WHY FORMAL STOP WORK SCHEMES DO NOT WORK

A qualitative study in safety-critical industries in Canada

Thesis submitted in partial fulfillment of the requirements for the MSc in Human Factors and System Safety

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WHY FORMAL STOP WORK SCHEMES DO NOT WORK:

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ABSTRACT

Stopping unsafe work is not only a legal but moral necessity for those that perform work in safety critical industries. Stop Work Authority Cards, Interventions, Refusals of Unsafe Work and the Andon Cord have become symbolic and physical abstractions of decentralization – a shifting of authority down to those which perform the dirty and dangerous work. Paradoxically, the manner in which these formal stop work schemes work is divergent to what these industries and organizations often advocate.

I undertook six semi-structured interviews with employees experienced in varying safety critical industries in Western Canada to investigate how decentralization is operationalized in practice. The study found that individual work stoppages through formal stop work schemes have good intentions but in reality, become counterproductive due to ensuing bureaucracy and the possibility of reprimand. Furthermore, this study finds that stopping unsafe work is actually achieved through informal means; that is, casually informing a co-worker that they are in a line of fire or that they are in a situation potentially hazardous which could cause harm to themselves or others. This informal 'brother's keepers' approach appears more effective; however, it runs the risk of potential unsafe acts and conditions being misconstrued as incidences (near misses) within their organizations incident reporting structure. In reality, this 'social interplay' is not only encouraged amongst crew members but necessary for creating a safer work environment for the organization as a whole.

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"If you throw out a stop work card, you better have your shit together and know what you're talking about …it's a lot easier to go up to the individual that's doing the work and tell them I don't think that you're doing this a safe way. When you throw that stop work card you got your ass on the line basically". (Rob)

Rob, a supervisor for a large industrial construction company in Canada found comments like these to be common place for workers employed in Oil and Gas, Manufacturing, Mining and Industrial Construction within Western Canada. The prevalence of formal stop work schemes in these industries can be surprising to some but it is generally acknowledged amongst employees in these industries that they will be trained in various formal stop work schemes or refusals of unsafe work throughout their work lifetime.

Oil and Gas giants like Chevron and Imperial Oil refer to these forms of decentralization as a Stop Work Authority Card. JV Driver Group, a large industrial construction company headquartered in Western Canada, refers to them as Intervention Cards. They even cast a national celebrity, Don Cherry, in their Safety Intervention Coaching video[1]. In addition, automotive manufacturer Toyota, popularized the idea of the Andon Cord which is a physical rope pulled whenever production line workers observe quality or safety deficiencies that signals for help and to halt the assembly line (Wartzman, 2010). Stop Work Authority/Stop Order, Interventions and Refusals of Unsafe Work have become the symbolic Andon Cord of these industries. To pull the Andon Cord, to use a Stop Work Card, or to have an employee refuse unsafe work, acts as symbolic and physical abstractions of decentralization within these safety critical organizations. *The Drucker Difference* as quoted by Rick Wartzman describes that "in a sense, a stop order is the utmost expression of something that

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[1] Can be viewed at www.youtube.com/watch?v=FnWyT0h2j48

Drucker advocated for many decades: pushing authority down through the organization to the lowest level possible" (2010, para.5). However, we have to wonder: Do formal stop work schemes actually work in practice? (to decentralize the authority for safety decisions?)

This thesis will explore why formal stop work schemes do not work (as imagined) and how stopping work really works (in practice). In this study two realities were contrasted: 'decentralization in practice' versus 'decentralization as imagined' providing a deeper understanding of decentralization for workers employed in safety critical industries in Western Canada. Six participants with experience in varying industries (Construction, Manufacturing, Forestry, and Military Operations) were interviewed in 5 interviews (1 interview included 2 participants). The empirical data collected will be discussed in relation to the academic literature available on this complex topic.

THEORETICAL AND PRACTICAL BACKGROUND

Decentralisation and stopping work

An organizational theory that advocates the idea of stopping unsafe work at a decentralized level is High Reliability Theory (HRT), which takes High Reliability Organizations (HROs) as its central object of study. HROs argue that they can navigate through operationalized decentralization with relative ease. In order to deal with the inherent complexity and tightly-coupled nature of their systems and to react to unforeseen surprises quickly from the field-level, HRO's argue for the need to decentralize (safety related) operational decisions (Sagan, 1993). Basically, there is not enough 'slack time' to react in tightly-coupled systems in order to reach an informed centralized approach to surprises; therefore, HROs counter this with decentralization. High Reliability Theorists (HRT) considers decentralization as a defining characteristic (Marais, Dulac & Leveson, 2004; Laporte & Consolino, 1991) and in turn lays the theoretical framework that operationalized decentralization can be successful - in theory.

From this popular theoretical mainstream in safety (HRT), many practical safety management practices have been developed: Stop Work Authority Cards/Stop Order Cards, Interventions, Refusals of Unsafe Work and the Andon Cord. Kenny Wise, who blogs for WiseBusinessware, advocates that effective Stop Work Authority Programs "…[provide] employees and contract workers with the responsibility and obligation to stop work when a perceived unsafe condition or behaviour may result in an unwanted event" (Wise, 2014, para.1). Chevrons Richmond, California Refinery Plant utilizes their Stop/Pause Work Authority Pocket Card which:

"encourages and enables every single worker at the refinery, regardless of rank or expertise, to stop any work if they believe that it is not being done safely. In other workplaces, it may be unusual for a company to encourage employees to stop or pause work. But at the refinery, empowering our workers in this way demonstrates the commitment we have to an ingrained culture of safety." (Judd, 2015, para. 2).

The Plant General Manager Kory Judd was cited in the *Richmond Standard*, a news website for the Richmond community on information about the Chevron Richmond Refinery that 93% of employees surveyed at the Richmond Refinery responded favorably of using the Stop/Pause Work Authority Pocket Card.

Many organizations, like Chevrons Stop/Pause Work Authority Pocket Cards, share the philosophy that 'Safety is their number one organizational priority' and that 'employees have the responsibility and authority to stop unsafe work'. This belief can often be found communicated on their official policy and safety slogan, on the physical Stop Work Authority Card, and promoted during safety meetings. These typical physical Stop Work Authority Cards are business sized, laminated and include Stop Work Authority conventions (as depicted as figure 1 on page 10). These are handed out from managers, supervisors and others in positions of authority and power to lower status workers.

Total Eden Pty Limited, based out of Australia, Stop Work Authority Card stated that if an employee utilized this card and a resolution was not reached then they have the right to contact the Chief Executive Officer, Chief Financial Officer or Senior Health, Safety and Environment Coordinator to rectify the hazardous situation (Total Eden Pty Ltd, n.d.). This organization also stated that since the Stop Unsafe Work Authority Card was introduced a remarkable 70% reduction

of Lost Time Injury (LTI) incidences followed and that there had been no LTI's within their

organization in the two years it was implemented.

Figure 1. **Castle, Bart. 2013.** *Authority to Stop Work.* **[Photograph]**
Retrieved from http://incident-prevention.com/ip-articles/the-authority-to-stop-work

Similarly, to Chevron's 'stop, notify, correct and resume' approach to Stop Work Authority, the

Worker's Compensation Board of British Columbia (WCB) provides a flowchart outlining the

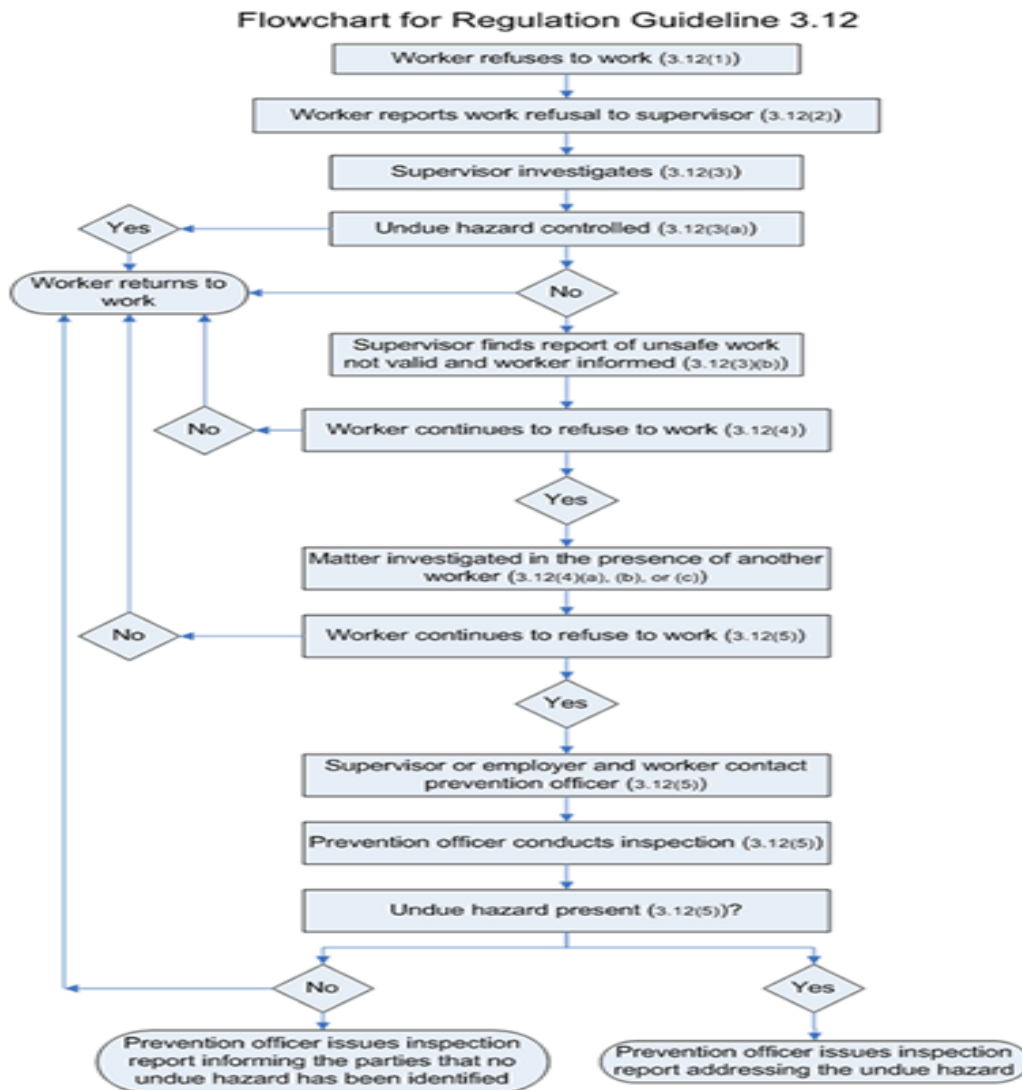process for refusing unsafe work and can be depicted in figure 2.

Flowchart for Regulation Guideline 3.12

- Worker refuses to work (3.12(1))
- Worker reports work refusal to supervisor (3.12(2))
- Supervisor investigates (3.12(3))
- Undue hazard controlled (3.12(3)(a))
  - Yes → Worker returns to work
  - No
- Supervisor finds report of unsafe work not valid and worker informed (3.12(3)(b))
- Worker continues to refuse to work (3.12(4))
  - No → Worker returns to work
  - Yes
- Matter investigated in the presence of another worker (3.12(4)(a), (b), or (c))
- Worker continues to refuse to work (3.12(5))
  - No → Worker returns to work
  - Yes
- Supervisor or employer and worker contact prevention officer (3.12(5))
- Prevention officer conducts inspection (3.12(5))
- Undue hazard present (3.12(5))?
  - No → Prevention officer issues inspection report informing the parties that no undue hazard has been identified
  - Yes → Prevention officer issues inspection report addressing the undue hazard

Figure 2. **WorkSafeBC. n.d. [*Flowchart for Regulation Guideline 3.12*]. Retrieved from https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-guidelines/guidelines-part-03**

The underlying philosophy that underpins the health and safety legislation in Canada is the internal responsibility system (IRS) that lays the foundation for stopping unsafe work. Within this are both the employers and employee's responsibility for health and safety. Key elements are the *right to know*, the *right to participate*, the *right to refuse unsafe work* and lastly the *right to no discrimination* (British Columbia Federation of Labour Health and Safety Centre, 2015). The Workers' Compensation Board of British Columbia (WCB) describes a refusal of unsafe work as follows:

A person must not carry out or cause to be carried out any work process or operate or cause to be operated any tool, appliance or equipment if that person has reasonable cause to believe that to do so would create an undue hazard to the health and safety of any person. (*Occupational Health and Safety Regulation*, 1999)

The Workers Compensation Board of British Columbia regulatory framework for refusal of unsafe work provides guidelines which assist with the application and interpretation of these types of regulation. The guideline referencing the regulations for work refusals seek to determine whether a worker has reasonable cause to believe that an undue hazard exists or if it could be created. In most refusal of unsafe work situations, the interpretation of 'reasonable cause to believe' and 'undue hazard' can be straightforward. For example, the Procedure for Refusal regulations guideline describes a situation where a worker was requested to work in the back of a warehouse to temporarily replace a worker who was absent due to illness. Some of the work in the warehouse requires the worker to use a forklift for unloading delivery trucks. The worker believes that they lack the training, experience and knowledge to perform this task and would expose them to undue harm. A refusal of unsafe work in this case would be legitimate because they have reasonable cause to believe that operating the forklift without training, experience and knowledge would create an undue hazard to themselves (1999).

Now determining whether a worker made the right choice of refusing or stopping unsafe work in the heat of the moment can be difficult – especially under the misleading light of hindsight. In tightly coupled situations the amount of time required to act could be instantaneous making it difficult for the worker to evaluate the reasonableness and impact of the hazard to themselves or others in the area. A notable case involving a work refusal which did not result in a successful win involved a co-worker in a saw mill in Ontario Canada, who refused working with his lead hand because his aggressiveness could make the work of a two-person bandsaw unsafe and chose to

work alone. The co-worker was eventually terminated because the employer provided the co-worker with other work options outside of working with the unsafe lead hand to which he refused. The Ontario arbitrator working on the case ruled that the work refusal was not justified because he felt that the co-worker did not have reasonable belief nor reasonable grounds that working with the lead hand was a danger to him (*Haley Industries Ltd. v. U.S.W.*, 2012). Although this case resulted in the refusal of unsafe work being dismissed, it speaks to the organizations like Chevron which often emphasis the ease of stopping unsafe work through Stop Work Cards but underestimates the justification needed for 'reasonable cause to believe' and 'undue hazard' for the worker to make a successful case of work refusal.

Complexity for Decision Making

What becomes challenging with these abstractions of decentralization is that not all decisions to stop unsafe work are as simple and bimodal as HRT and the discussed HROs make them seem out to be. Marais, Dulac & Leveson criticise this approach to surprise made by High Reliability Theorists (2004), as they found that the individuals studied by the HRO researchers were highly trained to respond to crisis with only two options: continue or abort the process all together. In interactively complex and tightly coupled systems it is advantageous to have individuals highly trained to respond to crisis with only two simple choices; however, not all systems are tightly coupled, nor are all decisions bimodal and not all possible outcomes are easily predictable. The HRO researchers analysed systems that were tightly coupled. In loosely coupled systems, where the decision to stop work or not is not time sensitive, individual action in isolation might conflict with other local or global decisions. In other words, decisions that go in one direction can simplify the context which may present itself in other circumstances. If the outcomes of socio-technical systems were uncertain (which the literature argues they are), or if they look at loosely coupled systems, would decentralization be as effective in creating reliability? These are answers that HRO

does not provide. Decisions once thought to be black or white from an HRO persuasion, in reality become different shades of grey in the context of work in practice.

Organizational Hierarchies

In the HRO context, decentralization is operationalized as a shift in safety related decision making to those considered in a lower level in the organizational hierarchy. Proponents of High Reliability Theory consider decentralization as a defining characteristic (Marais, Dulac & Leveson, 2004; Laporte & Consolino, 1991) and can be illustrated by Rochlin, La Porte & Robert's quote:

> Even the lowest rating on the deck has not only the authority, but the obligation to suspend flight operations immediately, under the proper circumstances and without first clearing it with superiors. Although his judgement may later be reviewed or even criticized, he will not be penalized for being wrong and will often be publicly congratulated if he is right. (1987, p. 84)

This is an encouraging statement, however the decision to suspend flight operations for a lower ranked officer (or anyone in a lower status in any type of work environment) may not be as simple as this quote makes it out to be. Fischer and Orasanu describe that to maintain safety in high risk environments crew members must continually monitor and challenge each other's performance. Yet, when they analysed aviation accidents for mitigated speech strategies, they uncovered that lower status pilots were frequently unsuccessful in changing actions or decisions of higher status crew members in critical situations (1999). Similarly, Milanovich and Driskell (1998) analysed patterns of authority relations between superordinate's and subordinates in aviation and acknowledged the difficulty for individuals in an organization to question or stop the action of someone in a superordinate position.

Preoccupation with Failure

HRO's preoccupation with failure and anything that could remotely lead to failure including individuals and their actions is supported by the belief that:

> Any failure, regardless of its location, is treated as a window on the reliability of the system as a whole. One lapse could be a weak signal that other portions of the system are vulnerable. While most organizations tend to localize failure, effective HROs tend to generalize it. (Weick et al., 1999, p. 39)

The belief that there is proportionality between minor errors and larger disruptions to the system could increase the uncertainty for would be interveners; since, Dekker reminds us that "Murphy's Law is wrong… what can go wrong usually goes right" then overtime, organizations and individuals become desensitized to these potential safety threats (Dekker, 2006, p. 165). In other words, when a potential safety threat does not propagate into a harmful outcome and over time the threat becomes normalized; the requirement for individuals to stop work is not effective any longer since they no longer recognize it as a condition or action that needs to be stopped. This example of 'normalization of deviance' was first theorized by Diane Vaughan and describes that the normalization of deviance:

> "…is a story of how people who worked together developed patterns that blinded them to the consequences of their actions. It is not only about the development of norms but about the incremental expansion of normative boundaries: how small changes - new behaviours that were slight deviations from the normal course of events - gradually become the norm, providing a basis for accepting additional deviance" (1996, p. 410)

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This concept of normalization of deviance is something that HROs do not seem to take into account, nor do they clearly define what failure or error is. Since there is no ubiquitous definition for what error or failure is and how it is observed and since socio-technical systems are highly reflexive and intractable; one must conclude that there is no clear definition (at least no clear definition proposed by HRT). This is problematic for decentralization, especially if lower-status workers cannot clearly understand what safe or unsafe is and it thus remains unclear when to intervene (stop work).

Another reflection of being preoccupied with failure is observing safety as the priority organizational objective (Sagan, 1993). The notion that decentralized decision making related to safety is uncomplicated because safety is viewed as the priority organizational objective is challenging. Since most organizations exist to produce a product or to sell something makes it impossible for safety to be the overriding objective of the organization (Dekker, 2006). Safety is number one until it impacts production or getting things done. This can also be illustrated from the reactions after the Eyjafja "llajo" kull volcano which erupted in April 2010 in Iceland. The initial response was to close the European airspace, but after 27 European Union transport ministers and representatives from the air transport industry came together, they agreed to only *partially* resume flying once all economic and safety aspects were covered. If safety is the number one priority then all the flights in Western Europe should have been grounded, in theory, but it was not.

In addition, there are financial implications for safety which influence the choice and viability of safety measures for organizations (Besnard & Hollnagel, 2012). Arguably, when researchers Rochlin, La Porte and Roberts (1987), published their seminal piece, they failed to account that peacetime operations have drastically different pressures, both internal and external, then while the

Navy is in active wartime (Laporte & Consolino, 1991). However, Rochlin et al. (1987), does not address whether organizational goals automatically parlay into individual goals or whether these conflict. This is an important distinction since HROs are assuming that safety is relatively simple and linear and that there is a macro-micro connection which extends to the individuals which make up the organization as a whole. In theory, safety as the organizational objective sounds like a great moniker, in reality, organizations have competing objectives which makes the ability for workers to stop work difficult since those at the sharp end are at the whim of higher organization goals. In which lies the eternal conflict for lower status workers. Into one ear the organization lectures that the workers are to never compromise safety and to stop work when it is unsafe, but in the other ear they whisper not to impact schedule or not to cause unnecessary delays (Dekker, 2006).

Decentralization in practice

Research surrounding decentralization for safety related decision making is scarce. No research papers can be found pinpointing worker difficulties using formal stop work schemes, but similar research surrounding decentralization has been found relating to workplace fatalities involving risky driving behaviour in transportation industries. From this research, co-workers who were involved in a situation where risky behaviour was observed (e.g. texting while driving or not wearing a seatbelt), indicate that only half or fewer surveyed would have intervened on the driver they were with (Otto, Ward, Swinford & Linkenbach, 2014). Similarly, a study performed by the RAD Group, who targeted 2600 employees across industries in fourteen countries and in ten languages, sought to understand why employees chose not to intervene when they observe a fellow worker doing something deemed unsafe. The study indicated that 24.6% would not intervene on a fellow worker because they felt they would become angry or defensive and 19.8% felt it would not make a difference anyway (Ragain, Ragain, & Allen, 2011). These are not encouraging numbers for practitioners. Researchers in safety critical industries conclude that intervening and stopping

perceived unsafe behavior in work environments is difficult; never mind stopping and handing out a physical card which states Stop Work Authority on it.

Whether it be called Stop-the-Line, Stop Work, Stop Work Authority, Intervention Cards, Work Stoppage Cards, Refusals of Unsafe Work, Andon Card etc., the purpose is the same. In an organization which typically manages day-to-day activities in a centralized manner, these formal stop work schemes are meant to symbolize a spontaneous transfer to decentralization; empowering lower status workers to stop work in an instantaneous manner. For some this might be an outlandish artefact in the faith-based approach to organizational safety (as opposed to science-based). In safety critical industries in Western Canada, it is common practice. As this brief overview of theoretical and practical backgrounds indicate, stopping work might not be as straightforward as HRT and the organizations buying into these stop work schemes make it out to be. This thesis aims to further explore why formal work schemes often do not work (as imagined), and aims to understand how stopping work really works (in practice).

METHOD

The Research Orientation

The epistemological orientation of my research is focused on social constructivist's inspired ethnographic methodology since:

> Social constructivists hold assumptions that individuals seek understanding of the world in which they live and work. Individuals develop subjective meanings of their experiences directed towards certain objects or things. These meanings are variable and multiple, leading the researcher to look for the complexity of views rather than narrowing meanings into a few categories or ideas. The goal of the research is to rely as much as possible on the participants' views of the situation being studied. (Creswell, 2007, p. 24)

With that being said, since interviews provide one of the best options to capture people's own views on the object of this study, formal stop work schemes, I chose interviews as the main manner for data gathering, also being cognizant that interviewees under these types of studies may know what the interviewer expects and often answers the questions accordingly (Essays, 2013). Therefore, reliance on the views of the participants is important but not to be taken at face value.

Participant Selection

My method included participant results from semi-structured interviews from individuals currently employed or experienced in safety critical industries where these abstractions of decentralization exist. Sampling and selection of those chosen to be interviewed was based on a "networking

approach" (Blaxter, Hughes & Tight, 2010). I used my professional network to contact potential participants interested in scheduling an interview with me.

Five interviews were conducted in which six informants were interviewed: one of the interviews was conducted with two participants' while the other five interviews were conducted individually. The six participants for this research included workers experienced in safety critical industries in Western Canada: two workers with experience from manufacturing; one worker had a mixture of experience in the military and industrial construction; two workers had experience in industrial construction and one worker had a mixture of experience in industrial construction and forestry (See table 1). Each had a vast range of experience (10-30 years) in these safety critical industries. I contacted the potential participants through varying communication mediums (i.e. email, phone or text) and interested participants were informed that the interview would last typically 30-45 minutes. The participants were also informed that their participation was completely voluntary. Table 1 provides a simple overview of the six participants and their background, and serves as a reference to the interviewees' statements in the result section.

Table 1 First Names, Titles, Industries and Years of Experience of Interview Participants

First Name	Title/Position	Industries (past and present)	Years of Experience
Alan	Labourer	Manufacturing	3o
Patrick	Safety Adviser	Military and Industrial Construction	10
George	Carpenter/Equipment Operator	Industrial Construction	20
Rob	Supervisor/Equipment Operator	Industrial Construction	25
Milton	Equipment Operator	Forestry and Industrial Construction	25
Sean	Electrician	Manufacturing	20

Interviews

Data was collected from face-to-face semi-structured interviews. The questions that I maintained during the interviews were in essence open, with the ability for the interviewees to bring up new ideas and perspectives prompting my questions to evolve. The first interview question in all of the interviews was surrounding the idea of decentralization: Do you have an understanding of Stop Work Cards, Interventions, Refusals of Unsafe Work and the Andon Cord? In the subsequent questions, I would prompt the informants to tell me whether these abstractions of decentralization are effective or not and to tell me a story for when they actually stopped work. If the informant had not experienced formal work stoppages, I asked whether they have been involved indirectly from a co-worker who may have been involved and that if their informant was aware of the details.

The first interviewee provided me with a new perspective which assisted me in adding the reflection on whether there is a separation between stopping work formally versus informally in the following interviews. The second interview participant provided me with more reflection on whether work stoppages involving situations which are immediately dangerous to life or health and ones that are merely deviations from best or common practice. These two reflections were included as questions to ask during the subsequent interviews.

Collecting and Analyzing Data

All five interviews were digitally recorded and in addition hand-written notes were made. Both were later transcribed for data analysis. My analytic framework evolved with each new interview: I was analyzing as I was performing interviews and had the privilege of transcribing them quickly before I moved onto the next interview. The first interview prompted the theme of work stoppages being formal and informal in nature. The second interview prompted the theme that work

stoppages are comprised of situations which could be immediately dangerous to life or health or merely to ensure best or common practice. The remaining themes of 'decentralization is inherently problematic' and 'stopping work has bureaucratic consequences' were consistent in all interviews and were not categorized under these final headings until all the interviews were completed and transcribed.

Confidentiality

At the beginning of each interview a *consent for participation in interview research form* was provided to review, sign and explain the purpose of the research to gain an understanding of why there is a disinclination for lower status workers to exercise stop work programs in situations deemed unsafe (see Appendix 1). The participants were also informed that their confidentiality will be secured and all subsequent use of the interview data will remain anonymous.

PROBLEMS WITH THE DECENTRALISED RELIANCE ON FORMAL STOP WORK SCHEMES

Three main themes surfaced during the interviews, which conflict with the traditional formal stop work schemes safety critical industries often advocate: (1) Decentralization is inherently problematic; (2) Stopping work has consequences; (3) Unsafe work conditions are grossly underspecified. This section will outline the results of the interviews on the basis of these three themes. The discussion section, presented hereafter, will continue where these three themes leave off by describing how the interviewees deal with these problems of formal stop work schemes through informal means.

Decentralization is inherently problematic

The assumption that the decentralized reliance on stopping work is a key to safety, as outlined in the literature review, builds on the idea that any worker at any time at any place and in any context, can stop unsafe work with no repercussions. However, as will be seen in the following interview results, the decision of stopping work at the local decentralized level is inherently difficult - never mind the action itself.

Patrick, a 34-year-old Safety Advisor for a mid-size construction company in Western Canada, explains how organizational calls to stop unsafe work oversimplify the complexity of operational work. He goes onto describe that formal stop work schemes are meant to empower individuals to cease hazardous work but if they chose not to stop unsafe work because the hazard was not 'clear' than they can be judged negatively. Ultimately, if something goes wrong because they did not intervene they might be blamed for failing to stop unsafe work (rather than assigning responsibility on the individual performing the unsafe act or the environment which created the unsafe

conditions); it focuses on the individual who failed to stop unsafe work. Contrarily, if they do stop the work they might also be judged negatively since what they have stopped might not be actually hazardous and might also have impacts on other organizational goals like scheduling and productivity. Ultimately, these adhoc judgments, individually and collectively, are retrospective and counterfactual.

Alan, a 30-year veteran from a large manufacturer in Western Canada, has difficulty in even the wording of work refusals itself. He states that:

> [It's] the word itself, 'work refusal', that puts the worker in a defensive mode cause you're doing something bad or something wrong – you're refusing work. And as a worker you're taking your labor away, it's kind of your last resort…automatically it's a bad thing. (Alan)

The notion of stopping work is challenging and the wording itself immediately puts the worker in a defensive mode. Consequently, the action of stopping work can also be daunting and challenging. Milton, an equipment operator who mostly worked in the forestry industry but who was working on an industrial construction site at the time of this interview, expressed that:

> The workers have to believe that they actually do have the right and they are going to be backed with these stop cards. If they don't feel they have the backing by the superintendents or the management, there a waste of plastic and a waste of paper. (Milton)

Such remarks show how stop work schemes are not as straightforward as they seem – that is, as 'a key to safety' – but can have very negative sentiments attached to them, especially if they are not properly backed up by leadership.

Rob, who worked with Milton for the same organization at the time of this interview, felt that stopping work can affect productivity, reputation and the potential to what Milton considered as "job action". The term 'job action' can have negative connotations particularly because the project that Rob and Milton work on is a unionized site with an organized labor contract in place. Any work stoppages precipitated by union workers can be damaging since the project labor agreement states that there would be no work stoppages except for unsafe situations, otherwise the union could be found in breach of contract. Since unsafe work is not universally defined (as will be discussed later in the result section) and because the workers' justification to stop unsafe work will be judged by individuals further up the union and the company's hierarchy, stopping unsafe work using a stop work card can be difficult.

In summary, the decentralized reliance on stopping work as a key to safety has great intentions, but intentions only. The interviewees described that stopping work is a judgement call and that you will be judged whether you made the 'correct' call or not; that the vernacular, work refusals, reduces one to defensiveness and the perspective that they are immediately wrong for stopping work; and that stopping unsafe work is not that simple as there are hierarchical interpretations about whether the unsafe work stoppage was 'justified'. As such, arming lower status individuals with the instruction to stop work may look straight forward, and nowadays morally and legally obligatory, however it leaves workers with impossible goal conflicts as these formal stop work schemes are not inherently easy and in fact deeply problematic.

Stopping work has consequences

> I follow your sidewalks, I go into your change room, I go into your uniform, I drive your equipment, I attend your pre-shift start, I follow your rules, work your shiftwork, under your security guard, your everything but as soon as something happens – it's my fault? (Alan)

The quote above summarizes the bureaucracy of Alan's organization beautifully at the conclusion of our interview together. Bureaucratization with regards to organizational safety involves hierarchy, specialization and division of labor, and formalized rules (about how authority for decisions is disseminated, maintained and enforced) (Dekker, 2014). This increasing bureaucratization within the interviewees' organizations can liken their experiences to 'rats in a maze'.

Alan explains that there is a separation between how stopping work is operationalized in his organization versus how it really works in practice. Surprisingly, he states that even if he stopped unsafe work informally, "for example to tell a co-worker to stop and use a crosswalk when walking throughout the site", he would not dare to report this work stoppage to his superiors because "shit is going to hit the fan" (Alan). He goes on to describe that there was a time in the past when informal means of stopping unsafe work were encouraged amongst co-workers and shared with supervisors with no repercussion but now his feelings are that the supervisor would have to do something about it formally as it is considered an incident. Unfortunately, Alan describes that this is the way that the organization is headed.

Alan also felt that formally stopping work had tended to be a "battle" between the employees and their supervisors. He felt that supervisors take employees' stopping work personally, which often

resulted in the employee that refused unsafe work to be replaced and given a different task, considered "menial" in nature. Alan had participated in formally stopping work in the past and always felt "like a rape victim" by the time it was completed.

George, a ticketed journeyman carpenter and experienced equipment operator, had almost used his stop work card but eventually did not because he was provoked by his superintendent at work. George did not feel safe at one of his worksites and expressed how uncomfortable he was to his superintendent, who subsequently responded that if he felt something was unsafe that he should "go play [his] stop work card"; with an expression of ridicule. George, like many other workers, has been beset with circumstances that appear unsafe, but when approached with a superior for confirmation they are rebuffed, mocked, and even threatened with termination.

George was working on a large construction site when he almost used his stop work card. His $S0_2$ gas monitor started to alarm inside one of the buildings they were constructing. George sought his general superintendent for direction. During a long discussion about the question whether the SO_2 monitors were getting false alarms, the superintendent's response was simply "Well if you think we have a problem with that area maybe you should go play your stop work card and walk over there and stop the job", in a factious, mocking, almost provoking fashion. George's response was that if the superintendent wanted him to stop the work then he will walk over there and pull a stop work card. George began to leave to "play his stop work card" when the superintendent began yelling at him shouting that he will be fired and removed from the job site immediately.

Sean is employed as an electrician and also acts as a Health, Safety and Environment Union Representative for his organization. During the interview, he described a situation where a supervisor and manager of his organization informed a worker that if he would not return to work, after he formally stopped unsafe work, that he would be suspended indefinitely. The worker,

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reluctantly, returned to work for fear of losing his job. The union and regulator were notified by the worker's job steward and the threats of losing his job were rescinded. Subsequently, a written order from the regulator was served to the organization stating that discriminatory action was taken against the employee for refusing work based on what they considered to be an undue hazard. The organizations response to the written order was to communicate to the supervisory staff of the importance of respecting an employee's right to stop unsafe work without discrimination. However, the news of the affected employee, who advocated his right to stop unsafe work and was subsequently threatened with indefinite suspension, had spread like wild fire across their organization.

Unsafe Work Refusals – (2007 – Present)
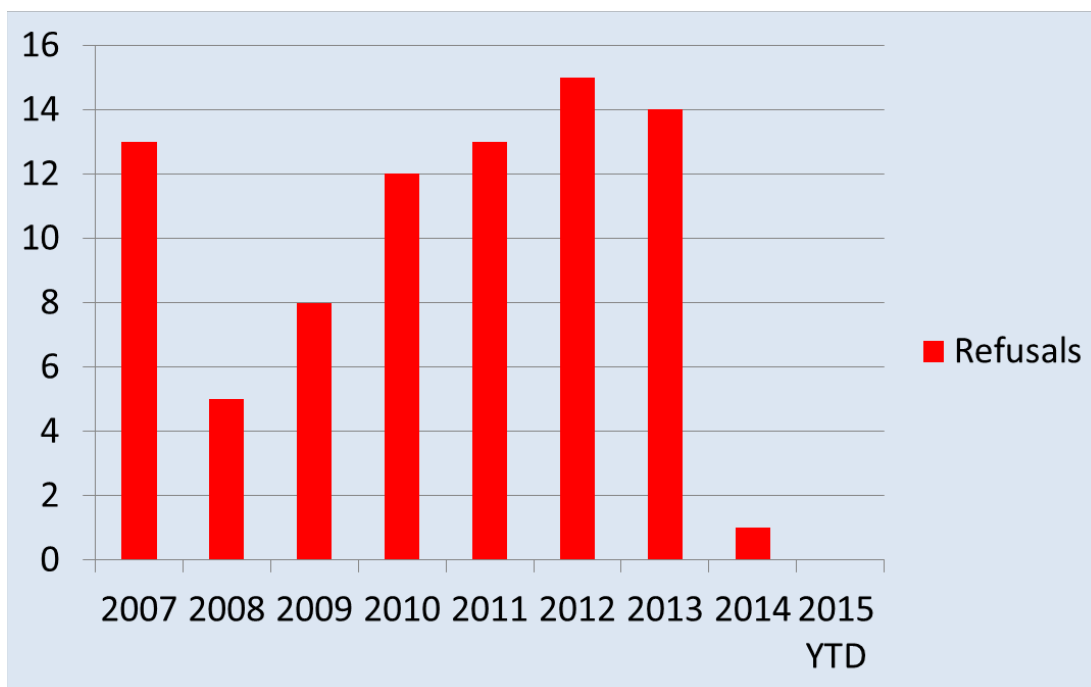
** so far in 2015 there have been no documented work refusals as of July 1 2015.

Figure 3. Unsafe work refusals in Sean's organization.

As you can see from figure 3 above, Sean's organization had been tracking formal unsafe work refusals from 2007. From 2007 to 2013 the average cases of formal refusals of unsafe work per year were 10. This dropped tremendously in 2014 to 1 case of formally refusing unsafe work. Sean's

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colleague who was in charge of tracking the formal unsafe work refusals informed me via email that his viewpoints on the steep decline are probably because of the case outlined above. As a consequence of this case, when the organization started promoting the stopping of unsafe work again, the resounding comments from their peers were "I'm not putting a target on my back" (Sean's colleague as expressed by Sean).

Sean also cited that his coworkers have a "fear mentality" in regards to near miss reporting because of the evident repercussions for reporting. It has become so bad that the organization and the union held a 'meeting of the minds' to discuss the tremendous drop in near miss reporting. Near miss reporting and stopping unsafe work are on the same 'reportability' continuum. Workers in Sean's organization are fearful of reporting near misses because their employers might find the employee responsible and respond negatively to them - similar to workers stopping unsafe work. Sean went to say that he has been involved in unsafe work stoppages in the past with no repercussions but others he knows, as mentioned earlier, rights have been clearly violated and that individuals are 'clamming up' when it comes to reporting. Sean summarized that all employees have the right to be free of discriminatory action but states:

> It's a double edge sword. With this employer, they have taken a very heavy hand approach… people are afraid to report, afraid to actually exercise their right [to stop unsafe work] because they figure they are settling themselves up for discipline. (Sean)

Robs initial quote of the thesis introduction: "If you throw out a stop work card, you better have your shit together and know what you're talking about …When you throw that stop work card you got your ass on the line basically", explains, profoundly, that in order for your stop work action to be effective, you have to ensure that you are one hundred percent certain that the work is in fact,

unsafe. Throwing a stop work card out is a gamble and if you are incorrect 'your ass could be on the line' for affecting productivity and reputation.

Scenarios like these were expressed by all the interviewees, which clearly evidenced the sentiment that stopping unsafe work has bureaucratic consequences. The bureaucracy aimed to produce safety by supporting a system that creates, distributes, maintains and enforces a formalized protocol of decentralization has contrarily also stymied potential interveners from exercising their right to stop unsafe work because of the consequences experienced by employees like George, Alan, Sean and Rob alike.

Unsafe work conditions are grossly underspecified

> Everything is different, everyone's perspective is different, [and] everybody background is different. What's dangerous to me may not be dangerous to you and to say that there is a line where it has to be is impossible because [it's] their perspectives and so many variables…it will never be a universal one way of doing things. (Patrick)

Contrary to what the HRO persuasion assumes, unsafe work or conditions are often not clearly specified in safety critical industries, as illustrated by Patrick in the quote above. Take, for example, the Stop Work Authority examples discussed in the literature review, which attempts to specify for when a worker can exercise unsafe work; it only includes generalities but fails to deliver scenarios with which an employee might be faced. In specifying what is unsafe, context clearly matters.

My interview with Patrick inspired a categorization of unsafe work conditions as reduced to two separated definitions of unsafe work: (1) deviation from best or common practice, and (2) situations

immediately dangerous to life or health. However, beyond these two categories, what is 'unsafe work' becomes a profound question with an unlimited number of answers.

The case that Alan presents is another example of the problem of 'under specification' of what 'unsafe' means at the decentralised level. Alan explained he was considered 'unintelligent' for stopping the unsafe work from his supervisor. They had stopped work because they were required to work in the basement of a smelter shovelling snow. The basements of these smelters have tremendous amounts of electricity running through the bus bars underneath the floor of the potrooms; that is, the location where Alan and his co-workers were shovelling snow. Given the risk of electrocution, they decided to stop the unsafe work and the supervisor essentially called them "stupid" because he stated that electricity does not go through snow and that they had non-conductive rubber boots and clothing on. Alan described that it took three hours from the discussion between the workers and the supervisor on the interpretation of what is safe or not safe until the manager decided to contact the regulator for their decision. By the time that the regulator was notified, the shift was completed and the snow had melted so the potential hazard had become a non-issue.

In any organization workers are exposed daily with hazards, as unnecessary by-products of the processes or the processes itself. Sean likens his organization to a minefield. He states that:

> I akin a workplace to a minefield…and it's very easy to adapt a floor with literal mines and of course as a traditionalist… [I]would say 'please employer get rid of the mines, because if someone steps on it - [they're] going to get hurt'. The employers typical approach is to put up a sign that says 'don't step on the mines' – it doesn't cost as much. (Sean)

Continuing from Sean's illustration of the day to day danger he and his co-workers are exposed to, Rob described that everybody accepts a certain level of risk or 'mines' he could deal with:

> Well everybody has that limit where they're going to accept some unsafe act[s]. Everyone has a personal limit on what they'll accept for an unsafe act…they'll walk by something and 'okay that's not a big deal' and everybody's got a different attitude or a different idea of what that is. (Rob)

As demonstrated by Rob and Sean's quotes, much of the work carried out in safety-critical industries is potentially dangerous. This means that organizations have to be very explicit in specifying the unsafe work conditions that need to be stopped by stop work cards. Moreover, stop work schemes do not take into account personal preferences and limits in deciding when the work conditions are deemed unsafe 'enough' for them to stop work.

As another example, George indicated that if he had seen someone not wearing their gloves on a daily basis he would probably mention something to them informally but if it was a onetime trivial non-compliance issue he would let it go. Again, without clear definition of what is safe or not safe, makes it difficult for employees like George to intervene.

The triviality that George described is similar to what Rob states during the interview about a small property damage that occurred on one of his sites.

> It's interesting you'll have a small property damage...on a piece of equipment and you talk to one supervisor and their willing to let that go its only negligible they're not concerned about it. But the next employee or supervisor, 'well its balls to the wall! We're going to [get] Safety involved and go at it hard!' So, it's…context. (Rob)

Rob expressed that some people would be willing to let things go, however, if a different employee or supervisor sees it then it can be interpreted as a big issue.

Alan found that unsafe acts or conditions can be trivial and often discretionary in his organization. At times, he becomes anxious about all of the 'low hanging fruit' he has to deal with on a daily basis; "is [his] hardhat on, collar up, safety glasses on, ear plugs on etc., etc."., whereas the higher risk hazards are discarded by supervisors when questioned. Unsafe acts or conditions in organizations like these blur the lines on what is immediately dangerous to life or health versus ones that are merely "flavour of the week items", as described by Alan.

When prompted to describe the definition of unsafe acts or conditions, Sean responded with a: "from whose perspective?" He went on to say that when a new worker starts at a heavy industrial workplace everything is going to scare him or her. The entire whole place is unsafe. As opposed to the seasoned veteran that has been around the block a few times and has experience on what can cause you to be at risk, Sean stated it is "…all a manner of perspective and experience".

In summary, these three themes demonstrate that stopping unsafe work is not an easy endeavour. The inherent difficulty of decentralization describes stories of individuals who have been trained to view decentralization as a key to safety but in reality, view it as a judgement call with negative connotations, fear of discipline, defensiveness, loss of reputation and productivity, and a high threshold for justification for whenever stopping unsafe work occurs. The bureaucratic consequences that ensue when stopping unsafe work resulted in interviewees with a vocabulary of alienation, victimization, discrimination, mockery, blame and essentially the last 'soft control' in creating safety. Finally, the third theme of unsafe conditions being grossly underspecified was built on the interviewees' narrative that what is deemed safe and unsafe depends not only on the context but also on the observer and his frame of reference. This section, which outlined the results of the

interviews on the basis of these three themes, now leaves off to the results and analysis section that describes how the interviewees deal with these problems of formal stop work schemes through informal means.

RESULTS AND ANALYSIS

FORMAL VS. INFORMAL WAYS OF STOPPING WORK

The previous section discussed three main themes that surfaced during the interviews and described how the traditional formal stop work schemes deployed in various safety critical industries do not align with operational reality. As you can see in table 2, whereas the (predominantly HRT) literature assumes that a decentralized reliance on stopping work should be valuable, the data collected from the interviewees presents an opposing view.

Table 2. Assumptions and Themes from literature and interview data

Assumptions (derived from the literature)	Themes (emerged from the interview data)
Decentralized reliance on stopping work is a key to safety.	Decentralization is inherently problematic.
HRT assumes that everyone in the organization can stop work at any moment without any repercussions.	There are consequences (socially, bureaucratically and for the professional identity) whenever an individual stops work.
Decision making is bimodal and prioritizing safety will automatically parlay into explicit decision making criteria at the local level.	Unsafe work/conditions can be grossly underspecified, making the decision to stop unsafe work subjective or dependent on local conditions and interpretations.

The present section will continue where the discussion of these difficulties of a reliance on formally stopping work leave off, and will present the manner in which the interviewees deal with the challenges of unsafe work through informal means. This informal manner of stopping work has positive implications for individual employees and the organization as a whole.

The interviews reveal that there is an implicit separation of decentralization through formal and information means. The traditional formal means of stopping work can be considered 'Decentralization-As-Imagined' which is play on words from Hollnagel's (2004) 'Work-As-Imagined versus Work-As-Done'. The corollary between the phrases is that Work-As-Imagined, like Decentralization-As-Imagined, is the idealized way on how formal work is supposed to be conducted and often ignores the changing context of the work and the system as a whole. Contrarily, Work-As-Done is more aligned with reality and describes what actually happens in the context of a changing and resource constraint world.

In the case of decentralization, there is a formal means of stopping unsafe work in an idealized world and then there is the informal means of stopping work which is much more aligned with reality. Alan noticed in his career that when he stopped unsafe work through informal means there were no repercussions for the intervener and whom he intervened on - neither socially nor bureaucratically. He was just being his "brother's keeper" (Alan) by looking out for each other.

> We look out for each other for sure like 100% just in the nature of the job. I think that most people in construction would also. You're like a soldier because it could be your back tomorrow, it could be something like stepping in a hole or getting hit by a two by four. I think it's human nature to watch people [and informally intervene] … (Alan)

The frequency with how often employees use formal means of stopping unsafe work versus informal means is astounding. From seldom (Alan was quoted as formally stopped unsafe work 3 times in 30 years) to "daily" (Alan), "weekly" (George) or "all the time" (for all other interviewees) for informal means. Patrick believes that he would rather 'slap a co-worker's wrist' than go through the formal means of stopping work. He said he "wouldn't stop the work, I would just remind them gently that we don't do that and leave it at that rather than the whole formal thing". Sean, like

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Patrick, agrees that the informal means is a better approach and believes that is how decentralization is conducted on a daily basis anyways with his organization. He states that:

> In all honesty, that's probably the majority of what we call as Safety Interactions. Between workers, or supervisors and workers, workers and contractors, 'hey just so you don't get into trouble' so to speak or 'for your benefit use your fall arrest or make up a work zone so that if anyone comes around the corner and bumps into your ladder or whatever', just that kind of mentorship. (Sean)

George, as well as Patrick and Sean, uses a gentle approach but differs with the use of referring to procedural requirements on his informal approach. He states that he would approach someone performing work deemed unsafe or in an unsafe situation and tell them the following:

> 'Excuse me but you don't have your safety glasses on, it is mandatory to wear your safety glasses' or 'its mandatory to wear your gloves for doing that particular task', so that's the way I normally approach it at a very informal manner and try to address it in that respect. (George)

In other circumstances, he might even state what the outcomes might be for unsafe acts or conditions for the individual if the unsafe work continued unabated:

> I would stop my zoom boom for instance and say 'excuse me but your standing in   a pinch zone please move yourself out of that pinch point because if I dropped that you're going to get caught in between there'. I'll stop the work at that point. (George)

Rob too broaches the informal means of stopping unsafe work in a gentle manner but adds a 'physical' touch. He states "as a person doing an individual act, that I would nudge him and say 'hey, you know you shouldn't do that'…maybe they just don't understand." (Rob).

Milton found that historically in the forestry industry informally stopping work was always the normal way of performing work and had not heard of formal stop work schemes until the last five years while working in the industrial construction industry. He goes onto to say that "we don't need a stop card. We don't even think about them as far as pulling them out. We just naturally try to stop unsafe acts" (Milton).

Even with this repertoire of informal means of decentralization there can be negative connotations. Alan commented that during the last decade things have changed within his organization with more focus on reporting. As defined by Reason (1997), a reporting culture is "an organizational climate in which people are prepared to report their errors and near-misses" (p. 195). In Alan's organization, the reporting culture became inverted where workers discreetly intervene on fellow workers through informal means and do so in a way that the supervisors or managers are not aware or informed. As Alan already described once you notified your supervisor that you intervened on your fellow worker, then your supervisor or manager has to do something about it. The intervention or informal means of stopping work can be labelled as a near miss incident from the organizations incident reporting structure and the intervened worker could be subjected to a full-on investigation culminating with disciplinary action if required. History matters so only if a small percentage of situations where formal means of stopping unsafe work resulted in the intervened being subjected to negative repercussions - can have disastrous effects throughout the organization as a whole. Sean's co-worker's refusals of unsafe work and almost termination is an example of how quickly information can spread amongst an organization.

With that being said, Sean also responds to this type of disparagement with a positive spin. He went on to say that:

> If I have five safety interactions in a regular working day as an electrician on the floor, which would probably not be unusual to say, 'hey maybe you should put your safety glasses, gloves or whatever on.' You're not in the morning meeting the next day counting all of those and chalking them up as near misses or whatever. I mean that's just the social interplay between folks on the floor that work together, kind of looking after one another. It happens all the time (Sean).

In essence, this repertoire of informal means of stopping unsafe work is not something created out of thin air or is brand new and innovative, but is a system that has always been in place behind the scene that might appear as disingenuous to the expectation of the formal means of stopping work traditionalists but something necessary as to how decentralization is actually practiced in reality.

REFLECTIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH.

While this thesis addresses this gap of research into the practical workings of stop work schemes unexplored by High Reliability Theorists in the literature, there were several limitations, reflections and recommendations for future research to the study. Firstly, to address the limitations of the paper, some of the papers creating the foundation for the theoretical background can be considered dated, with some papers first published in the late 1980's and early 1990s. Although the limitations of HRO's oversimplification of the causes of accidents and underestimates the problems of uncertainty (Marais, Dulac & Leveson, 2004), the characteristics of High Reliability Organizations have not changed (preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience and deference to expertise) which helped provide the basis for my thesis. Secondly, cases of formal work refusals through the provincial and federal authorities in Canada are available for researchers but this body of data is so immense that it would be out of my scope in a master's student thesis. In addition, formal work refusals are typically not registered into a governmental 'database' unless the matter is not resolved and the worker continues to refuse unsafe work – prompting a visit from the regulatory bodies occupational safety representative. This data would already be insufficient because all the cases of formal work refusals that do not get to that level are resolved internally and are not registered. Thirdly, data of informal work refusals from the workers interviewed only portrays limited examples of how stop work schemes work in safety critical industries and further research is needed to attain a representative sample.

If I was to redo this study in the future, there are a number of changes I would have made. Since there is limited data that explicitly points towards formal work refusal difficulties, my theoretical background was challenging. With limited studies, my mentor suggested researching High Reliability Organization Theory to utilize as the foundation of my thesis theoretical background.

Some of the contentious charges on High Reliability Theory was not something that I was completely comfortable with using as a theoretical background and I felt this thesis would help serve safety practitioners with more research focused on the practical background.

Also, my initial approach to data collection involved not only just qualitative, by means of interviews, but also through quantitative means. After reading the RAD group study (Ragain, Ragain, & Allen, 2011), I felt that a few pointed questions in a survey to individuals in industry's which adhere to these forms of decentralization might augment the qualitative data in my thesis, but discussions with my mentor led me to believe that qualitative data should be sufficient enough to validate what the theoretical and practical backgrounds posit. Recommendations for future research would be to revisit this study as a longitudinal study and also include an element of quantitative data if time permits.

CONCLUSION

This research paper explored the traditional concepts of stopping unsafe work against how it is actually performed in reality. The theoretical literature was contrasted against the data provided by participant's organizational experience in safety critical industries in Western Canada. The themes revealed from this data consisted of: (1) Decentralization is inherently problematic, (2) There are consequences whenever an individual formally stops work, (3) Unsafe work can be grossly underspecified. The interviewees also explained that due to these problems with formal work schemes, they tend to stop work through informal means – a concept that I have called 'decentralization-as-practiced'.

The findings from the data indicate that an individual observation on what is or is not safe is not as black or white as High Reliability Theorists support and that legal and organizational bureaucracy often hinders would be interveners. Rather it is from individual employees through informal means is how safety is created on a normal basis contrary to the formal stop work schemes organizations often purport.

This formal means has implications for the actor(s) who have exercised decentralization with the outcome of repercussions, apathy and cynicism from their supervisors, managers and employers. Even the informal means of stopping unsafe work can threaten the individual interveners as whatever act or condition which is informally stopped could be misconstrued as a near miss from a superior within the organization incident reporting structure.

The lessons learned from analyzing 'decentralization-as-imagined' versus 'decentralization-as-practiced' would be that stopping unsafe work should truly remain (or refocused) on anonymity. That Key Performance Indicators (KPI) should not be focused on tabulating the amount of unsafe

work stoppages, formally or informally, as they have very little on how safety is created in reality and in fact can be counterproductive. A 'brother's keepers' informal approach should be advocated within safety critical organizations, and that informal decentralization should not be misconstrued as incidences (near misses/near hits/no loss) as this can certainly inhibit would be informal interveners, but in reality, as what Sean calls it a "social interplay" amongst coworkers creating a safer environment.

Whether these formal stop work schemes are called Stop-the-Line, Stop Work, Stop Work Authority, Intervention Cards, Work Stoppage Cards, Refusals of Unsafe Work, Andon Card etc., the purpose is the same. In an organization which typically manages day-to-day activities in a centralized manner, these formal stop work schemes are meant to symbolize a spontaneous transfer to decentralization; empowering lower status workers to stop work in an instantaneous manner. For some this might be an outlandish artefact in the faith-based approach to organizational safety and for the ones which work in safety critical industries 'decentralization-as-practiced' is the effective, necessary and informal manner in which work is actually performed.

Appendix 1

Consent for Participation in Interview Research

Research Project Title
Is unsafe work unsafe? Do stop work programs work?

Researcher
Hayden Greenshields
Email: hgreenshields@hotmail.com
Phone: 250-755-6435

Supervisor
Roel van Winsen
Email: roel.van-winsen@risk.lu.se

Purpose
The purpose of this research is to gain an understanding of why there is a disinclination for lower status workers to exercise stop work programs in situations deemed unsafe. This research project is conducted as part of my Master's thesis.

1. I volunteer to participate in this interview. I understand that the interview is designed to gather information about Organizational Stop Work Programs. I will be one of approximately eight people being interviewed for this research.
2. I understand that if I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.
3. The interview will last approximately 30-45 minutes. I understand that notes will be made during the interview and that the interview will be recorded and subsequently transcribed. At any time you can ask for the recording to be stopped.
4. I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. In all subsequent use of this data my anonymity will be protected.
5. I have read and understood the explanation provided to me. I have had the opportunity to ask any remaining questions.
6. I have been given a copy of this consent form.

Participant's signature_____Date_____

Researcher's signature_____Date_____

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