not coded in an epistemological vacuum (Braun & Clarke, 2006, p. 12), I recognize that as researcher, I suffer from what Birch and Bloom (2007, p. 382) called the "curse of knowledge," and the inductive approach was utilized to allow minimal epistemological or ontological bias in theme identification. By utilizing thematic analysis at the latent level, I came back time and time again to the entire data set, reducing the themes collected, expanding them, and again reducing them in number, which resulted in creating subthemes under major themes recurring across the data set. I searched time and again across the entire data set for themes relating to the notion of live electrical work and why men continue to take the risks of live work.

Pilot Study Results

Results from the pilot study showed the study sequence and questions laddered quite well, and once participants got into the flow of questions and answers, they were quite willing to speak honestly about their lived experiences with live work. This was an anonymous study, which I believe helped participants open up and speak freely. Pilot study results informed the main research study in the following ways: They served to confirm the importance of gender, organizational power, the power and impact of the ancient society of electrician, and its ability to ensure men conform to the electricians' ideal image: technically strong, brave, independent, self-starter, and *not a pussy.* The pilot research data also highlighted the pressure to hurry, and although fear of reprisal was mentioned briefly,

mention of this factor encouraged me to pay extra attention to fear of reprisal mentioned in the main study. Other than these few changes and the asking of COVID-19 questions to apprentices, along with the shift from face-to-face and focus group interviews to telephone interviews for apprentices in the main study, very little changed from pilot to main study. The results of the pilot study were instrumental in finalizing the questions used in the full research study.

Study Objectives and Purpose

In this section, the purpose and objectives of the research are introduced. Each is described in detail to form the basis of the study conduct.

Purpose

The purpose of this inductive thematic analysis study was to examine what risk apprentices and electrical workers face at work. Specifically, why men work live on energized machinery, panels, circuits, and equipment were explored.

Objectives

The goal was to uncover deep-seated beliefs, attitudes, opinions, and values of men employed in male-dominated work settings that are dangerous, such as electrical work, and where, even though these workers have been trained to recognize and deal with the dangers presented by live work, they still work live. The primary aim of this qualitative thematic analysis study was to examine:

1. How is it that highly trained, subject matter experts continue to *work live*?
2. Discover the many and varying factors that contribute to live work.
3. Explore these factors through the lens of apprentice versus journeymen electricians and group the findings into distinct themes and subthemes.

4. Search for the impact of organizational power, gender, ancient masculine work cultures, and the role of modern precarious employment in the construction trades, specifically the electrical trade.
5. Assess the overall fit of identified themes to develop and refine a series of thematic maps showing linkages and perhaps causality.

Workers employed in the electrical trades continue to get killed and injured due to contact with energized electrical circuits, machinery, and panels. Reiser (2007) noted that over 50% of all death and injuries to those employed in the electrical trades were a result of what is called in the trade *live work* or *working hot:* undertaking electrical work when the power is still on. Electrical injuries are also notable for their fatality rate; injuries suffered by those working in the electrical trade are deadly: "Electrical injuries occur less often on work sites, but they are the most fatal. In fact, 1 in 5 critical injuries and 1 in 18 non-critical injuries involving electricity results in death" (Aviva, 2018, p. 3).

The practice of live electrical work is outlawed in most circumstances, yet this deadly work practice continues. Why? This study explored the notions of risk, risk perception, and sense making of risk by apprentices and journeymen electricians in an effort to determine how is it that this life-altering work practice is still commonly utilized today.

Due to the impact of COVID-19 on research procedures, apprentices in the main research study were interviewed over the phone versus face-to-face and focus group settings, which were utilized in the main study with qualified electricians. These questions enabled me to examine live electrical work through the lens of occupational risk taking and occupational risk bearing. The research was carried out in an effort to determine why live electrical work continues today and what are the factors driving such a deadly practice. A thematic analysis

method was utilized with an inductive methodological stance and data being examined at the latent, or underlying, levels of meaning to better understand the operating worldviews of those employed in the ancient society of predominantly male electricians. The underlying constructionist view utilized while searching for latent themes and a rich description of the data set helped minimize bias. This epistemological view recognizes the impact of social-cultural contexts and the structural conditions in which electricians are trained and mentored and guided the choice of methodology to carry out the research.

Methodology

The method utilized for the main study was a qualitative research instrument called thematic analysis and was utilized in one-on-one interviews conducted with fully licensed journeyman electricians and apprentice electricians, as well as a focus group with the licensed journeymen. Thematic analysis was chosen as a research method in order to allow emergent, recurring, and important themes about occupational risk of harm as a result of live electrical work to be identified in the research data provided in this pilot study. This thematic analysis utilized a bottom-up constructive methodological approach, where key themes were identified in the verbatim transcripts of research participants. Thematic analysis was also selected for its ability to help identify key themes in a study where risk bearing and risk taking appear to be active, still today, allowing seasoned, highly trained, expert males to take an action that can cause serious injury or death.

A deductive approach to information and data interpretation is based upon "predefined or a priori codes generally based on understandings from prior research, or theoretical considerations" (Crabtree & Miller, 1999, p. 167). Somewhat distant from this approach to code development is the inductive approach to analysis of the information itself:

"Data-driven codes are constructed inductively from the raw information" (p. 30). Further, they described the power of this approach: "Because a data-driven code is highly sensitive to the context of the raw information, one is more likely to obtain validity against criteria and variables" (p. 30).

Boyatzis (1998) described why the inductive approach to coding of raw information may be highly useful to research examining the notions of occupational risk of harm and occupational risk bearing:

> Working directly with the raw information enhances appreciation of the information in addition to eliminating intermediaries as potentially contaminating factors. With a complete view of the information available, the researcher can appreciate gross (easily evident) and intricate (i.e. difficult to discern) aspects of the information. Previously silenced voices or perspectives inherent in the information can be brought forward and recognized. (p. 31)

Utilizing this constructionist epistemological framework allowed me to analyze all research data to then help identify deductive themes or patterns and to compare and contrast these amongst apprentice and journeymen electricians. This research framework was well suited to exploring a research question that has received little in the way of prior study.

Data were also analyzed from a constructionist point of view in order to examine "events, realities, meanings, and experiences" (Braun & Clarke, 2006, p. 9) of live electrical work. Key themes were identified by their ability to capture important concepts, ideas, and beliefs, along with their prevalence of mention around the notion of live work. Themes were identified at the latent level in an effort "to identify or examine underlying ideas, assumptions and conceptualizations [around live work]" (p. 13). Following data analysis, theme identification, and the development of research findings, a thorough review of the

literature was again conducted to determine where the literature agreed or disagreed with my findings and what, if any, were new contributions to the literature.

I argue that live work is a socially produced and reproduced action; that the socio-cultural, environmental, organizational, gender, regulatory, and economic conditions provide a context in which live work thrives today; and that all these factors combined ought to be considered when exploring occupational electrocution and injury in the electrical trade.

Participant Selection and Recruitment

All participants for the main study were volunteers. Journeymen participants were recruited by the International Brotherhood of Electrical Workers (IBEW) Local 353, while apprentice participants were recruited by the Joint Apprentice Council (JAC) Electrical Apprenticeship Training, a certified electrical apprentice trainer based in Toronto, Ontario.

In order to participate in the study, apprentices were required to be in the provincially certified training program offered by JAC. Two additional criteria for apprentice selection were (a) they were not powerline workers, and (b) they must also have completed 2 years of the 6-year apprenticeship training program. They were asked by their apprentice school if they would volunteer to participate in an electrical safety research study.

In order to participate in the study, journeymen had to be fully licensed electricians who possess 2 years or more of electrical experience as a fully qualified ICI journeyman in the Province of Ontario. No participants were known to me, and as such, there was reduced risk of researcher influence during research sessions.

The anonymity of participants in this research study has been assured, in order to ensure no risk of harm to participants from release of identifying information. No personal and identifying participant data were collected due to the fact that live work is illegal in

Ontario, Canada, and in many other jurisdictions. Research was conducted in the Toronto area, as this is where I reside. The recruitment process comprised a random-selection process, and all research participants were unknown to me.

Number of Participants

Thirteen certified and provincially licensed electrical apprentices were recruited, all having at least *two years on the tools,* as electrical work experience is known in the trade. Ten fully qualified electricians were recruited and possessed a current Ontario C of Q, which is a licence to practice as an electrician in the Province of Ontario and is recognized by the Electrical Safety Authority and MOL.

Confidentiality

Perhaps one of the most important elements in creating a safe place for participants to speak freely was to ensure that participants remained anonymous. Participants were presented with an informed consent form as per approval by Fielding Graduate University's ethics review committee. After presentation and discussion of the Informed Consent form (approximately five minutes, see Appendix B), participants were asked to mark an X, as opposed to signing their name, signifying they understood the content and agreed to participate in this study. This process was designed to keep all participants safe from risk of harm given live electrical work is illegal in many circumstances.

Materials and Instruments

For the certified electricians, a nine-question pen-and-paper survey, including demographic questions, was utilized where individuals wrote out their answers to the survey followed by a 20-minute, in-depth discussion utilizing six open-ended questions (see Appendix C). The six in-depth questions were asked in a focus group session with the

qualified electricians and lasted 30 minutes. However, due to the outbreak of COVID-19 in early March 2020, which coincided with the timing of the apprentice interviews, the apprentice research was conducted via one-on-one phone interviews lasting up to an hour in length. Informed consent forms (Appendix B) were emailed to apprentices who agreed to participate and whose email addresses were forwarded to me by the Joint Apprenticeship Council.

The research questions focused on what the occupational risk of harm means to highly trained, adult male experts, exploring their operational perceptions of risk of harm in electrical work and why, apparently, live electrical work is sometimes perceived as not being too risky. As noted, one specific risk of harm explored was the common electrical trade practice called live work, which is illegal in most jurisdictions, and as such, research participants were not asked if they undertake live electrical work directly, in order to avoid risk of harm to participants should their identities become known.

Research Procedures

Interviews were conducted at a union hall training facility, and over the phone, and all lasted an hour on average. The participant names and identity remain confidential in order to ensure no risk of harm to participants given live work is illegal in most cases. All participant responses amongst the qualified electrician group were audio recorded and subsequently orthographically transcribed by me. Participant responses from the apprentice group were orthographically recorded, by hand only, by me. Any names and other identifying information of research participants were removed from recorded data.

Interview/Survey Questions

Participants were asked their views and perceptions on electrical safety at work, how they see safety in practice, how veteran electricians and supervisors work to keep apprentices safe, and what types of work veterans and apprentices view as potentially causing risk of harm. Other questions included what types of work are seen as risky, and finally, what types and sources of risk of harm do apprentices and electricians encounter on the job? Those employed in the electrical trade know how dangerous this trade is, and in prior research work, participants identified over 200 different sources of risk of harm (Howe, 2016). Participants were encouraged to take an appreciative stance on electrical safety, and to talk about safety at work, and if the notion of live work was mentioned, participants were queried further on this phenomenon as part of unstructured questions. The questions provided in Appendix C were asked of all research participants in this study, and as noted, due to the outbreak of COVID-19, the apprentice portion of the main research study was conducted via one-on-one telephone interviews lasting from 1–1.5 hours in length; no focus group was held with apprentices.

Data Analysis: Coding and Data Management

I transcribed all research data and coded these data several times before beginning theme analysis. Once themes were reduced to seven overarching themes, I then went back and color-coded all data in order to securely measure the frequency of mention of the various themes and subthemes. Having lived with and worked with these data over a period of several weeks and months, I realized the wisdom of my inductive coding choice. Had I utilized the reverse methodological stance, where I entered the data analysis and coding stage with preconceived notions of what codes I was looking for, I likely would have missed some

very important themes shared with me. Further, by keeping an open mind to what data were being shared with me and not being forced into checking for mention of any preconceived coding themes I should be looking for, I was able to nimbly shift topic and pace to ask probing questions during interviews when interesting data points emerged.

Risk and Ethical Considerations

In an effort to do no harm to research participants, no names or any other identifying information were collected in order to maintain the confidentiality of study participants. This is important given that live electrical work is illegal in Ontario in most situations, with the exceptions of powerline work, and where it is impractical to otherwise undertake the work (i.e., streetlights and traffic lights). To ensure I met this goal, study participants were asked to simply mark an X on the informed consent form, indicating they understood what the study was about, why it was important, and that they agreed to participate (see Appendix B).

Study Limitations

Managing my own bias, worldviews, and the so-called "curse of knowledge" (Birch & Bloom, 2007, p. 382), which, in this case, was my extensive research and study over the past 20 years on the topic of occupational risk of harm to apprentices and journeymen electricians, was an exercise in mindful self-awareness. In order to withhold judgement and bias, I undertook a strategy in data analysis where I again utilized an inductive or ground-up approach to data analysis, data coding, and theme analysis. I was extremely mindful as I transcribed all research data line by line and coded these data several times before beginning theme analysis. Once themes were reduced to overarching themes, I went back, and color coded all data in order to securely measure the frequency of mention of the various themes and subthemes. By keeping an open mind during interviews as to what data were being

shared with me, and not being forced into checking for mention of any preconceived coding themes I believed I should be looking for I was able to withhold bias, and nimbly shift the topic and pace to ask probing questions when interesting data points emerged during research.

Summary

Presented in this chapter were the research methods and thematic analysis methodology employed to examine the lived experiences of electrical apprentices and fully qualified electricians as they face risks in their day-to-day work. Inductive thematic analysis was utilized to dig deep into the underlying structures supporting the practice of live electrical work. Special attention was paid to live electrical work, which is a common and risky work procedure that has been used in the electrical trade for decades. Presented in the next chapter will be an introduction and discussion of the major themes arising from the research data and how these themes were condensed into three major risk findings, in descending order of importance: (a) the constant job pressure to speed up the work; (b) fear of reprisal for refusing to work live; and (c) the dynamic complexity and conflation of male gender, dangerous work sites, and organizational power in the culture of the ancient society of electricians. The importance of a theme was based on frequency of mention and repetition, key words in context, use of indigenous to-the-trade word typologies, categories and phrases, the passion observed and heard when expressing opinions, scanning for missing data, the laddering and transition of comments in the focus group, and being aware of patterns within the data.

CHAPTER FOUR: FINDINGS—FEAR AND HOPE IN THE ELECTRICAL TRADE

The research design and methodology of this study were summarized in the previous chapter, and in this chapter, the results and findings of this study into occupational risk bearing by electrical apprentices and fully qualified electricians as they face everyday risks at work with the main risk being live electrical work will be discussed in detail. Also shared in this chapter are the findings showing that risk taking and risk bearing lie along a continuum that has not yet been fully explored. In Chapter 5, a deep dive will be taken into how these new learnings may be applied to both the risk taker on the job as well as the risk bearer, in an effort to keep more trade workers returning home safely after a long day at work. Further, in Chapter 5, the literature will be tied together with the findings of this thematic analysis in order to provide meaning, interpretation, and recommendations on how to reduce death and injury caused by live electrical work.

Eight key themes, which were later synthesized into three core risk themes, were identified in this study, and will be discussed in greater detail later in this chapter. The eight key themes identified were

1. Pressure to work faster
2. Fear of reprisal for refusing live work
3. Male gender and dangerous workplaces
4. Residential and low-rise is risky work
5. The culture of the ancient society of electricians
6. Communications, or lack thereof
7. 1:1 apprentice to journeyman ratios are risky
8. Underreporting of injuries is endemic in construction

These eight key themes were further reduced into three core risk themes:

1. Male gender and dangerous workplaces
2. Organizational power and precarious work
3. Ancient work cultures and men

The human and organizational factors involved in taking a risk on the job site and bearing a risk on the job site are detailed herein. These findings suggest fear, hope, culture, organizational power, precarious work, and gender combine with a complex host of other factors to allow these well-trained experts to engage in the deadly practice of live electrical work. Explored in depth in this paper is the risk-bearing aspect of electrical injury and death. Risk bearing at work is when an electrician or apprentice is asked, coerced, or otherwise pressured into taking risky actions by working live on energized circuits panels.

On Fear and Hope

Key findings showed that fear and hope for those "who have the right to practice" (Kleiner & Won Park, 2011, p. 2) is an everyday occurrence for those who are licensed electricians and registered apprentices in the Province of Ontario, Canada. Throughout this chapter, and indeed the entire dissertation, phrases in italics are verbatim quotations from electrical workers interviewed.

The first prominent emergent theme was that men in the electrical trade fear the risk outcomes of being pressured into speeding up the pace of work as well as the outcomes of live electrical work.

> *Haste is in direct correlation to risk or harm because the moment you take him out of his regular pace and tell him to go a little bit faster, something happens to the mind because the mind loses train of thought, and you do things out of the ordinary.*
>
> *I don't think he's ever going to stop asking me.*

Fast, a lot faster and sometimes, no choice

Feel that most of the load of pressure: mismanagement of builder and trades

Pressures at the end of the month: billings

100% go

Push is always there; they have to get things done quickly.

A second, very prominent theme is that electrical workers fear being laid off or facing other forms of reprisal if they say no to a hint, request, suggestion, shaming, demand, or command to work live. As an aspect of this emotional labor (Stahl et al., 2003; Ward & McMurray, 2015), these men invest in not seeming to be outwardly concerned about risks, fear, or pressure to speed up the work pace. However, to undertake live work increases risk and hinders open communications amongst the men and with their leadership. These men fear the safety outcomes of being pressured into taking or bearing the risks of live work, but often are operating under a worldview of *I can't say no*. They fear the number, frequency, and newness of risks they face on the job site. They fear customers who cut labor costs at every corner, increasing risks. They fear the results when a supervisor, foreman, or client, *who always has an excuse for working live, they won't stop asking,* asks them to work live. They fear inexperienced customers taking on more job site responsibility than they are trained for, thus increasing risk. They also fear untrained, unlicensed workers doing electrical work.

They fear the impact of new, more aggressive competition and tighter bidding: *The job comes first, safety second*. They fear that the new *1:1 apprentice to journeymen ratio will simply kill and injure more apprentices*. They fear the *golden boys* who will do anything the

boss asks: *Every site has one, and they stay steady*! Such attitudes also create worker-on-worker pressure to take risks and to work live.

A recurring theme mentioned was hope for change. Electricians hope that the better educated and trained apprentices along with their changing attitudes, expectations, and opinions will reduce the frequency of live work. They hope that the vital knowledge, experience, skills, and safe work habits possessed by *old school* electricians will be passed on to the next generation, as many veterans are retiring: *Mentoring, that's the first thing that comes out of my mouth because those trade practices need to be passed down*. They hope that the younger generation of electricians are, and will continue to be, empowered enough to speak out, as a group, against demands for live work. They hope that everyone goes home safe at the end of the day. They hope that *the electrical trade gets more respect from other trades and clients*, thus reducing pressures to work live. They hope the *union halls take back responsibility for workers signing papers* (i.e., safety) on the job sites. They hope that management will *walk the talk of "don't work live."*"

They *hope for more electrical safety campaigns like the Just Don't Ask Authorization form* created by the Electrical Safety Coalition gets more use (Appendix A). They hope for the *use of more aerial lifts versus ladder*s. They hope for much greater fines and serious personal penalties *for any supervisor or client who puts electricians at risk (e.g., $500,000.00).*

One second-year apprentice commented at the end of the interview:

> *I appreciate the phone call. It really helps me to get it off my chest, and its really important now there are people looking into this. I did not expect it to be so in-depth, and it puts me in a better mood knowing that someone cares .....Keep up the good work!*

This comment highlights Ely and Myerson's (2006, 2010) findings regarding communications and dangerous workplaces. If employers create a safe haven for men to voice their concerns, fears, and worries about safety and occupational risk of harm, safety improves.

Apprentices fear the safety outcomes of the constant push to get the work done faster: *Fast and safety do not work*. They fear working in high-rise and *low-rise residential construction, where risks are greater and live work is common.* They fear the pressure of not fitting in with peers and supervisors. They fear being laid off if they do not undertake live work like the *yahoos or guys with big egos do*. They fear working in non-union organizations. They are angry, fearful, and confused that no meaningful accident injury or fatality data regarding charges and fines are posted on the MOL web site *after a death or serious injury to an electrician*. They fear safety enforcement has *no teeth*. They fear the unsafe conditions of the new 1:1 apprentice ratio, as there are *too many apprentices and no supervision;* and *It's like an insane asylum run by the inmates. It's all about money and cheap labor.* They fear the frequency of risk on the job site. They fear the *Johnny Now who will do anything the boss asks*. These verbatim comments spoke volumes about the impact of both peer and supervisory pressure to take risks on the job site.

Apprentices hope they do not get COVID-19 on some heavily over-crowded workplaces, where often it is impossible to maintain social distancing from each other. They hope the substandard and limited washroom facilities and common lunch areas with many different trade workers taking a break at the same time will not get them sick. They hope that *sparkies*, as electrical apprentices and journeymen are called, will one day be able to report

all injuries and electrical contact sustained on the job. They *hope that the 1:1 apprentice ratio does not kill and injure more apprentices and unregistered electrical workers*.

Research participants hope the double standard stops: *Here we don't work live* is heard at the safety talks, *and then a few minutes later, some are working live*. Apprentices hope more companies, such as Guild Electric, Ontario Hydro, the nuclear generation plants, and Western Mechanical, will follow guidelines for ensuring zero live work is conducted unless it is absolutely necessary, supervised, and with proper protective equipment. Apprentices hope they get more safe work practice training in apprentice school (i.e., circuit testing). They hope that the Joint Apprenticeship Council (JAC) gets more support, more funding, and becomes more tech savvy while continuing to be a *top-notch educator*. They hope that the Electrical Safety Authority of Ontario's (2011) arc flash video gets shown to all apprentices more frequently. Participants noted that union membership provides protection and hope for electrical apprentices:

> *When you go non-union, it even gets, oh yeah, a lot worse. The cheaper the company is, the less money they have available; the more and more risks are being taken.*
>
> *Non-union –they are there for the profit themselves, comes down to what the individual needs are, like where they work, but have to get paid, but don't want to get laid off.*
>
> *Used to do it in non-union, now – no, quite a lot of experience working live in high-rise residential, a lot. If you don't work live –you don't work!*
>
> *You know guys come from non-union: not taught right.*

Key Risk Findings Identified by Participants

Analysis of the most important risk findings emerging from interviews with apprentices and journeymen electricians led to identifying eight key themes. When distilled into their most raw form, these eight key themes showed fear and hope along with male

gender, organizational power, precarious work, and the work culture of the ancient society of electricians were mentioned frequently—and vividly—as being significant factors impacting risk of harm on the job site: (a) emotional labor: pressure, fear of reprisal, and hope; (b) culture; and (c) gender.

I noted this study explored the notion of risk bearing at work, and in her article "When the Risk of Harm Harms," Placani (2017) discussed a fundamental construct related to this notion of risk bearing:

> This essay's central theme is that to risk harm can be both to wrong and to harm, which speaks to the involuntary nature of risk bearing when a supervisor might ask a worker to undertake live work: "To risk a harm, then, is to increase the possibility that harm may come about." (p. 78)

This construct about live electrical work and risk bearing is important "because a lost time injury (LTI) due to electrical contact is 100 times more likely to kill a worker as compared to all other types of LTI's combined" (Howe, 2011, p. 31). Azaroff et al. (2002, p. 1421) noted that injury underreporting by the U.S. Bureau of Labor Statistics can be as much as 100% less than reported. Based on this current study, underreporting of injuries was tightly linked to precarious employment in the electrical trades.

This is a male gender study given that 97% of electricians are male. Gender within the setting of a male-dominated industry and dangerous work sites plays a powerful role in risk taking, and I would argue risk bearing. Ely and Meyerson (2006) noted, "A prime site for the conferral and expression of masculinity is dangerous workplaces" (p. 9). Ely and Meyerson provided a highly appropriate and contextual outline of why gender, specifically male gender, was important to the findings of this study:

> Where gender once was equated with women, gender scholars now commonly recognize that men, too, have a gender and that masculinity—the values, experiences

> and meanings a culture ascribes to man (Alvesson and Billings, 1997 :83) is a central component of gender relations worthy of study.....At the individual level, masculinity refers to how successful a person conforms to societal expectations for men, and at broader levels norms and at the broader levels it denotes how successfully structures and practices preserve a gender order in which men predominate and the culture attributes of manliness hold sway. (p. 3)

Finucane et al. (2000) found that "white males are different from everyone else in their perceptions and attitudes toward risks" (p. 160), as "white males were always less likely to rate a hazard as posing a high risk" (p. 164). They also posited that "risk perception varied considerably across African American, Hispanics, and Asian males and females," with White males being more likely to take risks versus other groups (p. 170). Finucane et al. identified that race and gender matter insofar as risk perception is concerned, and given that data show that females comprise just 3% of U.S. electricians, white males make up 69% of electricians, while Hispanic males make up 12% of U.S. electricians. Finucane et al. suggested more study is needed on non-White male institutions when she noted, "Viewing risk as a social construct dependant on characteristics of individuals raises questions. What might be found in societies not dominated by white males?" (p. 170). Yet indeed, examining both manifest and latent themes of risk in a White, male-led organizational society and culture is what this study focused on. Due to the limited time and space allowed for this study, I did not dive more deeply into the dynamically complex role that race, gender, and risk play on risk bearing by electrical apprentices and journeymen.

Stergiou-Kita et al. (2015) explored the male prevalence of injury at work: "Men are more likely to die from work related injuries than women..... In Canada in 2008 more than 97% of all workplace fatalities between 1882 and 2005 were male" (p. 214). Stergiou-Kita and her colleagues also suggested that gender "can be considered a verb and examined in

relations to the concept of 'doing gender'" (p. 218). Therefore, it makes sense to include gender as well as culture into any research into the practice of live electrical work.

This research is important because research into the occupational health and safety of electrical workers has primarily focused on the notion of choice in the decision to work live or not. However, what if choice is really no choice at all when it sometimes comes to working live? The findings of this research study show that choice is perhaps the wrong word to use when describing why live electrical work still takes place. Many participants stated they truly have no choice in the decision to work live; they either work live, or they go home. This lack of a meaningful choice in a decision to work live or not, is what I refer to as the occupational bearing of risk. It is the electrician or apprentice who bears all the risk of live electrical work. Scholars have found that unnecessary risks such as live electrical comprise a phenomenon deeply rooted in dynamic, not simple or linear, complexity, and there appears to be no one silver bullet designed to stop this practice (Austin et al., 2020; Howe, 2008, 2011; Sparrow, 2008; Stergiou-Kita et al., 2015; Williamson & Feyer, 1998).

Williamson and Feyer (1998) had noted, "Unsafe work practices were by far the most common type of contributing factor in electrocutions (53%) whereas unsafe or risky normal operating procedures due to management are the second most common (50%) contributing factor in electrical trade" (p. 193). This qualitative research study confirmed the research findings of Austin et al. (2020), Howe (2011), Tulonen (2010), and Williamson and Feyer (1998), showing that electrical trade workers often find themselves facing pressure from management and customers to work faster, thereby engaging in unsafe practices. This research also discovered that emotional labor (Stahl et al., 2003; Ward & McMurray, 2015), expressed as fear of supervisor reprisal, was the Number 1 reason participants stated for

hurrying, rushing, and working live. This research also found a strong hope for change in the electrical industry, where such demands would be eliminated.

This emotional labor (Stahl et al., 2003; Ward & McMurray, 2015) comes with a "dark side," which has been noted as, "Mainstream approaches characterize the 'dark side' of organization as incidents, experience, or behavior that are perceived to be abnormal by-products of dysfunctional relations" (McCabe, as cited in Ward & McMurray, 2015, p. 3). Vaughn (as cited in Ward & McMurray, 2015) described the dark side phenomena as being "how things go wrong in socially organized settings" (p. 3). Kamal (2013) stated, "Human error was found to be the main causation factor of accidents at construction sites" (p. 154), stressing the fact that risk decisions made by practitioners are critical to safety outcomes, whereas the findings of this study have suggested leadership decisions, not practitioners' decisions, are prevalent in risky situations. Research findings showed there was no ambiguity amongst participants, whether seasoned pros or apprentices, as to the deadly nature of live electrical work.

Research Questions

This study examined the lived experience of electrical trade workers who face daily risks on job sites, such as falls, being struck by an object, electrocution, and getting caught in/between (U.S. Department of Labor, n.d.). However, the main research question was, "How is it that live electrical work continues today?" Electrocution was the third leading cause of death in the construction industry in 2018, accounting for 8.5% of construction worker deaths in the USA (U.S. Department of Labor, n.d.), while just 10 years previously, electrocution was the fifth leading cause of death on job sites. Consequently, I asked, "Why

are more workers and electricians getting killed on the job by electrocution when most other construction injuries and fatalities are down?"

Eight Key Research Themes Identified

As noted in the introduction to this chapter, eight key themes arising from the main research study were identified through analysis of participant data. Each is discussed in detail in this section. Throughout this section, phrases in italics are verbatim quotations from electrical workers interviewed.

Theme 1: Time, Pressure, Speed: The Job First, Safety Second

Human, organizational, cultural, and environmental factors contribute to live electrical work today. Research data showed one prominent organizational factor is time, or rather lack thereof, and was reported to be the Number 1 job site risk: *Time, Pressure, Speed* were mentioned over 66 times throughout the study as being the key factor in the decision to take or bear a risk. Participants noted, *In this day and age, competition is very high, and bidding is very tight*; and *The rush [order] from the office down to the foreman, through to the workers, causes people to work faster and different than usual, and this causes unsafe working conditions*. The pressure to complete the scheduled electrical work in less time than is normal, or prudent, was noted as the Number 1 risk factor for electricians and electrical apprentices:

> *Job comes first, safety second. Gotta move with the fast pace. Feel that most of the pressure: mismanagement of builders and trades, its different, the whole perception of time: kinda like, "This will only take a second," they say. They say to stress, "The other guy did it. Craig did it; why the fuck can't you?"*
>
> *I agree with you on training. I think we are all trained to the point, I think its outside influences to do what we do on our job site. I worked for a new company with distribution centers that were going all around. We did the first one, and I got to talk to the owner, "Oh well, you know how we got from start to finish in four months.*

> *Good, we're going to the do the next one in three and a half months, and the one after that in three months! But now they're taking short cuts, There's no, there's no time! Like, I mean trades are literally on top of one another! How are there not more accidents? You know it was ridiculous.*

Westaby and Lowe (2005, p. 1028) discovered that as supervisors actively placed priority on safety versus production speed, safety improved. Zohar (2010) found that despite leadership, worker safety was paramount: "Safety procedures are often compromised under completing operational demands such as production pressures and costs" (p. 1518).

These research findings on the pressure to work faster with less safety in mind, along with an aging workforce in the construction industry, begins to help explain the startling increase in fatal injuries amongst older construction workers. As noted by Tucker (2017),

> The largest portion of construction fatalities shifted from workers aged 25-34 to the 45-54 age group in the last two decades. In 2010 workers aged 45 or older accounted for 53% of all construction fatalities, an increase from 34% in 1992 and 44% in 2005. (p. 1)

Theme 2: Fear of Reprisal: I Can't Say No to Live Work; The More You Say No: Pink Slip

Electrical workers called the second major risk theme fear of reprisal, which comes in the form of potential layoff from the job site or other forms of reprisals should an electrical worker refuse to work live. Participant comments included

> *Are you willing to get laid off and go home, or risk your life and not go home?*
>
> *Common sense is NOT common sense on the job site.*
>
> *If you refuse this shift (weekend), you may not get another one.*
>
> *So what you say or open your mouth about, that's why there's a difference between electricians with seniority lists and electricians with not because I spoke up and got a text lay-off one quarter of an hour after leaving, on my way home.*
>
> *I think I can make the correlation between pay…*
>
> *We gotta do it live; that's happening a lot out there.*

Guys get pegged.

There's a lot of guys on the site who don't want to rock the boat; they just want to go home. They see things, but they don't say anything.

Again, it goes back to fear of layoff; we have to be careful.

This is bullshit; this GC does not even understand!

I've seen it go so far as a union steward getting laid off. Some way or another, they will go far enough up the chain to get rid of a steward—will be isolated in a dark corner where no one can reach him or access him.

The risk factor behind this theme is dynamically linked to pressure to speed up, as it is well known that live electrical work saves time and money, increases productivity, and helps meet ever-shortening project timelines. Working live by not shutting off the power also removes the inconvenience of no electrical power during shut off for clients, contractors, and other trades on the job site, all of whom require light and power. There are multiple levels of pressure to work live, and fear of reprisal could also take the form of reduced shifts or bad shifts (i.e., weekends), short notice for weekend or overtime work, being given *the crap work*, or being the first to be laid off; as the project nears completion, *guys get pegged*, meaning they *get a reputation as a complainer*.

Working live is no small matter. Howe (2011, p. 31) stated that when the Electrical Safety Authority of Ontario surveyed hundreds of electricians in the province, it found over 90% of electricians had worked live, and their reasons for working live were (a) supervisor needs (72%), (b) scheduling needs (80%), and (c) customer needs (91%). Pressure on the job site is prevalent and has a real impact on worker safety.

Theme 3: Culture: The Ancient Society of Electricians

Culture was noted as the third most important risk theme by electrical workers who undergo a secondary socialization while working the rigours of electrical apprenticeship and

on to the journeymen status. Culture is defined as, “Culture is a way of life for a group of people—the behaviors, beliefs, values, and symbols that they accept, generally without thinking about them, and that are passed along by communication and imitation from one generation to the next” (Choudhary, 2016, Some Definitions section, para. 5). Based on research findings, this certainly sounds like how apprentices learn to work live.

This process of organizational socialization (Berger & Luckmann, 1966) within the ancient society of electricians is based on the fact that electricians learn a substantive portion of their technical work skills and the vast majority of their safe work skills on the job under the tutelage of one or more journeymen electricians, along with other more advanced apprentice peers. This on-the-job training includes being exposed to live work, and Chan (2013) described the dynamic complexity of becoming a successful apprentice in the trades, how this is linked to occupational identity formation, and how live work gets taught to younger workers, thus becoming normalized:

> Apprentices learning is understood to include individual identity formation through embodiment of knowledge as revealed through skilled practice; incorporating learning through inter-relational or co-creation with other learners and experts through interaction with materials and tools and machines be they hardware or software. In learning a trade apprentices learn the social and cultural practices of their trade as they learn how to do, think, feel, and be. (p. 6)

This ancient society of electricians is a male gender organizational culture and society, as 97% of all electricians are male, and this preponderance of men on the job site is further confounded by men working on dangerous work sites. Ely and Meyerson (2010) noted, “A prime site for the conferral and expression of masculinity is dangerous workplaces. Dangerous work involves physical risk, which is the *sine qua non* of masculinity” (p. 9). This *sine qua non*, or essential condition, of masculinity in the ancient society of electricians is

played out time and again in live work. It has been ingrained as a normal work practice that the *old school* electricians, who were taught by a prior generation of licensed electricians to work live, and they have, in turn, educated younger electricians (i.e., apprentices) on how to work live. However, the two different aspects of live work should be noted: (a) it's one thing to be taught how to do it; (b) its another thing to undertake live work.

> *I think back to the day 35 years ago; you just did it.*
>
> *COR certified, everybody has this app on cell or tablet, really advanced. At the beginning of each day, everybody fills out their own little safety. Check this box, check that, and I'm going to be commissioning live potential, this stuff, but is it hitting home? No, not at all. This compliance was just a joke, and everybody's putting in the same thing; you don't really talk about it.*
>
> *So its cover your ass, the reality of what is happening on a lot of these sites. . .*
>
> *Simple: loyalty, they [want] to build that with the boss—can get the job done.*
>
> *You're working on it after locking out, and there's like, "Oh you're almost done, I'm going to turn it back on." Your Boss!*
>
> *All of us walked three or four times; we refused to do the hook-up. Eventually, they did shut off, so there something that has to be pushed for.*

The culture of the ancient society of electricians is one where, for many decades, live work was a normal practice given its historical significance: 130 years ago live work was the only way of stringing and connecting poles and lines. This further implies that the action in question may be performed again in the future in the same manner with the same electrical grid. Berger and Luckmann (1966) offered an appropriate definition of organizational culture:

> All human activity is subject to habitualization. Any action that is repeated frequently becomes cast into a pattern, which can then be reproduced with an economy of effort which *ipso facto* , is apprehended by its performer *as* that pattern. Habiualization further implies that the action in question may be performed again in the future in the manner and with the same economical effort. (p. 53)

Berger and Luckmann went on to state, “Society is a human product. Society is an objectives reality. Man is a social product” (p. 61).

Live electrical work is a cultural phenomenon deeply rooted in the electrical trade and is tightly linked to its male participants, the danger of the trade, and the precarity of the work. Organizations take advantage of this phenomenon today to improve their productivity and profit margins at the expense of their electrical workers.

Theme 4: Communications: Walk the Talk

The fourth common risk theme for both apprentices and licensed electricians centred on communications involving management’s commitment to safety, how this is communicated to the workforce, and subsequently acted on. Research data showed how apprentices and electricians are exposed to *great safety talks* about safe work practices and that *live work is not condoned by the company, yet minutes later, back on the job site, live work continues*. The communication issues central to the continued risk for electrical workers are two-fold: (a) the inability to talk with co-workers and supervisors about their fear surrounding job site risks, and (b) a disconnect between what the leader says and what they do.

> *We sign the papers, everybody leaves then they need a favor from you, Yeah.*
>
> *It’s a hospital you have to do it live.*
>
> *Like all the contractors come up with all the reasons we need this to be done live, so they can give you all kinds of reasons, and I think they are still putting us in this position because a month ago I was testing stuff – it happens.*
>
> *Show apprentices the Arc Flash video from ESA: Life or Death!*
>
> *Are you comfortable with this ….looking for a yes.*
>
> *They say the scenario: It’s got to be done with out LOTTO (lock out tag out), it depends on the individual if someone offers. NO ONE say no.*

This is, in part, due to the masculine or manly role apprentices and electricians exhibit and is also due to fear of reprisal.

Communications on the job and about the job is a key factor tightly linked to risk in the male-dominated culture. In 2011, Howe reported on electricians facing job reprisals as a result of refusal to work live, while negotiating their safety by asking their supervisor or client to sign the live work authorization form:

> One disturbing trend is the anecdotal report of job sanction against electrical trade workers who presented this form for signature, thus supporting the author's suspicion of vulnerable electrical workers. (p. 33)

The Just Don't Ask Authorization form (Appendix A) was created specifically to deal with the inability to speak up and lack of training of electrical workers on how to negotiate their own safety effectively by saying no to live work. The Electrical Safety Coalition of Ontario created this form as an organizational intervention designed to stop those who would ask electrical workers to work live by having them sign this declaration stating they would take responsibility should anything go wrong due to working live. This form was extremely effective in Northern Ontario: "After me presenting this form so often, after a while, they just stopped asking" (G. Howe, personal observation, September 18, 2020). This form was also designed as an educational and communications tool, serving to inform customers, clients, and contractors on the deadly outcomes of live electrical work. In defining that "Culture is Communication, Communication is Culture," Choudhary (2016, Some Definitions section, para. 3) again noted that the culture of communications on the job site for electricians is tightly bound by tradition and lore, and live work is deeply embedded in the lore of this ancient society.

Theme 5: Male Gender and Dangerous Workplaces

The fifth common theme has to do with masculinity, male gender, and hyper masculinity and the culture of the ancient society of electricians. As noted by Ely and Meyerson (2010),

> The notion that men "do gender" has replaced static conception of masculinity (West and Zimmerman 1987). A man encounters—and learns to anticipate—others' expectations of him as a man: he responds, others react, and through this back-and-forth, he comes to see and present himself as a man (Padavic, 1991). (p. 4)

For those employed in the electrical trade, fearlessness is a crucial aspect of this manly behavior: "Organizations are principal purveyors of conventional gender ideology (Acker & Van Houten, 1974) and thus are an especially potent site for doing gender (Ely & Padavic, 2007; Martin 1994; Ridgeway, 1997)" (Ely & Meyerson, 2010, p. 4). So why does live electrical works still prevail today? Kimmel (as cited in Ely & Meyerson, 2010) stated, "The very definitions of manhood we have developed in our culture maintain the power that some men have over other men" (p. 5). This power often resides in the organization: "Organizations import occupational norms and most occupations are associated with a gender, envisioned in culturally prescribed forms" (Ely & Padavic, 2007, p. 1125). Ely and Padavic (2007) went on to say, "Conventional masculinity is associated with power" (p. 1128), and as such, in the electrical trade, organizational power, dangerous worksites, male gender, risk taking, and risk bearing are tightly interlinked.

Howe (2008) noted, "Risk takers fit into three broad groupings: thrill seekers, goal achievers and risk adaptors ..... Only the first group are truly risk takers, and the others are risk bearers" (p. 44), and it is the risk bearers who work in dangerous situations who were the focus of this study. When discussing dangerous work, Ely and Meyerson (2006) noted,

> A prime site for conferral and expression of masculinity is a dangerous workplace. Dangerous work involves physical risk, which is the sine qua non of masculinity. No other setting evokes more vividly the dominant cultural images of the ideal man: autonomous, brave and strong. Hence dangerous workplaces are a particularly rich venue for studying masculinity. (p. 9)

Based on study findings, fitting in and being accepted by peers and supervisors in this male-dominated setting becomes deeply ingrained in apprentices for 6 long years. As voiced by research participants,

> *Prove yourself; you don't want to be the first one laid off.*
>
> *You don't want to look like a pussy.*
>
> *One guy no fear: he dead.*
>
> *Never say anything to anybody, I got zapped, just walk away, have a coffee, have a smoke. Like I embarrassed. Like how often does that happen? More often than they think.*
>
> *I was a second-year apprentice, working with my boss, got zapped, and he started laughing!*
>
> *Once I had my kids, my whole mindset changed.*
>
> *Ingrained, macho, construction*
>
> *Bravado, I'll just get the job done, I'll make it happen.*
>
> *Golden Boys, every site has one, they have an ego, and they stay steady.*

I argue these cultural learnings of how to "do" male gender (Ely & Meyerson, 2010) in the electrical trade contribute significantly to the difficulty in eliminating live work.

Theme 6: Residential Construction and Non-Union Work is Risky

A sixth common risk theme was the belief that residential high-rise and low-rise construction was riskier for electrical apprentices, which was more so if they were working in the non-union sector. Study participants reported they feel compelled to take a risk or bear the risk of live work because they fear being laid off work: *You fail if you don't take the same*

risks; you will be laid off; and *I spoke out, got a text on the way home 15 minutes later, laid off*. Workers believe they have more protection in union environments and spoke highly of the *gold standard of safe work practices* of Hydro One, the nuclear generating stations, Guild Electric, and Western Mechanical. Areas of risk noted by apprentices were related to lack of supervision, issues with ladders and inaccessibility of work areas, live work, and supervisors who would not tolerate pushback or challenge the demand for live work.

> *There are more things I can do live today than before.*
>
> *And there are horror stories that are non-union, the gentleman was asked to go home: he had been asked to tie into a live panel, whole panels!!*
>
> *When you hear these horror stories, non-union, it scares the hell out of me.*
>
> *At every tool-box talk, my safety rep would say that not to work live, unless you have to, I guess. Since switching to ICI the opposite is true, I haven't worked live in over a year and feel all the better about it.*
>
> *You know guys come from non-union, not trained right.*

Apprentices and journeymen noted that live work was important when stringing new lights and power for other trades in residential construction.

Theme 7: 1:1 Apprentice Ratios: More Will Get Killed and Injured

A seventh risk theme was apprentice ratios, where apprentices noted that with the change in Ontario to a ratio of one journeyperson to one apprentice (1:1) versus the previous ratio of 3:1, they believe that more apprentices will get killed and injured under this new regulation: *It's like an insane asylum being run by the inmates*, where apprentices described dangerous peer behavior because of little supervision. Lack of supervision creates a prime opportunity for the risk taker (i.e., *the guy with the ego, the golden boy*) who works to impress the boss. These types of workers take the risks of live work, thereby placing pressure on other apprentices to also work live.

In 2013, Howe challenged the findings of Bryden and Dachis from the CD Howe Institute (p. 1), where they categorically stated that there are no links between the ratios of apprentices to journeymen and safety and that ratios were truly only an economic issue. Others such as Dawson Strategic (2015), Human Resource Professionals Association of Ontario (2014), Lorimer (2012), and Ontario Chamber of Commerce (2017) have also argued that apprentice-to-journeymen ratios are only an economic issue. In doing so, they cited the flawed conclusion of Bryden and Dachis (2013) that ratios are only a matter of economics as proof of their argumentation, while ignoring the then published, peer-reviewed, longitudinal research study of Kaskutas et al. (2010). Kaskutas and her colleagues found that after a 3-year study and active surveillance of 5,000 unionized residential carpenters in the St Louis area,

> For every 10 percent increase in the percentage of apprentices on the worksite, there was a 27% increase in ladder falls ..... Our research echoes findings from other industries that organizational factors and safety culture strongly influence worker behaviours. (p. 263)

Research findings by Mucenski et al. (2015) agreed with Kaskutas et al. (2010) and showed that construction injuries are highly co-related to youth and years of experience:

> Young workers with less than 4 years of working experience make the highest risk group of construction workers. Workers between 20-34 with less than 4 years of experience account for one fifth of the total number of injured workers. The rate of their injuries is from three (workers aged 20-24 and 30-34) to six times (workers aged 25-29) higher than the average injury rate. (p. 533)

Mucenski et al. went on to note, “The group with the highest risk is made up of workers aged between 20-34, with 0-4 years of experience” (p. 532). The sad reality for many trade workers such as electricians is that “you’re pretty much screwed if you get injured at work” (Lipscomb et al., 2013, p. 1).

In light of these data showing just how vulnerable and prone to injury apprentices are, it defies logic and best safe work practices to reduce an important regulatory ratio designed to keep apprentices safe by ensuring many onsite trainers and watchful eyes—experienced journeymen, as opposed to fewer, helping new electricians learn safe work practices. Journeymen noted the following in regard to the new 1:1 ratio:

> *It's all about profit: cheap labor; and you are going to have more deaths in electrical because these contractors aren't going to stop it. So the way it is in Ontario, we are going to lose more apprentices.*
>
> *With many apprentices, it's like let's do it live, don't have to wait, don't have to bug the supervisor.*
>
> *2:1 ratios equal mob mentality, no one learns anything.*
>
> *Sometimes me and seven apprentices.*
>
> *Part of the company usually has more apprentices: cheap labor (apprentice); I am already working alone.*

Theme 8: Never Say Anything to Anybody

Underreporting of occupational injuries can be as high as 40% notes Tucker (2017, p. 9), while Azaroff et al. (2002) noted, "The incidence of unreported work-related injuries, illnesses, and even fatalities can be as much as several hundred percent" (p. 1421). Based on my research findings, underreporting of injuries by those in the electrical trade is common and is tightly linked to earlier risk factors: pressure, time, speed; fear of reprisal; gender; communications; and culture. Therefore, this underreporting of injuries limits safety researchers and experts, regulators, inspectors, lawmakers, and the industry from accurately determining just how many workers are injured on the job. This is important because non-lethal occupational injuries are linked to fatalities. Both apprentices and journeymen noted that they do not want to be seen *as a pussy* for reporting injuries or electrical contact. This is

especially so because the majority of electricians report having *got zapped* by current, and they simply *walk away, take a break, have coffee, have a smoke, and never tell anyone*.

There was strong evidence to support the motivations behind an organization trying to suppress claims or underreport injuries. Barnetson (2012) examined the validity of injury measures and found them wanting, in that

> These indicators significantly understate the occurrence of injury.....The study also raised questions about the degree that gaming by employers and indeed, the workers' compensation board (WCB) may undermine the validity of inferences drawn about injury rates. Finally, this study suggested injury-rate indicators do not effectively engage the real construct of interest—workplace safety. (p. 1)

Underreporting can be explained by supervisor production incentives, worker safety incentives, and threats, such as "Risking disciplinary action, denial of overtime or promotion opportunities, stigmatization, drug testing, harassment, or job loss and create worker on worker pressure to not report" (Azaroff et al., 2002, p. 1422), and based on findings and the literature, live work is endemic in the construction industry.

While journeymen electricians buy into the notion of companies attaining the Certificate of Recognition program (COR; see also Canadian Federation of Construction Safety Associations, n.d., for a more in-depth discussion), they noted that this system is also being gamed at the job site. When workers enter the required safety observations of risks and hazards, *They all fill in the same thing*. Certification requires an organization to significantly reduce risk of injury, and upon achieving certification, the company is given a significant advantage when bidding on new projects that require COR certification. More important to this study, COR has no practical ability to measure, capture, or record live electrical work given its illegal status and the noted reluctance of apprentices and journeymen to admit to live work.

In their research, MacEachern et al. (2012) found that "experience rating rules encourage employer 'gaming'—cost reduction attempts that do not necessarily increase workplace safety" (p. 77). Fagan and Hodgson (2017) noted in their research that: "Employee interviews identified workers fear of reprisals and employer disciplinary programs as the most important cause of underreporting" (p. 80). Underreporting is tightly linked, along with many other factors, to live electrical work. The word "fear" showed up 66 times in the research, and it was specifically related to electricians' and apprentices' fear of loss of economic viability (i.e., being laid off if they refused live work).

Six potential reasons arose as to why research participants were so open and honest to me, when those in the electrical trade are seen to be stoic and uncommunicative about fears, gaps, and concerns. These could be because of (a) offering complete participant confidentiality, (b) creating a safe and open space to discuss live work, (c) being non-judgemental about live work, (d) taking an appreciative inquiry approach asking what safety looked like on the job, (e) careful laddering of the six focus group questions, and (f) asking in many different ways and modalities why men still work live. I heard some of the richest responses to the notion of live work through these focus group questions, and it should also be noted that unsolicited, many apprentices and journeymen stated publicly how *appreciative they were of this research study, how important it was, how it's good to get this stuff off my chest, I feel much better now,* and *Good that this research is being conducted now.*

Comments around the notion of fear included *Johnny Now, there's one on every site; he will do anything the boss asks and stays steady*. Fear, safety record incentives, profits, human factors, and organizational factors all contribute to injury and illness underreporting. I argue underreporting alone increases the risk for apprentice and journeymen electricians

because the lawmakers, regulators, and inspectors operate under a condition Beck (2009, p. 15) called "nicht wissen konnen," meaning these system actors have an inability to know the true extent of occupational injury in one of the most dangerous trades—construction (U.S. Department of Labor, n.d., Construction's Fatal Four section). "Men do gender" (Ely & Meyerson, 2010, p. 4) as we have seen, and this is especially so in male-dominated workplaces, where the work is dangerous and there is a distinct and mature organizational culture, and where certain things, such as live work, are ingrained and normalized.

Scholars, practitioners, regulators, and lawmakers ought to pay special attention conducting future research on live work face-to-face in focus groups in order to allow for free-flowing laddering of participant questions, comments, and answers. In-depth focus groups appear to allow respondents to build on previously shared thoughts and opinions that might not have been shared between co-workers previously.

As noted previously, honest and frank communications between peers, apprentices, and journeymen in long-standing, male-dominated occupational cultures where dangerous work takes place can be made safer (Ely & Meyerson 2006). Findings from this study have shown that lack of communications is a strong impediment to whole-scale change in the practice of live or energized work.

Summary

Described in this chapter were the eight key overarching themes uncovered in this research study and the three core risk themes emerging from the qualitative thematic analysis, which aimed at exploring why apprentices and qualified electricians continue to work live on energized equipment, machinery, panels, and circuits. Culture, emotional labor, male gender, organization, laws and regulation, Workman's Safety Insurance Bureau

incentives, dangerous workplaces, long-established work cultures, and job precarity all play prominent roles in men bearing the risk of live work. Risk taking (i.e., working live by choice) was mentioned by participants, yet the most common reasons given for live work were pressure to work faster and fear of reprisal.

One contribution of this research is the discovery that in many cases, the notion of choice is absent from a decision to work live—the choice to work live is often really no choice at all. Another key finding is that there is no uncertainty as to the deadly risk of live work; all electrical workers know how fast live work can go wrong and how deadly it can be when it does go wrong.

The conclusions, interpretations, and recommendations resulting from these findings are examined in the next chapter. Special attention will be paid to recommendations aimed at increasing the safety of electrical apprentices and veteran electricians.

CHAPTER FIVE: DISCUSSION

The past chapter explored the prominent research themes and findings, which were distilled into three main risk themes: (a) pressure to speed up, hurry the work pace; (b) fear of reprisal for refusal to undertake live work; and (c) the tightly interlinked systems of risk, precarious work, male gender, dangerous workplaces, injury underreporting, and ancient work societies that, together, conspire to allow live work to continue

The purpose of this chapter will be to examine the research findings in context of several lenses: (a) how future research can advance our understanding of men in dangerous or risky situations by their choice, or not; (b) how to get more of the system actors at the table talking openly and honestly about live work; and (c) how fact-based injury data vital to the meaningful creation of safety regulations and their communication may help save lives. The findings, their interpretation, and subsequent recommendations are made in the hope future live work research will shed additional light on how to help reduce live electrical work.

Research surrounding the tightly linked systems supporting live work has not yet explored the matter of risk, choice, and live work. The vector of choice and risk imposition, or what I call occupational risk bearing, has not been well described in the occupational health and safety, risk, or organizational literatures. In this chapter, I discuss the notion of choice and risk as well as examine the roles of male gender, organizational culture, and power along with dangerous work such as live electrical work. The findings of the research study will be presented, along with interpretations, as well as the implications raised by this research. It should be noted that throughout this chapter and indeed the entire dissertation, phrases in italics are verbatim quotations from the electrical workers interviewed.

The main research question was, How is it that live electrical work continues today? This is a complex question with many layers yet to be peeled back on this onion of risk, and as such, a data-driven, inductive approach was utilized to analyze data in this thematic analysis study. This resulted in a deep dive into the lived experience of electrical workers when faced with a request, suggestion, hint, recommendation, coercion, demand, or threat to undertake live work and how they cope with such risk imposition.

Revisiting the Notion of Choice and Risk: Hurry and Fear of Reprisal

One hundred percent of respondents noted *hurry* as being the Number 1 risk on the job site, with fear of reprisal for refusing live work as the second highest risk faced by electrical workers. All participants noted live work as being highly risky, and all confirmed they had been trained on the dangers involved in live work. Amongst journeymen and some apprentices, live work was viewed as still being a common practice today.

The research findings discussed and explicated in Chapter 4 showed that electricians and apprentice electricians are often faced with a "Hobson's choice" when asked to work live on energized equipment: "A Hobson's choice is a free choice in which only one thing is offered, the two options are taking it, or taking nothing" (MacArthur Maguire &, Zimet, 1935, p. 1281). In other words, an electrical worker can take it or leave it, if asked, pressured, coerced, or told to work live, and should they leave it or refuse to work live, they may be leaving their jobs as well. Austin et al. (2020) examined electricians' safety decisions and stated that working live is not as simple as yes/no; it is a decision with many influences behind it. They went on to state in their recent research on safety decisions in electrical work, "Our results show that changing electrical workers' decisions about working energized from

‘yes’ to ‘no’ requires addressing erroneous beliefs about when to work energized and instilling norms to omit energized work that is not necessary” (p. 11).

One key element missing in this approach is based on the words “safety decisions.” It should be noted that the word “decision” is a synonym for the word “choice,” and I argue based on the research findings contained herein, that in many cases, for electrical apprentices and journeymen when faced with the demand for live electrical work, there really is no choice at all. The emphasis on safety as opposed to risk suggests a search for safety, not risk. This study had as its focus live electrical work, which was noted by all research participants as being very risky, and so perhaps semantically small, this difference in research methodology has impact, just as the shift from “decision” to “choice” has risk outcome impact. Consider for a moment the research finding of pressure to hurry up. If one is forced to change one’s normal work pace, increasing known and unknown risks, is this a safety decision?

As noted, much research has focused on risk taking, with different phrases used to describe the decision to work live: risk taking, accident, human error, unsafe choices, decision, and the choice to work live, to name a few (Austin et al., 2020; Brynes et al., 1999; Stergiou-Kita et al., 2015) as a key reason why men in the electrical trade undertake risky and unsafe acts at work. The bias inherent in the phrase risk taking leads to a blame game, where the victim becomes the perpetrator of some wrong. Westaby and Lowe (2005) crystalized very well this notion of blaming dangerous acts in the electrical trade as risk taking, where they described supervisor influence on safety or risk as, “Supervisor influence is defined in this study as an employee’s perception that his or her supervisor does not allow risk taking at work” (p. 1027). Yet, what if a supervisor overlooked or encouraged risk

bearing through some form of risk imposition? This does not seem to qualify as a safety decision.

Others such as Austin et al. (2020) used phrases such as uncertainty or "knowingly taking unnecessary risks . . . [and] working energized is not a simple yes/no choice" (p. 1). Again, received wisdom suggests perhaps that there is choice involved in working live, yet these research findings suggest otherwise.

Austin et al. (2020) noted, "Most published research on EOI (electrical occupational injury) to electric worker has been conducted with the public health paradigm and does not examine cognitive or organizational factors" (p. 2). However, published research work by Howe (2008, 2011, 2013) looked specifically at cognition and organizational drivers of risk for electrical workers, as this research does (see Appendix D).

It is perhaps a slight epistemological gap in the use of the word decision, or electric worker safety decisions, yet its use presupposes there really is a viable choice involved in live work. This approach presupposes that choice, the ability, and the power to make a decision are always present in a situation where electrical workers are faced with the demand for live work. However, if the "choice" offered electrical workers is really no choice at all, then it is equally true that insofar as any "decision" made under such circumstances was really no decision at all.

This condition of no choice at all when faced with taking a life-altering risk of live work is a phenomenon I call occupational risk bearing—a phenomenon I argue is at the other end of the continuum with risk taking. The major contradiction to the literature is that when pressured to work faster, and one way to achieve this is through live electrical work, electricians and apprentices are faced with Hobson's choices on a regular basis. In their

"Working Energized Decision Tree," Austin et al. (2020, p. 10) did not leave room for this finding of lack of choice in the decision to work live. As one of my participants said, *I can't say no.* To my knowledge, this is the first study to examine the notion of occupational risk bearing as a result of live electrical work by men employed in the electrical trades. Based on research findings, electrical workers bear the risk of live work for a complex and tightly linked system of factors, and this notion of risk bearing at work has been explored throughout this research.

In order to assist the reader to more easily grasp the notion of occupational risk bearing, I draw your attention to a recent example: the work situation meat packing employees faced in the spring of 2020 with respect to Covid 19 at work. Though not peer reviewed, several well-respected sources: The Centers for Disease Control (CDC) USA (Waltenburg et al., 2020), British Broadcasting Corp (Reuben, 2020), Alberta Health Services (2020), and others have noted the health and safety risks of Covid 19 in meat and poultry processing plants. The CDC, in their April/May 2020 report, listed 86 Covid-related fatalities, and among the 16,233 reported cases amongst meat and poultry workers, 87% of those workers who tested positive for Covid were of racial and or ethnic minority (Waltenburg et al., 2020, para. 1). This would seem to qualify as a high-risk situation for ethnic minorities and for White employees working in a meat or poultry packing plant. Though still not yet heard in a court of law, a lawsuit has been filed recently by survivors of several meat plant employees in Ohio who died of Covid. In this suit, survivors allege "gross negligence, and incredible, willful, and wanton disregard for workers safety" (Nelson, 2020, para. 2) by demanding workers come into work even when sick with Covid, offered no social distancing measures at work, and even more issues, in part because the plant managers

purportedly had a winner-take-all betting pool on how many floor workers in their plant would get sick with Covid-19. If proven in court, and I stress this is not yet the case, this behavior would seem to be a moral low point in the US around the notion of management's care of duty regarding worker health and safety and, if proven true, qualifies as a clear example of forcing workers into bearing the risk of contracting Covid-19 in their plant.

The few other studies examining electrical worker injury (Austin et al., 2020; Stergiou-Kita et al., 2015; Tulonen, 2010) explored contributing factors such as masculinity, male gender, health and safety, electrical risk, mental models, return to work post injury, dangerous workplaces, and accident sequence causation. These studies did not explore the emotional labor and stress caused by the incessant demand to speed up and the fear of reprisal for refusing to undertake live electrical work.

The results of this study have highlighted the risks workers face due to undertaking live electrical work, often not by choice. It is not a decision per se to work live, it is not risk taking per se, it is not human error per se, it is not because of lack of awareness of the risks of live work, it is often not by choice. It is bearing the risk of harm.

From a legal perspective, Finkelstein (2003) posed a valid question about this risk imposition phenomena: "Is the imposition of a risk a harm on the person to whom it is inflicted?" (p. 965), to which she went on to answer in the affirmative. Other legal scholars, such as Oberdiek (2012), have weighed in on this notion of risk imposition from both a moral and legal perspective and have called such an action risking. Oberdiek went on to note,

> A risk imposition that induces fear in whomever is in its orbit also calls for justification, for instilling fear in others always must be justified. And risky conduct that prompts others to take disruptive steps to avoid the perceived risk calls for justification, too, because one must always account for disrupting the life of another. (p. 3)

Oberdiek also suggested that what the lived experience of an electrical worker being suggested, implied, asked, told, or commanded to speed up, or work live reflects:

> One can do harm in subjecting a person to risk, for it effectively attaches sanctions to or normatively forecloses certain options that would otherwise be available to the individual, thereby narrowing the risked person's set of worthwhile opportunities. (p. 17)

In closing, Oberdiek (2012) summarized risking's moral significance: "The idea at bottom, is that imposing risk on others is morally significant in the terms because impositions amount to claims of authority over others' lives and more specifically, over the range of options that constitute their autonomy" (p. 22). The reason why these legal and moral arguments apply so naturally to risk bearing and live electrical work, based on my research findings, again comes from Oberdiek: "This is not merely to say that people cannot *die* or otherwise get *injured* as a consequence of our risky conduct, but that their wider normative lives can be affected by what we do" (p. 22). Especially relevant here is that others' well-being and autonomy are in our hands. Sadly, when it comes to risk imposition and its consequences in the electrical trade, live work is still responsible for over 50% of death and injury to electricians, and yet, we have no knowledge on the impact of *hurry up* on death and injury in the electrical trade.

In this regard, I state this research study is not an exercise in blame, looking for culpable actors; rather, it is an opening for communication amongst all actors involved in the social phenomena called live work, where Kahane (2004) noted the need for open and honest listening and dialogue about serious issues such as apartheid: "In Zulu, the conventional greeting is Sawu Bona, which means I see you. We cannot interact properly with others unless we see them as fellow humans" (p. 89).

Revisiting Gender, Organizational Culture, and Dangerous Work

Underreporting injury is tightly tied to male gender and work in dangerous places: *You never tell anyone about an electrical shock*; *You go for a walk, get a cup of coffee, have a smoke, don't tell anyone.* These are manly displays and help explain why "the workplace can thus be a proving ground for masculinity" (Ely & Meyerson, 2010, p. 3).

Gender scholars West and Zimmerman (1987) stated that when explaining gender role and role theory, "Roles are *situated* identities assumed and relinquished as the situation demands rather than *master identities* (Hughes 1945) such as sex category that cut across situations' and go to say more over many roles are already gender marked" (p. 128). Ely and Meyerson (2010) described how "organizations conflate masculine characteristics with the skills required to do the job" (p. 4). They went on to describe

> how various processes involved in demonstrating the "ideal man" such as confident, being in control, and emotionally detached, autonomous, brave and strong. Work norms encourage such displays and organizational practices reward them. Organizations doing dangerous work provide especially powerful illustrations of these processes, since dangerous work entails physical risk, which is a sine non qua of masculinity. Men's interactions are shaped by cultural beliefs and what it means to be a man. (p. 5)

A central tenet in the sociology of risk is that risk taking is inherently linked to masculinity. Again, note the bias toward risk taking with no consideration for risk bearing. This research showed that male masculinity and male gender "intersect with larger economic factors to influence men's workplace practise" (Stergiou-Kita et al., 2015, p. 731).

Recent economic research into COVID-19, risk, and gender by Garikipati and Kambhampati (2020) delved into gender differences in how female political leaders responded to COVID-19 risks versus their male counterparts, which shed further light into gender differences and risk. They suggested that women are more risk-averse than men,

which could potentially explain why women-led countries decided to lock down their nations that bit quicker. However, their research also suggested that while these women leaders were more risk-averse, when it came to saving lives, women leaders were prepared to take risks with their economies: "Risk aversion may manifest differently in different domains—human life versus economic outcomes—with women leaders being significantly more risk averse in the domain of human life, but more risk taking in the domain of the economy" (Gender Differences in Risk Aversion section, para. 2).

The risks associated with Covid-19 are not lost on electrical apprentices. When asked about the potential risk of the new COVID-19 virus (note: apprentice research was conducted March 1–16, 2020), the vast majority of apprentices were extremely concerned about the COVID-19 risks, enough so that they did not report to work in some instances, such as in this participant's comment: *My 60-year-old father-in-law lives with us, and I don't want to get him sick. I have two young kids and my wife at home.* Another participant declared with certainty,

> *There is no way to maintain social distancing in tight electrical work, there are not enough washroom facilities and when there are there is no water? Over 500 trades doing this one job, and we all take lunch at the same time?*

Electrical apprentices stated clearly there is no rule, regulation, or guideline that will serve to keep them safe from COVID-19 risk. Electricians often work in tight spaces, utility rooms, rafters, at heights, and similar spaces, and to date, I suggest that little in the way of the three main protections for COVID-19 assure apprentices of their safety: (a) social distancing—keeping six feet apart; (b) wearing a mask; and (c) washing your hands frequently, are regularly available to electrical apprentices

In this dissertation, I argue there are two enablers of live electrical work: (a) occupational risk taking and (b) occupational risk bearing. Scholars such as Austin et al. (2020), Howe (2008, 2011), Stergiou-Kita et al. (2015), and Tulonen (2010) have examined risk taking in the electrical trade, and all have stated live electrical work has no singular cause. Rather, this practice exists today because of a dynamic system of systems enabling live work to continue to thrive. Live electrical work thrives in a system of "dynamic, not simple or linear complexity" (Sparrow, 2008, p. 15), and it is this complexity that makes the study of live work so difficult.

Little attention has been paid to the notion of occupational risk bearing by electricians, specifically in relation to live electrical work. The findings of this study suggest that choice is not always an option available to electricians and apprentices when it comes to the decision of working live or not. This finding is a new contribution to the literature and will be explored in more detail.

Study Purpose

The purpose of this study was to explore the main risks electrical workers face with specific attention to one highly dangerous practice electrical workers still engage in: live electrical work on machinery, panels, circuits, and equipment. This study did not involve powerline workers who often must work live. Live work was first undertaken in the USA in 1913 (Loverncic et al., 2017), but has been illegal in most circumstances except for troubleshooting and working on traffic lights and signals, yet this practice continues today (Howe, 2008; Stergiou-Kita et al., 2015). While there has been much study on the hazards of electrical work, little attention has been paid to the phenomenon of live electrical work, and why after a century in use, it still persists today. It is important to note that live electrical

work is responsible for over 50% of all death and injury to those employed in the electrical trade, and occupational electrocution has moved from the fifth most common cause of death at work in 2011 to the third most common cause of death at work in 2019 (U.S. Department of Labor, n.d.).

Summary of Findings

The pressure to speed up was the Number 1 risk imposition noted while fear of reprisal for saying no to live work was reported as being the Number 2 risk electrical workers face. Hurry, the pressure to *get the job done faster,* was an expected finding and was the most common risk electrical workers mentioned. However, the consistency of mention of fear of reprisal was a surprise. The tightly interlinked system these two emotional burdens exist within conspire to become the two most deadly reasons why electrical workers engage in live electrical work.

One very positive and unexpected finding was the degree of hope expressed by many participants for change in the intractable culture of live work. This sense of hope for change is based on the safe work training practices and technical expertise taught in apprentice school, combined with the finding that today's apprentices are more educated than prior generations, with the majority of apprentices in this study attaining some form of post-secondary degree or diploma.

Three key findings were distilled and refined from the eight major themes developed from raw research data (see Chapter 4). Raw data were orthographically transcribed by the author and then distilled into eight themes using a constructionist, inductive method through thematic analysis, which were then reduced and refined into three key research findings on why apprentices and licensed electricians continue to work live today. These exercises were

followed by an extensive review of the relevant literatures on risk, occupational health and safety, electrical risk and safety, occupational culture, law, and the male gender working in dangerous jobs to determine where my findings agreed or disagreed with the extant literature or made new contributions to the literature.

Finding 1: Pressure to Speedup Work Pace

Research findings on risk at work show electrical workers must manage two linked vectors of "emotional labour" (James, 1989, p. 16) as they relate to on-the-job risks for apprentices and certified electricians. The first form of emotional labour forces the person to deal with risk *in a manly way,* to not show any emotional response to being under constant client and or supervisor pressure to *work faster*, *hurry up, don't complain, get the job done more quickly*. This is because the electrical worker is pressured to not *shut down power to the entire construction site just to install a new string of lights* or *does not have to walk to the other end of the factory to turn the power off* because *other trades will pay you back if you turn off the power.* All participants noted there is constant pressure to speed up the work pace, increasing the risk of accidents: *If you get out of your pace and process, things can go wrong.*

Emotional labor has been defined as "the management of feeling to create a publicly observable facial and bodily display, . . . [requiring one] to induce or suppress feeling in order to sustain the outward countenance that produces the proper state of mind in others" (Hochschild, 1983, p. 7).

Finding 2: Fear of Reprisal: Job Loss

The second most important occupational risk of harm-reported vector is *fear of reprisal* should an apprentice or an electrician refuse a request or demand by a supervisor or

client to perform live electrical work. Electrical apprentices are trained to not offer pushback, must be subservient for the 6-year apprenticeship in order to acquire the 6,000 hours needed to secure a certificate of qualification, and they also *must never be seen as a pussy.* The emotional labour caused by fear of reprisal was the second most frequently mentioned risk at work by both apprentices and many seasoned veterans and is tightly linked to gender at work (i.e., *I can't say no; job first, safety second*). Contrasting this type of emotional labour, and yet tightly linked to fear, was the finding of hope. Apprentices and journeymen alike are very hopeful of change surrounding the notion that *live work is safe to do, if you know what you are doing.* This prominent theme of hope stems from better-educated apprentices, many of whom have other-post secondary education; journeymen who will stand up to the boss if asked to work live; and a surge in retirement of older electricians, who represent the *old school electricians, guys who were trained to work live.* Sjoberg et al. (2004, p. 9) noted that research into voluntary risk shows "humans tolerate substantially more risk when they engage in voluntary behavior," as the results of this study demonstrated.

This finding of fear and hope was unexpected and to date has not been studied carefully in the literature. Howe (2011) noted the incidence of job reprisal: "One disturbing trend is the anecdotal report of job sanction against electrical workers who presented this form for signature, this supporting the authors suspicion of vulnerable electrical workers" (p. 33). Austin et al. (2020) also discussed that for an electrical worker "to arrive at the outcome of working de-energized . . . [requires among other conditions] the ability to either walk away or negotiate to safe working conditions" (p. 11). This research study has suggested that walking away from a request or demand for live work is seldom an option.

Howe (2011, p. 34) advocated for the widespread adoption of the Just Don't Ask Authorization form (see also Appendix A) for use by electrical workers as a tool to help them say no to a request or demand to work live. Based on current data, working live is still prevalent, yet Austin et al. (2020, p. 10) reported this practice to be on the decline.

How electrical workers make sense of client or supervisor request/demand to work live has been well explained by Weick et al. (2005): "Sensemaking is about the interplay of action and interpretation rather than the influence of evaluation on choice. When action is the central focus, interpretation, not choice is the core phenomena" (p. 409). So, when faced with a request, demand, or suggestion to work live, electrical workers think of their job security first and foremost and fear being *labelled as a complainer* and losing shifts, promotion, and gainful employment. Weick et al. noted, "To work with the idea of sensemaking is to appreciate that smallness does not equate to insignificance. Small structures and short moments can have large consequences" (p. 410). I argue the practice of live work is supported by many small structures and one small structure with large consequences—fear of reprisal leading to greater job precarity. As well, hiding the emotional burden of fear is a normal practice in male-dominant workplaces: "The final attribute in the masculinity literature is the need to present oneself as emotionally detached, unshakable, and fearless. The ability to hide fear was crucial to masculinity" (Ely & Meyerson, 2006, p. 11).

Finding 3: Male Gender, Dangerous Workplaces, and the Ancient Society of Electricians

Gender, specifically male gender situated in the organizational culture of the ancient society of electricians, was the third critical finding linked to on-the-job risks in general and, specifically, the risks involved in live work for electrical workers: *It's not ok to pushback,*

must not talk back, must not be seen as a pussy. Apprentices need their sponsor's support for 6 years while they undergo their apprenticeship in a very dangerous trade.

Ely and Meyerson (2010) described the confluence where organizational culture and male gender meet:

> Subjects do not have experience, rather they are constituted through it (Scott 1992). A man encounters and learns to anticipate other expectations of him as a man; he responds, others react, and through this back-and-forth he comes to see and present himself in particular ways (Padavic 1991). Masculine identity is how he sees and presents himself as a man. (p. 6)

The importance of male gender and dangerous jobs present a powerful risk for electrical workers. Ely and Meyerson further posited,

> A prime site for the conferral and expression of masculinity is dangerous worksites. Dangerous work involves physical risk, which is the sine qua non of masculinity. No other setting evokes more vividly the dominant cultural image of the ideal man: autonomous, brave, and strong. (p. 9)

As noted by Stergiou-Kita et al. (2015),

> Nowhere is the risk to men's health more apparent than in the workplace. In Canada more than 97% of all reported workplace fatalities between 1993 and 2005 were male. It is frequently within gender segregated occupational sectors such as construction, mining, fishing, firefighting, law enforcement, and the military where men are described as striving to appear physically and emotionally tough, fearless in the face of risk and dangers, and unwilling to demonstrate vulnerability. (p. 214)

Stergiou-Kita et al. further noted that young apprentices are especially vulnerable to pressure to conform to the norms of the workplace:

> Young workers report that they understand how an organizations' OH+S [occupational health and safety] practise may be mitigated by its desire to save time and enhance profits, and how their position as new workers can limit their power, agency, and ability to ask questions related to workplace health and safety practices. In making decisions about how to proceed when they encounter risky tasks, young workers report that they weigh the personal risks associated with not adapting to the male dominate workplace culture (Neilson, 2012). (p. 217)

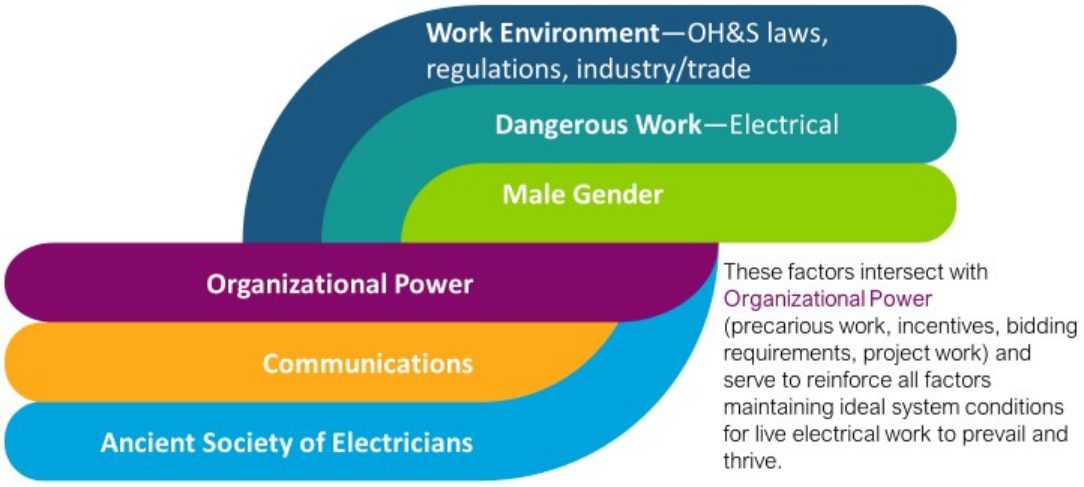
An important insight into the male gender work culture is that construction and extraction occupational groups had the highest male suicide rates at 52.3 per 100,000 workers in the US between 2000 and 2016 (Centers for Disease Control, 2018, para. 2). Stergiou-Kita et al. (2015) noted that "work (e.g. little job control or job insecurity) and other non-work factors are associated with psychological distress and suicide" (p. 1254). This can be seen as the sad toll of men's desire to be seen as fearless and tough, accepting any and all risks, and brushing them off as if there are invincible, insofar as working live: *It won't happen to me; I've done this a thousand times.*

This research has resulted in the identification of human risk factors for electricians. The diagram presented in Figure 1 denotes key human factors of risk for electrical workers arising from the findings of this research study. This diagram also shows where these five factors intersect: male gender, dangerous work (i.e., electrical), ancient society of electricians, communications, and work environment (i.e., OH+S laws, regulations, industry/trade). These five factors then intersect with organizational power (e.g., precarious work, incentives, bidding requirements, project work, etc.) to create a system of systems that serves to reinforce all human risk factors to maintain ideal system conditions for live electrical work to prevail and thrive.

Figure 1

Human Risk Factors for Electricians

This diagram denotes key human factors of risk for electrical workers arising from the findings of this research study. This diagram shows where these factors intersect.



Conclusions

The results of this study built upon recent electrical risk research by Austin et al. (2020), where they confirmed a host of contributing factors, and I agree with the finding that mental models play a role in live electrical work. This study, however, found the economic power employers hold over electrical workers, the vast majority who are employed contract to contract as precarious worker; male gender; injury underreporting; the workplace environment; the ancient culture of electricians; and dangerous worksites are primary drivers of occupational risk bearing in the electrical trades.

This research has shown that in most cases, it is not risk taking per se, but rather electrical workers report being asked, encouraged, or forced into live work due to *pressure to speed up work* or because of a *fear of reprisal if they refuse live work.* This study has added to the literature through a focused examination of three key human and organizational factors heavily involved in why men work live. The three key findings of this research study showed that

1. Pressure to speed up work pace and fear of reprisal should they refuse live work.
2. Gender and organizational power play a significant role in why live work continues today.
3. The ancient society of electricians, their dangerous job sites, and their unique masculine culture contribute to both risk taking and risk bearing.

These findings also challenge a commonly used risk control measure for electrical safety, insofar as live work is concerned, called the Hierarchy of Controls (HOC) as described by Zhao et al. (2015, p. 143). HOC has five control measures, with descending effectiveness: (a) elimination, (b) substitution, (c) engineering, (d) administration, and (e) personal protection equipment (PPE). My findings challenge HOC, as I discovered that the first three most-effective levels of control are technical control measures, while the last two are least-effective control measures, noted as behavioral controls (i.e., admin and PPE). Research findings from this study suggest that rather than starting at a technical controls level to try to reduce/eliminate live work, the industry must first start at human and organizational factor levels, which are the most difficult to control and least effective steps, in order to recognize the importance of: economic and organizational power.

The fundamental premise behind HOC is that all hazards are known, and working on live electrical equipment is generally known as live work and is for the most part not legal, yet it continues unabated. As Sparrow (2008) rightly noted, “Pick important harms and deal with them” (p. 15). However, very little official data exist today on how widespread live work is, and therefore, it becomes very difficult to eliminate, substitute, or engineer, if the industry does not see the problem of live work for what it is—endemic, entrenched, and very difficult to stop. The issue hampering HOC is that this methodology does not view live electrical work in its dynamic complexity. It “sees” technical rules and regulations for turning off power and de-energizing, but does not factor in gender, culture, or emotional labour into the equation, nor does HOC identify how common and pervasive live work truly is today. A new model must be developed that takes into consideration the impact of the powerful human and organizational factors involved in a system of systems called live work. As noted by the Eastern Kentucky University (n.d.),

> According to The World Health Organization’s definition of human factors “refer to environmental, organizational and job factors, and human and individual characteristics which influence behavior at work in a way which can affect health and safety.” (para. 2)

Findings one and two show electricians are bearing the risk of live work due to a complex and tightly linked stew of organizational economic and profits goals, peer and supervisor pressure, emotional labour at work, masculine gender, the culture of the ancient society of electricians, dangerous work places, inability to speak out, along with numerous environmental and technical factors resulting in unsafe behavior. This notion of occupational risk bearing is a new contribution to the literature, as is the finding that fear of reprisal was the number two on-the-job risk, which makes the problem of reducing live work very

difficult to control due to the number and complexity of human factors involved in live work. The difficulty in developing a meaningful organizational intervention to limit live work lies in the fact that for the most part, this problem is not recognised in the traditional OH+S models as being an issue.

Williamson and Feyer (1998) suggested human error is to blame, and they argued that human error is inevitable and that electrical injuries are often due to a lack of awareness and "virtually all behavioural events involved error" (p. 194). Yet, the results of this study show these men were, for the most part, fully aware of the hazards they faced if asked or ordered to undertake live work.

What if there is not the breadth or depth of human error in occupational electrical injury and fatality? What if the construct called human error today is really masking human and organizational factors that enable and encourage live work? The single most important and frequent mention of risk for electrical workers is employer or client pressure to speed up the job, with the second being fear of reprisals should they refuse live work. If, as this study has shown, electrical workers are not working live by choice, then we ought to call this phenomenon for what it is—occupational risk bearing, as clearly these men do not all work live willingly.

Implications for Theory, Knowledge, Practice, Policy, and Future Research

Enzo Garritano, CEO Infrastructure Health and Safety Association of Ontario, Canada (as cited in Gismondi, 2018) stated,

> I'm not going to sugar coat it; we've had a really bad year in Ontario, so we all have a part in making sure it doesn't happen going forward. The number of people who get hurt in a year fill up half of the Air Canada Centre in our sector, that's about 10,000 people. (para. 5)

Garritano is right; several implications arise for theory, knowledge, and future research: the system of systems involving male gender, dangerous worksites, male-dominated workplaces, long-standing cultural norms, regulations, incentives, and laws, along with organizational power over precarious workers. All are conflated to increase live work and ought to be explored in greater detail in order to develop human and organizational interventions designed at modifying the current modus operandi, where speed and profit appear to be strong drivers, while safety comes in a weak second place.

Primary Implications

So far to date, the literature has not explored the bearing of risk in live electrical work as being part of the problem, let alone being a primary driver of injury and death to electrical workers. Increased occupational justice would accrue to electrical workers if more research on the notion of "choice" was revisited and replaced by "no choice" insofar as live work is concerned. More studies, such as this one and the ones by Austin et al. (2020) and Stergiou-Kita et al. (2015) into male gender and dangerous job sites as well as new studies linking in and realizing the deadly and destructive role of worker safety compensation rewards for limited corporate injuries, are warranted. Additionally, further research is required into the impact of precarious work, workers' compensation programs, and how these factors support underreporting of electrical injury, such as has been reported by Weil (2011). Finally, power and agency of temporary workers, as most electricians are, need to be examined more carefully in the context of dangerous worksites.

Scholarly Research Implications

As noted by Eisenhardt (1989), agency theory "offers unique insight into information systems, outcome uncertainty, incentives, and risk" (p. 57). I argue that where this theory

comes most into play involves workers' compensation plans, which reward contractors for reduced occupational injury and fatality. These policies support one of the largest systemic gaps in understanding death and injury in the electrical trade: underreporting of electrical injuries. Not all blame should be placed on the incentive plans because as this and other studies have shown, there is a segment of electrical workers who are *yahoos, risk takers, the go-to guys who will do anything, the golden boys—every site has one,* and given what this study has shown, employers are taking advantage of the regulatory loopholes to make their safety records look better through underreporting.

Excellent work has been undertaken on the prevalence of injury underreporting by Azaroff et al. (2002) and Tucker (2017), yet governments do not wish to see the cold hard reality of just how much underreporting of injury at work goes on, which has been estimated to be as high as 60% (Azaroff et al., 2002). This single gap in the injury reporting system does not allow researchers and safety experts to truly analyze and specifically examine "the ubiquitous agency relationship where one party (the principal) delegates work to another (the agent) who performs that work" (p. 58). Further research is required into the role of power, both organizational and human power, around worker safety in the construction industry and, specifically, the electrical industry.

Recommendations

Some possible actions for practitioners, lawmakers, and regulators designed to address the implications of this research are noted here:

1. A fundamental reframing of safety record incentives offered by workers' compensation boards is required in order to help reduce the systemic incidence of underreporting of illness and injury by construction workers. As noted by Howe

in 2011, there is a pressing need to develop accurate and trustworthy injury data (non-serious, serious, and fatal) for electricians and electrical apprentices in a national database.

2. ESA to take over all electrical inspections, except for powerline inspections, given they are cited as being the only ones *who know what they are looking at* when an electrical inspection is undertaken.
3. ESA, which is assigned the rule making and licensing role in the Province of Ontario, sought to be more closely aligned and actively involved with the approved apprentice educators in the province and should take over responsibility for apprentice licensing, certification, and safety training from the MOL.
4. ESA to receive extra annualized provincial funding for outbound communications and education on electrical safety aimed at the entire construction industry.
5. Supervisors who cause or allow the death of an electrical apprentice or journeyman to face a minimum, personal, fine of $500,000, which cannot be paid by or reimbursed by their corporation, along with a minimum $1,000,000 fine for the corporation involved.
6. ESA to re-launch its Arc Flash video and also should adopt and promote the Just Don't Ask Authorization form (Appendix A).
7. ESA to create an integrated communications plan aimed at general contractors, foremen, supervisors, and clients on the rationale behind the proposed new, stiffer personal and corporate penalties.

8. The industry to create a communications campaign valorizing the central role electricians and their apprentices play on any construction site: No power means no lights, fans, heaters, or power tools.
9. The Joint Apprenticeship Council to develop a new course aimed at educating new apprentices on how to effectively say no when asked to work live.
10. The union halls should take back responsibility for having apprentices and workers sign off on safe work papers, at the union hall, not at the job site.
11. ALL electrical work must be highly regulated to ensure no unqualified workers undertake electrical work.

Summary

Live electrical work in Canada is still practiced today. The research by Austin et al. (2020) suggested less live work takes place. However, this research has shown a different perspective based on participant comments: *There are more things you can do live today* and *how many times those things are done*.

Through the lens of systems theory (Senge, 2006), I argue the conditions surrounding and supporting live electrical work today are dynamically complex and are not connected in a simple nor linear fashion. The data from this research suggest there is no simple, single methodology of research that should be applied to examining occupational death and injury among electrical workers. A research lens must be turned on to the language, the communications of the words and phrases used to describe an electrical injury or death and live work at work.

This new lens on occupational safety amongst electrical workers must also be alert to the notion of occupational risk bearing; based on research findings, the victim ought not to be

part of the blame process with phrases such as human error, decisions, bad decisions, or mistakes when it comes to all injury or death due to energized electrical work. Electrical workers do not sometimes have a choice when it comes to live work as noted in the classic Hobson's Choice (n.d., para. 3), where "when choice is really no choice at all," and the price of this no choice reality can be very high indeed.

Provided in this chapter were the findings, interpretations to the research conducted on risks of harm to electrical workers, as well as recommendations designed to bring about change to a wicked and stubborn organizational form of risk imposition called live electrical work for those employed in the electrical construction and service trades.

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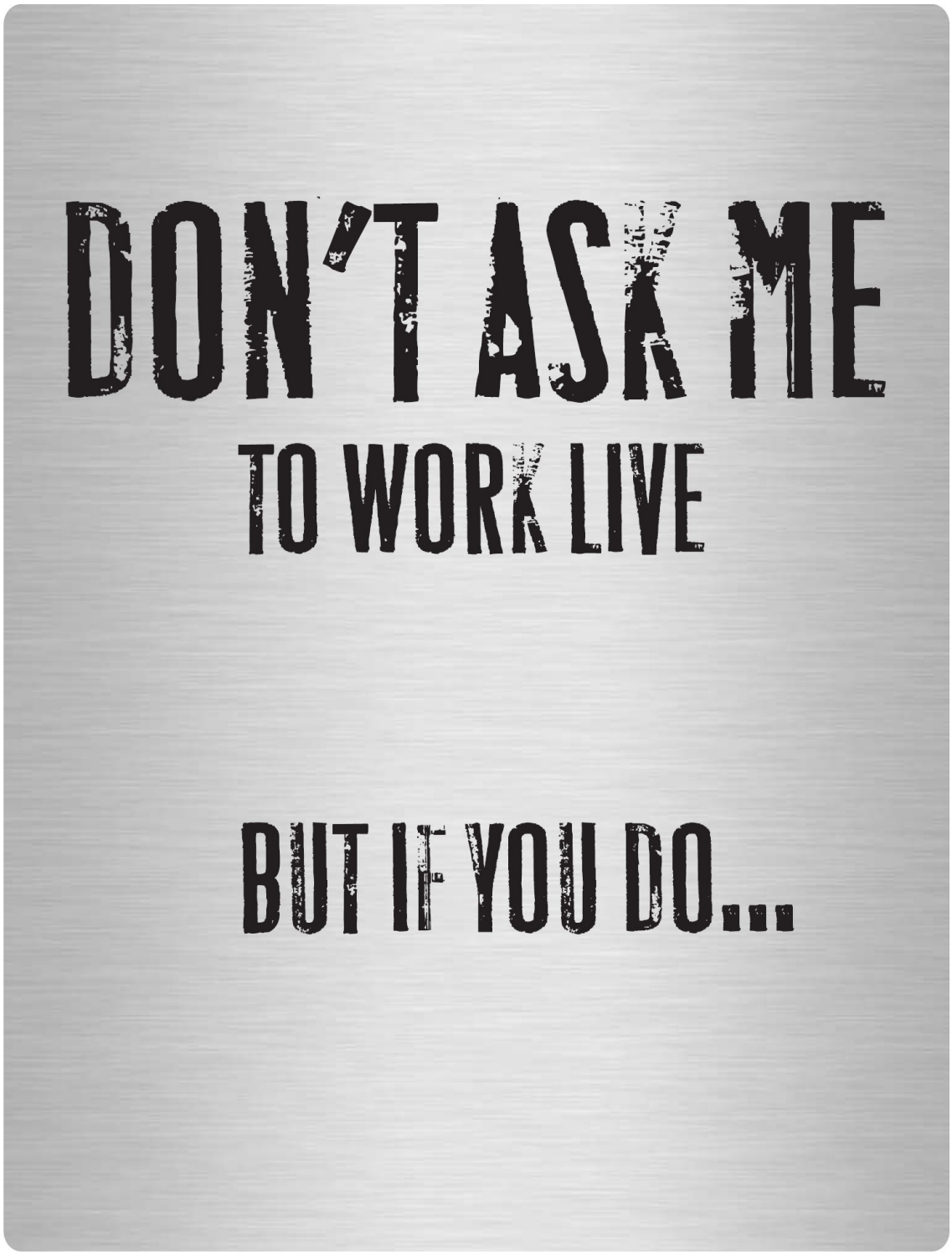
LIST OF APPENDICES

Appendix A: Just Don't Ask Form



AUTHORIZATION

Request for Live Work on Electrical Circuits

Section, 217.1 of the Criminal Code states:

217.1 Everyone who undertakes, or has the authority, to direct how another person does work or performs a task is required to take reasonable steps to prevent bodily harm to that person, or any other person, arising from that work or task.

Your organization is requesting our firm to work on a live electrical system. Working live without locking out should only be done in exceptional circumstances, when it is not feasible to de-energize the equipment. Before we consider your request, your organization must :

- Confirm that you are aware of your obligations under the *Occupational Health & Safety Act*, and that you have an existing, written electrical safety program.
- Provide written confirmation from the manufacturer that work on the equipment can be performed safely without disconnecting it.
- Confirm that you have conducted a hazard analysis with respect to the proposed work and provide us with a copy of it. (NFPA 70E or CSA Z462)
- Confirm that the equipment has been properly maintained according to the manufacturer's specifications since the date of original installation and provide us with a copy of those maintenance records.
- Confirm in writing the reasons why you are requesting our firm to work live, keeping in mind the hazards associated with working live.
- Acknowledge in writing that your organization will assume all risks of property damage associated with this request to work live, in the event of an inadvertent shutdown.

Date work to be performed: _____ Location: _____

Reason work must be done live:

_____

_____

_____

Name of Company making request: _____

Name of Company's Senior Officer making the request: _____

Signature of Company's Senior Officer: _____

Everyone takes a risk when asking someone to work live and anyone considering such a request is required to independently assess and confirm that the request can be complied with safely.

THE ELECTRICAL SAFETY COALITION

www.electricalsafetycoalition.com

ECAO Electrical Contractors Association of Ontario · IBEW Construction Council of Ontario · IAPA It's About Making A Difference. · USA · Electrical Safety Authority

Appendix B: Invitation and Informed Consent Form

Fielding Graduate University

A Pilot Study Exploring What Occupational Risk of Harm

Means to Electricians and Apprentices

You have been asked to participate in a research study conducted by Gavan Howe, a doctoral student in the School of Human and Organizational Development at Fielding Graduate University, Santa Barbara, California. Dr. Placida Gallegos is supervising this study. This research involves the study of occupational risk taking and risk bearing by apprentices and certified electricians and is aimed at better understanding electrical workers' perception of risk of harm, which is part of Gavan's Fielding coursework. You are being asked to participate in this study because I have asked the IBEW to assist me in recruiting highly qualified research participants for this important electrical safety study.

Before you agree to participate in this research study, it is important that you read and understand the information provided in this Informed Consent Form. If you have any questions, please ask the researcher for clarification.

Why Is This Study Being Done?

This study is being done because electrocution was the third most prevalent cause of occupational death in the USA in 2016 (Occupational Health and Safety Administration, Department of Labor, 2018). Further, if an electrician or an apprentice is injured by electrical contact and requires time off work, he or she is 10 times more likely to die from that injury as compared to all other types of injuries requiring time off work.

How Many People Will Take Part in the Study?

One apprentice electrician and one journeyperson electrician will be asked to participate in this pilot study.

What Is Involved in the Study?

Survey

If you agree to participate in this study, you will be asked a series of demographic questions, such as age, gender, time in trade, and supervisory experience. After this, you will be asked to answer nine open-ended questions of a pen-and-paper survey. Once all participants have completed the survey, we will meet for a 30-minute focus group discussion on how apprentices and journeymen electricians deal with situations that may lead to occupational risk of harm. This focus group will last no longer than 30 minutes and will be audio recorded only and later transcribed. Sample questions are noted at the end of this form.

How Long Will I be in the Study?

The study involves you meeting at an IBEW training center at a time to be arranged at the convenience of you, your colleagues, and the IBEW CCO. This study will last approximately 60 minutes.

What are the Risks of the Study?

The risks to you are considered minimal, and there is a slight likelihood that you may experience some emotional discomfort during or after your participation. Should you experience any emotional discomfort or distress in response to a question, the survey will be terminated and counselling help will be made available.

What are the Benefits to Taking Part in This Study?

You may develop a greater understanding of the situations, environments, organizational dynamics, as well as socio-cultural pressures that cause or encourage apprentices and electricians to take risks on the job or to knowingly bear risks by placing themselves at risk of harm while at work. Additionally, you may develop new and different coping strategies to help you if you are asked or encouraged to take risky job actions.

What about Confidentiality and Protection?

Study-related records would be held in confidence. Your consent to participate in this study includes consent for the researcher and supervising faculty. Your research records may also be inspected by authorized representatives of the Fielding Graduate University, including members of the Institutional Review Board or their designees. They may inspect and photocopy, as needed, your records for study monitoring or auditing purposes. In addition, parts of your record may be photocopied.

The information you provide will be kept strictly confidential. All materials will be kept under lock and key at 361 Ellis Park Road, Toronto. Only the Researcher, Transcriptionist, and Dissertation Chair will listen to the audio recordings. The results of this research will be published in my Knowledge Area's (course work) and in my Dissertation and possibly published in subsequent journals, books, and presentations.

Participation in Research is Voluntary

You are free to decline to participate or to withdraw from this study at any time, either during or after your participation, without negative consequences. Should you withdraw, your data will be eliminated from the study and will be destroyed,

Compensation

No compensation will be provided for participation.

Study Results:

A summary of the research findings will be presented to the participants of this survey after dissertation is accepted.

Additional Information:

If you have any questions about any aspect of this study or your involvement, please tell the Researcher before agreeing to participate in this research study. You may also contact the supervising faculty if you have questions or concerns about your participation in this study. The supervising faculty has provided contact information at the bottom of this form.

You may also ask questions at any time during your participation in this study. If at any time you have questions or concerns about your rights as a research participant, contact the Fielding Graduate University IRB by email at irb@fielding.edu or by telephone at 805-898-4034.

Two copies of this informed consent form have been provided. Please mark an X, and today's date indicating you have read, understood, and agree to participate in this research. Return one copy to the researcher and keep the other for your files. The Institutional Review Board of Fielding Graduate University retains the right to access all signed informed consent forms and any other study documents.

I have read this informed consent document and have had the opportunity to ask questions about this study. I have been told my rights as a research participant, and I voluntarily consent to participate in this study. By marking an X on this form, I agree to participate in this research study.

_____
PARTICIPANT's X

_____
DATE

Supervisor:
Dr. Placida Gallegos, PhD
[email address]
Address
[phone #]

Student Researcher
Gavan Howe, PhD Student
[email address]
Address
[phone #]

Appendix C: Study Questions

Research Question: Why is it that highly trained, expert electricians and electrical apprentices continue to work live on energized circuits, panels, and equipment when they know full well just how dangerous this behavior is?

Demographic Information:

Age, gender, qualifications, certifications, number of years in the trade, specialization, number of years' experience as a supervisor

Qualitative Questions

Nine pen-and-paper questions asked:

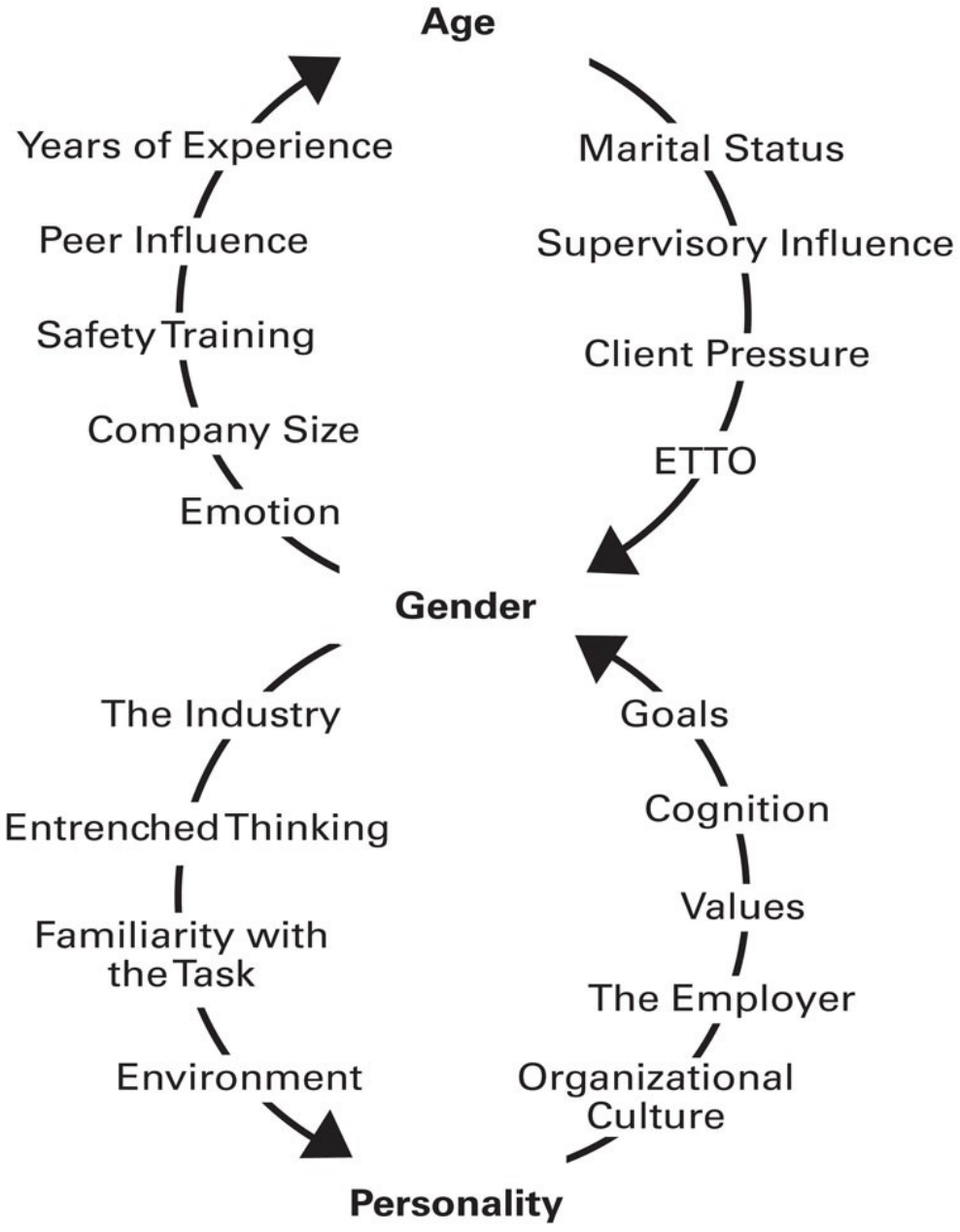
1. What does risk of harm mean to you?
2. Describe a time when you saw safety working well on the job site?
3. What conditions discourage electricians and apprentices from staying safe at work?
4. Name the 3 most serious risks of harm electricians and apprentices face today?
5. Do apprentice-to-journeymen ratios impact the safety of electricians and apprentices?
6. Do you face pressure to take risks?
7. If so what types of pressure? If none answer N/A
8. Is it easier to take risks because you see other guys taking risks?
9. Will the legalization of cannabis in Ontario increase risk of harm on construction sites?

Focus Group Questions

Six additional face-to-face in-depth questions asked;

1. In your opinion, can working live cause a risk of harm?
2. Why do men work live?
3. Are some men taught to work live?
4. How does management describe live work?
5. Do men talk about live work, if so, what do they say? If no, answer NA.
6. How do we stop live work?

Appendix D: The 21 Drivers of Electrical Accidents



Appendix E: Overview of Participants' Input

Exhibit #1: Top 10 Risk of Harm Themes Identified by Licensed Electricians

1) *Pressure to work faster*
2) *Fear of Reprisal/Layoff 'I can't say no'(to live work)*
3) *Culture*
4) *Communications 'Never report getting zapped'*
5) *Management does not walk the talk of safety*
6) *Bidding is highly competitive with very tight margins*
7) *1:1 Apprentice ratios: more apprentices will get killed injured*
8) *Hope: more apprentices are speaking out against live work, and are more educated and better trained than past apprentices*
9) *Seniority List works to reduce live work*
10) *We are safer in a union shop, though union halls should take back signing of safety papers.*

Exhibit #2: Top 10 Risk of Harm Themes Identified by Apprentices

1) *Pressure to work faster*
2) *Fear of Reprisal for refusal to work live*
3) *'Old School will never change and Your only as good as your journeymen*
4) *Culture, Peer Pressure I show up, get accepted and fit in, don't make waves*
5) *Communications: silence and not walking the talk of safety*
6) The frequency of risky situations and conditions i.e. COVID-19, with no ability to protect against it (*guys do not report in sick, compromised sanitary/rest facilities, overcrowding of trades on site, working close/tight conditions*

7) *Work is risker in hi rise and low-rise residential construction "I worked live every day for a year, now in ICI: never, in non-union shops*
8) *Covid protection rules won't work for electricians*
9) *1:1 apprentice ratios: 'it's like an insane asylum run by the inmates'*
10) Hope for Change/JAC is working, *we are better trained than the 'old school'***

Exhibit #3: Risk of Harm Themes Common to Both Cohorts

1) Working live is generally not admitted to
2) There are more risky situations today versus times past
3) *Old school 'these guys are not going to change'*
4) *The change of pace increases risk of harm significantly*
5) *Penalties have no teeth; fines should be increased and more held liable*
6) *Underreporting of electrical contact, or other injury is the normal practice*
7) *There is no effective way to protect against COVID on many construction sites*

Exhibit #4: Risk Theme Differences between Cohort

Apprentice Risk Themes Different from C of Q

1) *The frequency of risk was noted as being a risk factor*
2) *The need to belong, be accepted, fit in leads to risk taking and risk bearing don't want to be seen as pussy*
3) *Peer pressure plays a vital role in risk taking and risk bearing*
4) *Bravado, ego, stupidity, laziness, carelessness, overconfidence all drive risk*

5) *Other trades harass and put significant pressure on apprentices if they turn off the power*
6) *Live work is a Bad habit masked as training*

C of Q Risk Themes Different from Apprentices

1) *COR Certification does not account for live work: all the guys just fill in the same thing on the site*
2) *We can do more things live today*
3) *Signing 14 or 15 pages of safety stuff you don't have times to read and are not given a copy of anyway is sketchy*
4) Enforcement: '*too much bullshit is going on: 2 laptops to keep my license'*
5) *Live work is used to get guys on the layoff list*
6) *Extra training seems like punishment*

Exhibit #5: Demographic Info

Apprentices (*N* = 14): average age: 25, 100% male, 13/14 possess post-secondary degrees/diploma, combined 45 years on the tools, 13/14 are 2nd year apprentice, one participant was a 5th year apprentice. All are certified card-carrying apprentices licensed by the Province of Ontario.

C of Q (*N* = 10) average age: 51, 100% male, no mention of education other than as an electrician, combined 281 years on the tools, all are fully licensed electricians registered in the Province of Ontario.

Exhibit #6: Themes of Hope Common to Both Cohorts

1) Younger generation of apprentices better educated and trained more on safety work practices versus prior generation's
2) Journeymen play a vital role in showing and demonstrating first-hand, safe work practices to apprentices 'these are skills that have to be passed down'
3) Journeymen are powerful role models both for good and ill
4) Today's apprentices are much more comfortable saying no to live work as compared to apprentices in 2007/2008 Howe 2008
5) Today's apprentice trainers are top notch
6) Hydro One, Guild, nuclear plants and Western Mechanical of Barrie were noted as 'gold standard in safety'
7) The Electrical Safety Authority of Ontario's Arc Flash Video, and 'The Just Don't Ask Form' from The Electrical Safety Coalition help save lives